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The minerals of North Carolina. 1891.



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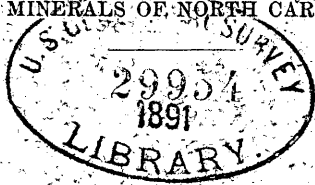
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THE MINERALS OF NORTH CAROLINA



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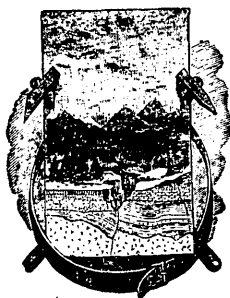
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MINERALS OF NORTH CAROLINA

BY

29954

FREDERICK AUGUSTUS GENTH



WASHINGTON
GOVERNMENT PRINTING OFFICE
1891

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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
U. S. GEOLOGICAL SURVEY,
DIVISION OF CHEMISTRY,
Washington, D. C., July 31, 1890.

SIR: I have the honor to transmit herewith the manuscript of a report by Prof. F. A. Genth, of Philadelphia, upon the minerals of North Carolina. I request that it may be published as a bulletin of the U. S. Geological Survey.

Very respectfully,

F. W. CLARKE,
Chief Chemist.

Hon. J. W. POWELL,
Director.

PREFACE.

The present bulletin is essentially a new edition, revised, corrected, and much enlarged, of a report published by the Geological Survey of North Carolina in 1881¹. Since that time there has been great activity in developing the mineral resources of the State; and by the reopening of old localities and the discovery of new deposits, a goodly number of species have been added to the old lists. To mineralogists North Carolina has become classic ground, especially as regards the mines of mica and corundum; the localities for modified quartz; the gold sands of Burke, McDowell, and Rutherford Counties; and the emerald and hiddenite discoveries. Minerals formerly supposed to be rare are now found abundantly, and through the recent developments of chemical industry even such unusual species as samarskite, monazite, and zircon have acquired commercial importance. For example, in response to an industrial demand, North Carolina has supplied zircon and monazite by the ton, and samarskite by the hundredweight; and the output can be increased almost indefinitely. The State has also contributed to science several new species as yet not found elsewhere, and some of these, notably among the vermiculites, are significant for the light which they shed upon other associated minerals.

In the former edition of this report due credit was given to several industrious workers whose enthusiasm had done much for the completeness of the record. The late Prof. J. T. Humphreys, and Dr. C. L. Hunter, Mr. J. A. D. Stephenson, and Mr. G. B. Hanna were there especially named. Mr. William Earl Hidden, of Newark, New Jersey, was also mentioned, but since then his continued labors have added largely to our knowledge of the mineralogy of the State. Mr. G. F. Kunz, also, in a number of separate papers and in his large work upon "The Gems and Precious Stones of North America," has done excellent service to the mineralogy of North Carolina. To Prof. J. A. Holmes, of Chapel Hill, Michigan, much credit is also due, particularly for perfecting the list of localities.

¹In an earlier form it appeared in 1871 as Appendix C of W. C. Kerr's report. A new edition was printed in 1875 as chap. I of vol. II of the Geology of North Carolina.

In the present memoir there will be found many new analyses, the greater number having been made by the author or under his direct supervision. Several very important analyses, however, were furnished by the chemists of the United States Geological Survey. To the field geologist or the collector of minerals the table of localities at the end of the report will be of especial value.

THE MINERALS OF NORTH CAROLINA.

BY FREDERICK A. GENTH.

NATIVE ELEMENTS.

GOLD.

Gold occurs in numerous localities throughout the State, generally in quartz veins of gneissic, granitic, and dioritic rocks, also in those of talcose, chloritic, and argillaceous slates, and in beds of the slates themselves, and in gravel deposits, the débris of the decomposed rocks and veins. The principal counties in which it has been found in sufficient quantity for exploitation are Franklin, Nash, Granville, Alamance, Chatham, Moore, Guilford, Davidson, Randolph, Montgomery, Stanly, Union, Cabarrus, Rowan, Mecklenburgh, Lincoln, Gaston, Catawba, Caldwell, Burke, McDowell, Rutherford, Polk, Cleveland, Cherokee, Jackson, Transylvania, and Watauga.

It is generally more or less alloyed with silver, varying from pure gold on the one side to pure silver on the other. Near the surface it is usually associated with limonite and at a greater depth of the deposits with pyrite, chalcopyrite, galenite, zinc blende, tetradymite, arsenopyrite, rarely with altaite and nagyagite. Specimens of gold, remarkable for their size, have been found at the Reid mine in Cabarrus County, the Crump mine and the Swift Island mine in Montgomery County (at the latter place in plates, covered with octahedral crystals), at the Cansler & Shuford mine in Gaston County, the Little John mine in Caldwell County, and Pax Hill in Burke County. Very beautiful arborescent gold has been obtained from the Shemwell vein in Rutherford County. The variety "electrum," containing from 36 to 40 per cent of silver, has been met with in octahedral crystals at Ward's mine, in Davidson County; also, in Union County, at the Pewter mine, and associated with galenite and zinc blende at the Stewart and Lemmond mines, and in the neighborhood of Gold Hill, Rowan County.

According to the late Dr. Asbury, very interesting specimens have been found at Silver Hill, when the mine was first opened, consisting of lumps of several inches in length, one end of which was pure gold, while the other was pure silver. None of them have been preserved,

SILVER.

Silver is, on the whole, rare in North Carolina. It has been obtained in considerable quantities at Silver Hill, in its native state, foliated and in plates in cerussite, also associated with argentite, galenite and zinc blende in small lumps, and arborescent and filiform masses; it has also been found in small plates and reticulated masses, associated with tetrahedrite and zinc blende, at the McMakin mine, in Cabarrus County; two specimens of laminated silver have been observed by Dr. Asbury at the Asbury mine, in Gaston County; it has also been found by Hon. C. J. Cowles, of the Charlotte Assay Office, associated with chalcocite, at Gap Creek mine, Ashe County, and rarely with the gold ores of Scott's Hill, Burke County.

PLATINUM.

The occurrence of grains of platinum among the sands of the gold-washings of Rutherford and Burke Counties was first brought to notice by General Clingman, who sent half a dozen grains from a mine near Jeanestown to Prof. C. U. Shepard. It has also been found on Brown Mountain, in Burke, northwest of Morganton, on Gen. R. F. Hoke's land. It is reported as having been found near Burnsville, Yancey County. Hidden, after much searching, failed to discover platinum at any of the reported localities.

PALLADIUM.

General Clingman sent a specimen to Prof. C. U. Shepard, which came probably from Burke or Rutherford County, which the latter pronounced "native palladium." Very doubtful.

COPPER.

Copper is found in small quantities in several mines, principally near the surface, in minute distorted crystals with limonite at the McCulloch mine, in Guilford County; arborescent and in crystalline plates at the Union Copper mine, in Cabarrus County, near Gold Hill. One lump of copper, about two inches in size, much resembling that from the Cliff mine, Lake Superior, said to have been found in Stokes County, is in the museum at Raleigh. It also occurs in quartz and epidote rock at Harris Mountain, one-half mile east of Gillis mine, Person County, at Wolf Creek mine, Jackson County, and Ore Knob, Ashe County. A very interesting association is that of native copper in quartz crystals from lower Mecklenburg County, as observed by Mr. E. Bissell.

IRON.

Terrestrial native iron has been found by Mr. W. F. Page associated with monazite, zircon, etc., in the auriferous gravel of Burke County. It was in the form of small malleable grains of almost pure iron, with mere traces of cobalt. Apart from this, a great number of highly in-

teresting meteoric masses have been found in the State. Many of them have been preserved through the industrious perseverance of Gen. Clingman, and were described by Prof. Shepard. The meteorites found were both irons and stones. They are:

1. The Caswell County iron, which fell on January 30, 1810; it weighed 3 pounds, and was described by Madison.

2. The Guilford County iron was found in 1820; weighed 28 pounds, and was described by C. U. Shepard in 1841. Analysis gave:

Iron	92.750
Nickel	3.145
Iron sulphide	0.750

3. The Randolph County iron was found in 1822, and weighed about 2 pounds. It was described by C. U. Shepard. It is highly crystalline, distinctly foliated, and presents thin, much interlaced laminae. When polished and etched it shows very fine almost invisible feathery lines, much resembling hoar frost on a window pane. It is, according to Shepard, pure iron with cobalt only in traces. It has a hardness like the best tempered steel, and a sp. gr. 7.618.

4. The Black Mountain iron, from the head of the Swannanoa River, 15 miles east of Asheville. It weighed 21 ounces and is evidently a fragment from a larger mass. It is highly crystalline, laminated, the laminae being about one-tenth of an inch in thickness and arranged parallel to octahedral planes. Sulphide of iron being inclosed between the laminae renders it subject to rapid weathering. The analysis by C. U. Shepard gave:

Iron.....	96.04
Nickel, with trace of cobalt.....	2.52
Insoluble sulphur and loss	1.44
Sp. gr., 7.261.	

It was discovered in 1835.

5. The Asheville iron, discovered in 1839 on Col. Baird's plantation, near the French Broad River, 6 miles north of Asheville. It weighed about 30 pounds. Analysis by C. U. Shepard:

Iron	96.5
Nickel	2.6
Silicon	0.5
Chlorine	0.2
	<hr/>
	99.8

With traces of chromium, sulphur, cobalt, and arsenic.

6. The Buncombe County iron, found in 1845 and described by C. U. Shepard in 1846, weighed about 27 pounds.

7. The Hominy Creek iron, near the base of Pisgah Mountain, 10 miles west of Asheville. It weighed between 5 and 6 pounds. It is circular near the surface, and is said to contain chrysolite, and becomes more compact towards the central portion. The polished and etched portions of the compact meteorite show most delicate Widmannstättenian

figures, consisting of very minute and thickly interspersed triangles. Sp. gr. 7.32. The analysis by Clark gave:

Iron.....	93.225
Nickel (cobalt).....	0.236
Iron, nickel, phosphorus, and graphite	4.765
Copper and tin.....	0.099
Sulphur.....	0.543
Silicon.....	0.501
Magnesium, manganese.....	traces.
	<hr/>
	99.369

8. The Madison County iron, from Jewel Hill. Several masses have been found. One of 8 pounds 13 ounces, described by J. L. Smith, was presented to him by Hon. T. L. Clingman, in 1854. It was covered with thick rust, and it deliquesces on account of the presence of ferrous chloride. The etched surface shows the most beautiful fine Widmannstädtian figures.

The analysis by Smith gave:

Iron	91.12
Nickel	7.82
Cobalt	0.43
Phosphorus	0.08
Copper	trace.
	<hr/>
	99.45

Another mass, which weighed about 40 pounds, was found in 1857; part of it is in the collection of Amherst College.

Still a third mass, found in 1873, is known to collectors as the Duel Hill iron. It weighed 25 pounds, and shows Widmannstädtian figures with octahedral structure, inclosing bright nickel iron. Deliquesces on account of inclosed ferrous chloride. Sp. gr. 7.46. The analysis by B. S. Burton gave:

Iron	94.24
Nickel	5.17
Cobalt	0.37
Copper.....	trace.
Insoluble ¹	0.15
	<hr/>
	99.93

9. The Haywood County iron, described by Shepard, weighed only one-eighth of an ounce. It is highly crystalline. When polished and etched shows brilliant Widmannstädtian figures. It is also irregularly veined by a black mineral, which appears to be magnetite. Sp. gr. 7.419. Contains iron, nickel, chromium, and phosphorus.

10. The Rockingham County iron, from Smith's Mountain, 2 miles north of Madison; found in 1866 in an old field grown up with pines, but cultivated 10 or 15 years previously. It fell probably in the interval. The original weight was 11 pounds, the greater portion of which is preserved in the museum at Raleigh. It is highly crystalline and on etching

¹Silica, iron, nickel, chromium, and phosphorus.

gives fine Widmannstädtian figures, showing that it consists of probably three different kinds of iron. Contains also schreibersite in short, very minute quadratic crystals; the so-called rhabdite; and, according to J. L. Smith, *solid* chloride of iron. Sp. gr. 7.78. It has been analyzed by me (I) and J. L. Smith (II) as follows:

	I.	II.
Iron	90.41	90.88
Nickel	8.74	{ 8.08
Cobalt		{ 0.50
Copper	0.11	0.03
Insoluble phosphide.....	{ Iron	0.27
	{ Nickel (cobalt)	0.33
	{ Phosphorus	0.14
	100.00	99.46

11. A second mass of iron from near Old Mansion House, on Deep Spring Farm, Rockingham County, now in the State museum at Raleigh, has recently been analyzed by F. P. Venable. Results as follows:

Iron	87.01
Nickel	11.69
Cobalt	0.79
Chlorine	0.39
Phosphorus	0.04
Silica	0.53
	<hr/> 100.45

12. A small meteoric iron, weighing only 428 grammes, was found on Linnville Mountain, in Burke County, about 1882. It came into the possession of Mr. Norman Spang, of Etna, Pennsylvania, from whom it was obtained by Mr. G. F. Kunz, who described it. Its dimensions are 65 mm. long, 35 mm. high, and 38 mm. wide. It is rough on one side, with very shallow pittings on the other; it shows traces of a black crust, and although the mass has not rusted, small drops of ferrous chloride have collected in crevices. It contains some troilite, but does not show the Widmannstädtian figures. A partial analysis was made by W. D. Weikel (I) in 1886, in the laboratory of the University of Pennsylvania; and later a more complete analysis was reported by J. E. Whitfield (II):

	I.	II.
Iron	85.83	84.56
Nickel	13.44	14.95
Cobalt .....	.73	.33
Copper	undet.	{ none
Sulphur		{ .12
Carbon		{ trace
Phosphorus		{ trace
Silicon		{ none
	100.00	99.96

The iron is now with the Kunz collection in the imperial cabinet at Vienna.

13. Another iron from Burke County was found by a plowman about 2 miles from Bridgewater Station, near the McDowell County line. It was broken by some laborers into two pieces, weighing $10\frac{1}{2}$ and $18\frac{1}{2}$ pounds respectively. Traces of crust are still visible upon its surface, which is very much oxidized. The iron is highly octahedral in structure, and between the plates schreibersite is visible. On the etched surface Widmannstädtian figures are shown similar to those on the Cabin Creek and Glorieta meteorites. Sp. gr. of a fragment 6.617. Analysis by F. P. Venable:

Iron	88.90
Nickel	9.94
Cobalt	0.76
Phosphorus	0.35
Chlorine	0.02
	<hr/>
	99.97

For the foregoing particulars I am indebted to Mr. G. F. Kunz, the present owner of the meteorite.

14. In the latter part of 1880 a meteoric iron weighing 72 troy ounces was found on a farm near Ellenboro, in Rutherford County. Somewhat over one-half of the mass was given to Mr. S. W. Cramer, of the United States assay office at Charlotte, who recognized its character, and by him a liberal portion was given to the U. S. National Museum. The iron is highly crystalline, and shows Widmannstädtian figures upon its polished surface even before etching. It contains small patches of troilite. From its description by Mr. L. G. Eakins the following analysis is taken:

Iron	88.05
Nickel	10.37
Cobalt	0.68
Copper	0.04
Phosphorus	0.21
Sulphur	0.08
Silicon	0.02
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	99.45

15. An iron from Davidson County, identified by Mr. W. E. Hidden, is described by him as follows:

On the 19th of July, 1879, while Mr. Gray W. Harris was prospecting for gold on his plantation near Lick Creek, Davidson County, he found in a ditch a nugget of what appeared to him to be silver. It was covered with a thick, scaly crust of iron oxide; weighed $2\frac{1}{2}$ pounds; was pear-shaped; measured $4\frac{1}{2}$ by $2\frac{1}{2}$ inches over its broadest surface, and about 1 inch in thickness. Wherever cut or hammered it showed a white metallic mass underlaying the red crust.

This iron has been analyzed by Dr. J. Lawrence Smith and J. B. Mackintosh. I here give the average of four closely agreeing analyses:

Iron	93.00
Nickel	5.74
Cobalt	0.52
Phosphorus	0.36
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	99.62

Traces of sulphur, chlorine, and copper; carbon not determined.

This iron does *not* show the customary Widmannstätten figures.

Apart from the meteoric irons, the following meteoric stones have fallen in North Carolina, and may properly be noted at this point:

16. The Cabarrus County stone fell on October 31, 1849. It weighed 18½ pounds and was an irregularly shaped mass, resembling a truncated four-sided pyramid; on the base a rounded, undulatory surface, coated with a black, coherent crust; tough; color, dark bluish gray, mottled with grains and crystals of lighter color; in structure, subporphyritic. Sp. gr. 3.60–3.66.

According to C. U. Shepard it contains:

Nickeliferous iron (with chrome)	6.320
Sulphide of iron	3.807
Silica	56.168
Ferrous oxide	18.108
Magnesia	10.406
Alumina	1.797
Lime, soda, potash, and loss.	3.394
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	100.000

17. The Nash County stones fell May 14, 1874, near Castalia. Perhaps a dozen or more stones fell, of which 3 have been found, 1 of over 12 pounds, the others of 2½ and 1⅞ pounds. They have a dull black coating and consist of darker and lighter portions. Sp. gr. 2.601. The analysis by J. L. Smith shows that it is composed of—

Nickeliferous iron	15.21
Stony mineral	84.79
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The nickeliferous iron contains:

Iron	92.12
Nickel	6.20
Cobalt	0.41
Copper and phosphorus not determined.	
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98.73

The stony portion is partly soluble in acids, leaving 47.2 per cent undissolved:

	Insoluble part.	Soluble part.
Silica	52.61	38.01
Alumina	4.80	0.46
Ferrous oxide.....	13.21	17.51
Magnesia	27.31	41.27
Soda with traces of potash.	1.38	.....
Sulphur.....	.....	1.01
	99.31	98.26

The insoluble portion is mostly bronzite; the soluble, chrysolite, with small particles of anorthite.

18. The Haywood County stone was seen to fall by Mr. W. A. Harrison of Ferguson, about 6 p. m., July 18, 1889, and was picked up hot. It weighed about 8 ounces, and very closely resembled the stones from Mócs, Transylvania. In shape it was slightly oblong, and was covered with a deep black crust, which, broken at one end, showed a perfect chondritic structure, with occasional specks of iron. It was sent to New York to Mr. G. F. Kunz, who furnishes its description; but in December, 1889, it was unfortunately lost.

19. A peculiar substance, consisting principally of iron and silicon, supposed to be of meteoric origin, has been found near Rutherfordton. Shepard described it and called it "ferrosilicine."

In a recent "List and Description of the Meteorites of North Carolina," by Prof. F. P. Venable, published in the "Journal of the Elisha Mitchell Scientific Society," three other occurrences are noted, of which little is known. An iron weighing 56 grammes found in Alexander County in about 1875, is now owned by S. C. H. Bailey, of Oscawana, New York. Another fragment of iron marked as being from Caldwell County is in the State Museum at Raleigh. Also a fragment of a meteoric stone has been reported from Ashe County, but it may be identical with the Grayson County, Virginia, fall.

LEAD.

A few small irregular lumps of what has been alleged to be "native lead" were received from Messrs. Bechtler, of Morganton. They were said to have been dug up 4 miles north of Morganton, in making a road near the Catawba River.

ANTIMONY.

A small piece of native antimony was received from Dr. Hunter. It is quite pure and free from arsenic, but coated with a crust of antimonious oxide. From a small vein in Burke County.

SULPHUR.

It is frequently met with in minute crystals in cellular quartz, filling the cavities, formerly occupied by pyrite, in Cabarrus, Mecklenburg, Gaston, Caldwell, Surry, and Stokes Counties; it also occurs diffused through the interstices of a white quartzose sandrock in Lincoln County.

DIAMOND.

This rare gem has been repeatedly found in North Carolina, and the following occurrences are well established. In every instance it was found associated with gold and zircons, sometimes with monazite and other rare minerals, in gravel beds resulting from gneissic rocks, but it has never been observed in the North Carolina itacolumite or any débris resulting from its disintegration. The first diamond was found in 1843 by Dr. M. F. Stephenson, of Gainesville, Georgia, at the ford of Brindletown Creek. It was an octahedron, valued at about \$100. Another from the same neighborhood came into possession of Prof. G. W. Featherstonhaugh, while acting as United States geologist.

The third diamond, at Twitty's Mine, Rutherford County, was observed in 1846 by Gen. Clingman, in D. J. Twitty's collection, and has been described by Prof. Shepard. Its form is a distorted hexoctahedron and its color yellowish.

The fourth came from near Cottage Home, in Lincoln County, where it was discovered in the spring of 1852, and was recognized by Dr. C. L. Hunter. It is greenish and in form similar to the last, but more elongated.

A very beautiful diamond was found in the summer of 1852 in Todd's Branch, Mecklenburg County. It was nearly of the first water and a perfect crystal. It was in possession of the late Dr. Andrews, of Charlotte. Dr. Andrews informed me that a very fine diamond of about the size of a small chinquapin, and of a black color, had been found at the same locality by three persons while washing for gold. In their ignorance, believing that it could not be broken, they smashed it to pieces. Dr. Andrews tested the hardness of a fragment, which scratched corundum with facility, proving it to be a diamond.

A very beautiful octahedral diamond of first water was found many years ago at the Portis Mine, Franklin County. There is a report that a second one has been found at the same locality.

A small diamond was found a few years ago in McDowell County, on the head waters of Muddy Creek.

Dr. C. Leventhorpe, of Patterson, North Carolina, reports that a small, poor diamond was found in a placer mine in Rutherford County a number of years ago; it was given to Prof. C. U. Shepard, who put it in his collection.

G. F. Kunz states that a diamond weighing $4\frac{1}{2}$ carats, or 873 mg., was found on the Alfred Bright farm, in Dysortville, McDowell County, in the summer of 1886. It is quite perfect, but not pure white, having a faint grayish green tint. In form it is a distorted hexoctahedron with

partial twinning. Its specific gravity is 3.549, and it measures 10mm. in length and 7mm. in width.

According to W. E. Hidden another diamond was found in 1877 by a small boy in the same region as the one above mentioned. It weighed $2\frac{3}{8}$ carats, was shaped very much like a smooth, flat field-bean, and was very well polished naturally. It was white, but somewhat flawed. The crystal planes were very obscure. It was finally sent to New York and cut into a small gem.

GRAPHITE.

Graphite has been found at numerous localities. It forms large beds in the gneissic and micaceous schists. Sometimes very minute scales are disseminated through the gneissic and micaceous, and occasionally the limestone rocks. In most places it is impure and gritty, at others purer and better varieties have been obtained. The largest beds occur in Wake County, others in Lincoln, Cleveland, Catawba, Alexander, Stokes, Surry, Wilkes, Person, Alleghany, Johnston, and Yancey Counties.

SULPHIDES, ETC.

SULPHIDES AND TELLURIDES OF METALS OF THE SULPHUR AND ARSENIC GROUPS.

STIBNITE.

Found in the northern part of Granville County, on the land of Maj. N. A. Gregory.

BISMUTHINITE.

In very minute crystals and specks in chloritic slate associated with gold, chalcopryrite, and pyrite at the Barnhardt vein of Gold Hill, Rowan County.

TETRADYMITÉ.

This rare mineral has been found associated with gold in quartz at David Beck's mine, 5 miles west of Silver Hill, and at the Allen mine, in Davidson County; also, in minute scales in Cabarrus County, at the Phoenix mine, Boger mine, Cullen's mine, at the Asbury vein in Gaston County, at Capt. Mills's mine in Burke County, and Capt. Kirksey's, McDowell County.

I have analyzed the tetradymite from Davidson County and that from the Phoenix mine, Cabarrus County; after deducting quartz and gold found:

	Davidson County.	Phoenix mine.
Tellurium	33.84	36.28
Sulphur.....	5.27	5.01
Selenium	trace	.....
Bismuth	61.35	57.70
Copper.....	.....	0.31
Iron.....	.....	0.54
	100.46	99.94

MOLYBDENITE.

In granite and quartz veins, in fine scales in the neighborhood of the Pioneer Mills mine, Cabarrus County; also, in Guilford County, and at Peach Bottom mine, Alleghany County; at Haskett's, Macon County; and in many other places west of the Blue Ridge.

SULPHIDES, ETC., OF METALS OF THE IRON, GOLD, AND TIN GROUPS.

ARGENTITE.

In small grains, associated with native silver, in the ores of Silver Hill, Davidson County, and the McMakin mine, in Cabarrus County; also in slates of Montgomery County. (Emmons.) Found also at the Cheek mine, Moore County, at Higdon's mine, in the Cowee Mountains, and in Swain County.

GALENITE.

At Silver Hill sometimes, in highly argentiferous, crystalline, bluish gray masses, also coarsely and finely granular. In coarse-grained masses at the Hoover mine and Boss mine, in Randolph County, and the McMakin mine, Cabarrus County; in small quantities at Miller's mine, Baker mine, and Little John mine, in Caldwell County; at Pax Hill, in Burke County; in Alexander County; at Cansler & Shuford mine, the Asbury mine, the King's Mountain mine, the Crowder's Mountain barite mine, and the Oliver mine, in Gaston County; highly auriferous and argentiferous galenite occurs at the Stewart mine, Lemmond mine, Phifer mine, Smart mine, Moore mine, and Crowell mine, and elsewhere in Cabarrus; and at Long mine in Union County; at the Cheek mine, Moore County; with copper ores it is found at the Clegg's and Williams's mines, in Chatham County; the Peach Bottom mine, in Alleghany County; at Marshall, in Madison County; with gold at Murphy, Cherokee County, and in Lincoln, Macon, Swain, and Surry. Specimens of fine-grained galenite have also been obtained from Beech Mountain, in Watauga; on Elk Creek, Wilkes County; and at the Steele mine, Montgomery County.

ALTAITE.

This exceedingly rare mineral occurs associated with gold, nagyagite, galenite, etc., at King's Mountain mine, Gaston County.

BORNITE OR VARIEGATED COPPER ORE.

I have crystalline specimens of bornite from Guilford County, probably from the Gardner Hill mine; it is of somewhat rare occurrence in North Carolina, but has been found with other copper ores at Clegg's mine, in Chatham County; Marshall, in Madison County; Peach Bottom, Alleghany County; the Gap Creek mine, Ashe County; near Concord, Cabarrus County, and at Well's farm in Gaston.

SPHALERITE OR ZINC BLENDE.

This mineral occurs in quantities sufficient for exploitation only at a few mines. The principal localities are Silver Hill and Silver Valley, in Davidson County, and the McMakin mine, in Cabarrus County, where it is found associated with silver ores; associated with gold ores at Stewart, Lemmond, Long, and Moore mines, and rarely at the Union mine, in Union County; in limestone at Dobson's mine, Cedar Cove, McDowell County, and in Macon County; in small quantities with other ores at King's Mountain mine in Gaston County; at Clayton, in Johnston County, near Marshall; in Madison County, and on Uwharrie River, Davidson County; at the Steele mine, Montgomery County; at Peach Bottom mine, Alleghany County; Crowder's Mountain, Gaston County; and the Smart mine, Union County.

CHALCOCITE.

This is also a copper ore, but rarely met with in the State. The massive variety has been found at the Ore Knob mine, in Ashe County; also associated with bornite at Gap Creek mine, Ashe County; the Waryhut and Wolf Creek mines, in Jackson County; the Gillis mine, and Mill Creek mine, in Person County; also at the Pioneer Mills mine, in Cabarrus; at A. Nichol's, in Swain; and in Guilford County, as a product of the alteration of other copper ores and rarely with silver ores at Silver Hill.

TROILITE.

Interlaminated with the meteoric iron from the Black Mountain, Buncombe County, and in other meteorites, q. v.

PYRRHOTITE.

Compact pyrrhotite is found at the bottom of the Asbury shaft in Gaston County; also associated with chalcopyrite at the Elk Knob mine, Ashe County, on East Fork and West Fork of Pigeon River, Haywood County, in Transylvania County, near Hickory in Catawba County, at Thorn Mountain mine, Macon County, and in Surry and Wilkes (Trap Hill).

SCHREIBERSITE (RHABDITE).

This mineral, of meteoric origin, has been observed in minute quadratic prisms of great brilliancy in the meteoric iron of Smith's Mountain, Rockingham County, and in less distinct particles in many of the meteoric irons.

PYRITE.

Pyrite is one of the most common minerals of North Carolina. It is not only found in globular and irregularly shaped crystalline masses in many of the marl beds of the eastern counties, but many of the gneissic rocks and slates and the traps contain it in considerable quan-

tities, and besides it is found in almost every mine of the State. In Cleveland and Rutherford it is a common constituent of the feldspathic, slaty gneisses, disseminated in minute grains, and its ready oxidation rapidly disintegrates the rocks, so that during the late war copperas was extensively and cheaply manufactured here by simply breaking and heaping the half decomposed fragments of rock in hoppers, leaching and crystallizing. In the gold mines the associated pyrite is generally auriferous. Cubical crystals occur at Hickory, Catawba County; Asbury mine, Gaston County; Soapstone quarry, 12 miles northeast of Statesville; Silver Hill, Gold Hill, and many other localities. Combinations of cubes and octahedra are found in Clegg's mine, Chatham County, and in the Guilford County gold and copper mines; the pyritohedron, often in combination with cubical and octahedral planes, is found at the Stewart mine, in Union County; Cambridge mine, Guilford County; Long Creek mine, Gaston County; Rudesill mine, Mecklenburg County, etc. Large veins of compact pyrite occur in Gaston County.

CHALCOPYRITE.

This is very abundant, and, indeed, is the only reliable copper ore in North Carolina. It has been found in fine crystals at the Gardener Hill mine, probably also at other copper mines of Guilford County. It is very abundant and largely mined at Ore Knob, Ashe County, and promises to be the ore of all the gold mines, which in depth change into copper mines in Guilford, Cabarrus, and Mecklenburg Counties; also at the Clegg mine, in Chatham County; the Conrad Hill and the Emmons and other mines in Davidson County; Peach Bottom and elsewhere, Alleghany County; and at Gap Creek, Ashe County; Newlin's mine, Alamance County; in Alexander; in the gold mines of Union, Rowan, and Gaston Counties; at Macpelah Church, in Lincoln County; in Granville and Chatham Counties; near Hillsboro; near Chapel Hill, Orange County; near Raleigh, in Wake County; in Surry, Wilkes (Trap Hill), Yadkin, Watauga, and Swain counties; and some of the mica mines of Mitchell County; the copper mines of Macon and Jackson Counties—in more than thirty counties, and hundreds of localities; at many of them it is found associated with other ores.

BARNHARDTITE.

A peculiar and rich copper ore, first noticed on Daniel Barnhardt's land and then at the Pioneer Mills mine, in Cabarrus County. It also occurs at the Cambridge mine, in Guilford County; at the Wilson mine and the McGinn mine, in Mecklenburg County; and at Elk Knob, Watauga County. The true barnhardtite occurs in compact masses—having, on a fresh fracture, a very pale bronze yellow color, but rapidly tarnishing with brownish pinchbeck, also with rose red and purplish colors. That from Barnhardt's land has been analyzed by W. J. Taylor (I), that from Pioneer Mills by me (II) and by P. Keyser (III).

	I.	II.	III.
Copper.....	47.61	46.69	48.40
Iron	22.23	22.41	21.08
Sulphur	29.40	29.76	30.50
Silver	trace		
	99.24	98.86	99.98

There occurs at the Pioneer Mills, associated with the barnhardtite, another copper ore, which appears to be uniform in composition and does not look like a mixture. It is paler than copper pyrites and contains, according to the analyses of W. J. Taylor (I) and Charles Froebel (II):

	I.	II.
Copper.....	40.2	40.5
Iron	28.4	28.3
Sulphur.....	32.9	31.1
	101.5	99.9

MARCASITE.

According to the information received from Dr. Asbury, of Charlotte, this mineral occurs in Iredell County.

LEUCOPYRITE.

It has been observed by the late Dr. Asbury, at the Asbury mine, in Gaston County; in nodular masses almost completely altered into scorodite at Dr. Halyburton's, in Iredell County; and at Drum's farm, on White Plains, Alexander County.

ARSENOPYRITE OR MISPICKEL.

It occurs sparingly in North Carolina, and has been observed in minute crystals, associated with gold ores, at the Lemmond and Stewart mines, Union County, and at the Barringer mine and George Ludwick's mine in Cabarrus County. It has been found by Gen. Clingman in Cleveland County, and by Dr. Asbury, at Ore Knob mine in Ashe County, the Honeycutt vein at Gold Hill, and highly auriferous at the Asbury mine, in Gaston County. It also occurs near Cooke's Gap, Watauga County, in fine crystalline particles, disseminated through siliceous rock; and, according to Hidden, at Brindletown (?).

NAGYAGITE.

This exceedingly rare mineral, which previous to its discovery in North Carolina was known only from Transylvania, in Hungary, occurs sparingly in minute crystals and foliated particles at the King's Mountain mine, where it is associated with altaite, gold, etc.

COVELLITE.

Resulting from the decomposition of chalcopyrite and associated with it, covellite occurs at several of the North Carolina copper mines, for instance at the Phoenix mine, etc., in Guilford County; and in fine scales at the Gillis mine and Mill Creek mine, in Person County.

SULPHARSENIDES, SULPHANTIMONIDES, ETC.

PROUSTITE (?).

Microscopic crystals of a bright aurora red color occur with talc, rhodochrosite, etc., at the McMakin mine. As they are rich in silver they are probably proustite.

AIKINITE OR CUPREOUS COSALITE (?).

A mineral containing sulphur, bismuth, lead, and copper, and therefore probably aikinite or cosalite, has been observed in small particles in quartz associated with chalcopyrite at Col. White's mine, Cabarrus County.

TETRAHEDRITE.

Two varieties of tetrahedrite are found in North Carolina, the highly argentiferous (freibergite), in small compact patches of subconchoidal fracture and a dark gray color, associated with silver, sphalerite, galenite, talc, magnesite, etc., at the McMakin mine, Cabarrus County, and the other in the same county at George Ludwick's mine, 14 miles northeast of Concord, rarely crystallized, but mostly massive and of a dark lead-gray to iron color. It is associated with chalcopyrite, scorodite, arseniosiderite, etc., in a quartz vein.

The tetrahedrite from the McMakin mine has been analyzed by myself (I) and by Mr. J. S. de Benneville (II) in my laboratory. The second sample was very pure, and was collected about twenty years ago, and twenty years after the first.

	I.	II.
Sp. gr.		4.776
Sulphur	25.48	26.55
Antimony	17.76	6.99
Arsenic	11.55	13.49
Copper	30.73	37.45
Iron	1.42	2.05
Zinc	2.53	5.67
Silver	10.53	6.47
Manganese		0.45
	100.00	99.12

There is probably an occasional small admixture of argentiferous tetrahedrite with the minerals associated with the native silver of Silver Hill, as they sometimes give before the blowpipe incrustations of antimony.

COMPOUNDS OF CHLORINE, ETC.

HALITE OR COMMON SALT.

Found in the waters of the Atlantic Ocean, from which it can be obtained by evaporation, and in wells and springs at several points in the Triassic beds, e. g., in Chatham, Orange, and Rockingham Counties.

CERARGYRITE.

In some of the gold ores of Scott's Hill, in Burke County; silver is found after roasting; a specimen, which I had an opportunity to examine, makes it probable that it is present as chloride of silver or cerargyrite.

FERROUS CHLORIDE.

It has been observed in the meteoric irons from Asheville and from Jewel Hill, Madison County, which are wet from the deliquescence of this salt. In the Rockingham County iron it has been found in the solid state.

FLUORINE COMPOUNDS.

FLUORITE.

According to Gen. Clingman, fluorite occurs at Brown Mountain, Burke County; also in Watauga; with barite and hematite below Marshall, Madison County, and at King's Mountain, Gaston County. In pseudomorphs after apatite rarely at Ray's mine, Yancey County.

YTTROCERITE (?).

A few minute, deep violet-blue spots were observed in association with pyrochlore, black tourmaline, orthoclase, quartz, etc., at Ray's mica mine, Hurricane Mountain, Yancey County, which are probably yttrocerite.

OXYGEN COMPOUNDS.

OXIDES.

CUPRITE.

Cuprite or the red oxide of copper occurs near the surface in some of the copper mines. It is rarely found in small cubical crystals at Cullen's mine and in octahedra upon native copper at the Union Company copper mine in Cabarrus County. It has been observed at Clegg's mine, Chat-

ham County; at Silver Hill, at the Harris mine, in Person County; in Caldwell, Lincoln, Alleghany, and Ashe Counties, and upon the gossan of the Waryhut mine, Jackson County. At the McGinn mine, in Mecklenburg County, and several of the Guilford County copper mines, cuprite in acicular and capillary crystals (so-called chalcotrichite) was formerly found in beautiful specimens.

MELACONITE.

It is found occasionally as a black coating or a powder associated with cuprite at the McGinn mine, and with zincblende, etc., sparingly at Silver Hill; also at Cullowhee mine, Jackson County.

CORUNDUM.

One of the most interesting minerals, which occurs in the State of North Carolina in a great many varieties, is corundum. It was first noticed when, in the spring of 1847, a large mass of a dark blue cleavable variety was found 3 miles below Marshall, in Madison County. Gen. Clingman's attention having been called to it, he searched for more, and obtained in 1848 a second piece of about half the size. It has since been found $2\frac{1}{2}$ miles north of Marshall, at Haynie's, associated with margarite and rutile. It was afterward found by Dr. C. L. Hunter, in small quantity, in reddish and bluish masses, sometimes crystallized, at Crowder's Mountain, and afterward at Clubb's Mountain and King's Mountain, Gaston County. About 20 years ago large beds of corundum were discovered by Hiram Crisp, near Franklin, in Macon County, at Culsagee or Corundum Hill. Here it is from 10 to 14 feet thick, embedded in prochlorite, between chrysolite and hornblende gneiss. The corundum itself presents many varieties. Beautiful hexagonal pyramids with basal and rhombohedral planes and of many shades of color, from almost colorless to yellow and deep red, rarely to green, have been found. Some of the crystals are very large, one, for instance, measured 5 feet 2 inches in length. Usually it occurs massive, often in large cleavage masses, frequently of variable colors; some are red and semitransparent and in small fragments even transparent and form a fair ruby; other specimens of reddish or gray corundum have disseminated through the mass the most beautifully colored azure-blue sapphire. Unfortunately the particles of the red and blue are usually too small to have any value as gems. A very peculiar variety is that consisting of white and blue bands. At this locality corundum is associated with prochlorite, black and greenish black spinel, tourmaline, small quantities of rutile, etc., and where it occurs in the mica schist, with muscovite and margarite.

Other localities in Macon County where corundum is mined are Jacob's and Haskett's mines, on Ellijay Creek, and at Robinson's mine, on Sugartown Fork. It is also found at Houston's mine, and at Moore & Higdon's. At West's mine "ruby" corundum occurs in small, irregular crystals and crystalline masses associated with cyanite.

At the Hogback mine, in Jackson County, corundum associated with muscovite, margarite, and tourmaline is embedded in chlorite. At the hanging wall feldspar with crystals of corundum is met with. A small quantity, not exceeding a few ounces, of corundum has been found near the chrysolite outcrop at Webster, Jackson County, and also on Scott's Creek. At Cullakenee mine, in Clay County, a grayish white and blue corundum is found associated with margarite, zoisite, actinolite, etc., and a red variety, sometimes of a deep ruby color, associated with zoisite, smaragdite, cyanite, and a feldspar.

At Penland's, on Shooting Creek, in Clay County, corundum is found associated with margarite and willcoxite. It also occurs in Cherokee County, on Valley River.

In Haywood County, 2 miles northeast of the Pigeon River, where the Asheville road crosses it near a serpentine outcrop, a small quantity of corundum has been found, also on the west fork of Pigeon. About 2 miles north of this is located the Presley mine, which has furnished the most beautiful specimens of blue and grayish blue corundum largely altered into muscovite and albite.

About 20 miles northeast of this mine, in Madison County, is the Carter mine, which yields a white and pink variety of corundum, both in crystals and laminated masses. It is associated with greenish black spinel and prochlorite. Very rarely crystals of asteriated sapphire, implanted on a micaceous rock, are found at this locality.

Corundum is found also in Mitchell County, near Bakersville, in chrysolite.

In the broad-bladed cyanite of Wilkes County, corundum is met with in small reddish brown particles, and in the cyanite of the Swannanoa Gap, in Buncombe County, blue, bluish, white, and reddish corundum. Also at N. P. Watkins's, in the same county.

It is found in the gravel 2 miles west of Statesville, in Iredell County, associated with cyanite, but rarely imbedded in it. Highly interesting crystals and crystalline masses of grayish white corundum more or less altered into muscovite and tourmaline have lately been found by Mr. J. A. D. Stephenson, at Belt's Bridge, and beautiful hexagonal prisms of a pale brownish corundum, with a partial alteration into soda margarite, at Hendrick's farm near Belt's Bridge, Iredell County.

Above Lock's Bridge, on the south side of the South Yadkin River, red corundum occurs largely altered into greenish fibrous and compact muscovite; at the Chipley Farm and Austin's Farm, $3\frac{1}{2}$ miles above Lock's Bridge, gray corundum partly altered into margarite; at Liberty Hill, 3 miles above Austin's Farm, it is altered into margarite and prochlorite; and at Hunting Creek, north of Statesville, blue corundum is partly altered into the rhaetizite—variety of cyanite.

Crystals of corundum surrounded by fibrolite occur at Shoup's Ford in Burke County, and Hidden reports corundum of three colors,

including the "ruby" variety, from Brindletown. It is also reported from Stokes County. In the neighborhood of Morganton corundum is found in muscovite schist, and in the gravel deposits of Burke, McDowell, and Rutherford Counties small grains and crystals, often partly altered into muscovite, are frequently met with. The granular variety of corundum, "emery," has been observed at Crowder's Mountain and also in the titaniferous iron ore belt near Friendship, Guilford County.

At Brackettstown, McDowell County, massive grayish white corundum has been found, and in Mitchell County, at Plum Tree Creek, well developed crystals of a brownish color. Rarely small remnants of corundum are found in the pyrophyllite slates of Chatham County. The associated minerals of corundum are mostly the result of the alteration of corundum, which latter has furnished the alumina necessary for their formation.

HEMATITE.

Red oxide of iron or hematite is one of the most important iron ores of North Carolina. The compact ore, sometimes more or less mixed with the specular variety, forms large beds in Chatham County, at Evans's and Kelley's ore beds, Ore Hill, Buckhorn, etc.; also in Moore County, 12 miles east of Carthage, in Orange County, at Chapel Hill, 6 miles south of Hillsboro; and at J. Woods's, Knap of Reeds; and in Macon, Swain, Buncombe, and many other counties. Foliated and micaceous hematite occurs at Buckhorn, Ore Hill, 7 miles west of Lockville, in Chatham County; Snow Creek, Stokes County; 4 miles south of Salem, in Forsyth County; at Mount Tirzah, in Person County; near Gudger's, 9 miles below Marshall, on the French Broad River, and near Franklinville, Randolph County, and elsewhere. A very fine variety of slaty hematite with crystals of magnetite is found at Cooke's Gap, Watauga County; and both here and at Richlands, in Caldwell County, and near Fisher's Peak, in Surry County, martite occurs. Other localities are: Smith's River, 2 miles east of Morehead's factory, in Rockingham County; a granular variety 1 mile east of Gaston, at House's mill, Cabarrus County; at Hickory, Catawba County; in Lincoln, Gaston, and Mecklenburg Counties, etc. The ocherous variety has been observed in Buncombe County, 4 or 5 miles west of Asheville, at Valley Town, on Peachtree Creek, Cherokee County, and in a great many gold mines. Hexagonal scales of hematite in crystals of quartz occur at King's mill, Iredell County.

MENACCANITE.

Many of the titaniferous iron ores are mixtures of true magnetite and menaccanite, others belong to this species, and others again are really magnetites, in which a portion of the iron is replaced by titanium. Our present knowledge of these ores is too limited to put all the varieties occurring in the State with certainty in the place where they belong.

Those from the following localities appear to belong under this head: Franklin, in Macon County; Big Laurel, in Madison County; on Ivy, Yancey County; Crab Orchard, Cane Creek, Flat Rock, and Grassy Creek, in Mitchell County; Damascus, Iredell County; Old Harris mine, 12 miles southeast of Charlotte, south end of Crowder's Mountain, and at Wills's, Gaston County; Yadkin River, near Patterson, in Caldwell County, and the neighborhood of Raleigh. Menaccanite in quartz occurs at Fisher Hill, Guilford County. Iserite is frequent in the gold sands of Rutherford, Burke, and McDowell Counties, etc. Menaccanite also occurs at Shoup's Ford, Burke County; at Huffman's, Catawba County; at Culsagee, Macon County; at Haynie's, Madison County, and in Person, Watauga, and Lincoln Counties.

Associated with oligoclase, forming cross fissures in the corundum vein at the Carter's mine occur *two* varieties of menaccanite (ilmenite): (1) of a brownish black color with a somewhat purplish hue, in small masses with indistinct crystalline structure and basal cleavage; (2) in rounded nodules, $1\frac{1}{2}$ to 2 inches in diameter, irregular shape, very fragile, and breaking into small fragments without regular form, and a subconchoidal fracture, resembling the slag-like magnetite from Unkel on the Rhine. Neither variety is magnetic. Mr. Harry F. Keller has analyzed them (I) and (II). I have also analyzed a variety of black, somewhat granular menaccanite (ilmenite) from near Franklin, Macon County (III):

	I.	II.	III.
Sp. gr.	4.67	4.68	.....
Titanic oxide	52.73	52.64	48.61
Ferric oxide	8.08	10.07	9.76
Ferrous oxide.....	33.08	31.11	40.22
Magnesia.....	5.33	5.33	1.38
Silica	0.14	.....	.....
	99.36	99.15	100.00

Menaccanite is also named by Hidden among the minerals occurring at Brindletown.

SPINEL.

The only spinel which has been found in North Carolina is that which results from the alteration of corundum, and it is usually a mixture, in variable proportions, of the varieties pleonaste and hercynite, sometimes with an admixture of that called picotite. In the chlorites of the Culsagee mine it is found in octahedral crystals with dodecahedral planes, but usually massive, coarsely to finely granular. Its color is black, but by an incipient alteration on the surface it generally becomes of a peculiar greenish gray color and satin-like luster. Some varieties are blackish green, but so dark that the green can be observed

only in thin splinters; it is rarely found at the Cullakence mine in Clay County, but frequently met with at the Carter mine in Madison County, where it is mostly of a very dark green color. Several varieties from the Culsagee mine have been analyzed. (I) A fine grained variety of 3.766 sp. gr., by G. A. Koenig; (II) a coarser grained variety of 3.797 sp. gr., by the same; and (III) the coarse-grained crystallized dark green, of 3.695 sp. gr., by myself. IV is an analysis of a greenish black spinel from the Carter mine, sp. gr. 3.77, made by Mr. J. S. de Benneville in my laboratory. In I, II, and III some mechanical admixtures have been deducted:

	I.	II.	III.	IV.
Alumina.....	54.32	56.58	66.63	67.54
Chromic oxide.....	3.96	2.28	trace	.....
Ferric oxide.....	11.51	9.66	1.80	.....
Ferrous oxide.....	11.16	14.60	11.35	13.38
Magnesia.....	19.05	16.88	19.86	18.62
Cupric oxide.....	.....	.....	0.11	.....
Nickelous oxide.....	.....	.....	0.25	.....
	100.00	100.00	100.00	99.54

Black octahedral crystals of vitreous luster from the Tibbets mine, in Macon County, are probably pleonaste.

GAHNITE.

Gahnite, or automolite, is mentioned by Gen. Clingman as occurring in Cleveland County; also in Mitchell County, at the Deake mine, where it occurs in small, compact, dark green masses, in part altered into and surrounded by fibrous muscovite.

I have made an examination of it and found:

Copper oxide.....	0.30
Zinc oxide.....	38.05
Manganese oxide.....	0.29
Magnesia.....	0.79
Ferrous oxide.....	1.14
Ferric oxide.....	4.50
Alumina.....	54.86
	99.93

Sp. gr.. 4.576

MAGNETITE.

This is the most abundant and most valuable iron ore in North Carolina. It occurs in small octahedral crystals in the granite at Dunn's Mountain, in Rowan, and in the granites and gneisses and (especially) the syenites very commonly in many counties, and in the slates at Fisher's Peake and Chestnut Mountain, in Surry County; also at Bull's Head, in Alleghany County, in quartzose sandrock and hematite at Cooke's Gap, Watauga County; at Capp's Hill, in Mecklenburg County;

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and Fisher Hill, in Guilford. It occurs in its granular variety, mixed with muscovite, manganiferous garnet, etc., at Buckhorn, in Chatham County, and mixed with menaccanite and occasionally with corundum, in a succession of beds, passing through the gneissic rocks of Davidson, Guilford, Forsyth, and Rockingham Counties. There appear to be several isolated outcrops northwest of this band and between it and the Dan River, and also in Randolph and Montgomery Counties. A band of granular magnetite, free from titanitic acid, mixed with actinolite, tremolite, and a little epidote, passes from near Danbury in Stokes County, and also from Surry County, through Yadkin, Forsyth, Davie, Lincoln, and Gaston Counties. It contains some of the most valuable ore beds. It is also found in large beds near Newton, in Catawba County; at Comb's farm, Summer's farm, and Thomas Payne's farm, in Iredell County; also in Orange, Mecklenburg, and Cabarrus Counties. Some very valuable ore beds of crystalline magnetite occur in Swain, Madison, Macon, Haywood, Burke, Alexander, Wilkes, Orange, Mitchell, and other counties, the most extensive probably at Cranberry. A granular ore, similar to the ores of Surry County, has been worked at the north fork of New River, near the mouth of Helton Creek, and on Horse Creek, in Ashe County. There are many other localities in which magnetite occurs, but they are of less importance than those enumerated.

CHROMITE.

Occurs in the chrysolite beds, which form lenticular masses in the hornblende slates, etc.; in minute octahedral crystals and granular masses at Culsagee; also at Higdon's, Ellijay's Creek, and at Moore's mine, in Macon County; near Webster, at Hogback, at Ainslie's, and on Scott's Creek, in Jackson County; on Mining Creek, near Hampton's, in Yancey County; at Cullakenee, in Clay County; Carter's mine, in Madison County; in small quantities near Bakersville, Mitchell County; on South Toe River, on Rich Mountain, Watauga County, and in Ashe County. Where it is found in abundance, it may become a valuable ore when it can be brought to market at a low freight. A small admixture of chromite is found in the titaniferous magnetite belt of Guilford, Rockingham, and other counties. Crystals of chromite are frequently met with in the gold sands of Burke, McDowell, Rutherford, etc.

The analysis which I have made of a compact variety of chromite from near Franklin, Macon County, gave:

Chromic oxide	44.15
Alumina	22.41
Ferric oxide.....	5.78
Ferrous oxide	11.76
Magnesia	15.67

99.77

Sp. gr., 4.319.

The pure octahedral crystals of chromite washed out of gravel at Culsagee, Macon County, have been analyzed in my laboratory by Mr. J. S. de Benneville. Sp. gr. 4·79. Deducting 2·70 per cent of silica, the mineral contains :

Chromic oxide	56·60
Alumina	5·31
Ferric oxide	10·98
Ferrous oxide	19·91
Magnesia	7·20

100·00

CASSITERITE.

Found in 1882, near King's Mountain, Gaston County, by Mr. R. T. Claywell. It was first recognized as cassiterite by Hidden, and the mineral was afterward more fully investigated by Prof. C. W. Dabney, jr. It generally occurs in irregular cryptocrystalline and massive lumps of a dark brown color, but also in many shades from colorless to black. The largest piece yet found weighed about 14 ounces. Specific gravity, 6·6 to 6·9. According to Hidden, the ore is sparsely disseminated over a very considerable area in and about King's Mountain Village, but no paying deposits have yet been discovered. Analyses by Dr. Dabney gave for two varieties:

	Light grayish.	Dark brown.
Stannic oxide	94·70	82·99
Tungstic oxide	0·92	1·14
Sulphur	trace	0·46
Arsenic	trace	trace
Iron and manganese oxides	undet	undet
Silica	1·76	2·36
	97·38	86·95
Metallic tin	74·41	65·21

URANINITE.

It was found by Prof. Kerr at the Flat Rock mine, Mitchell County, in 1877, in small nodules of gummite and uranotil, forming the nucleus of these minerals, both of which are resulting from its decomposition. It has since been found at one or two other mines in Mitchell, especially at the Deake mine, in cubes and cubo-octahedrons, of sp. gr. 8·968 to 9·218; color, iron-black to brownish, according to the extent of the alteration. The uraninite from the Flat Rock mine has lately been

analyzed by W. F. Hillebrand in the laboratory of the U. S. Geological Survey, as follows:

Uranic oxide.....	50.83
Uranous oxide.....	39.31
Thoria.....	2.78
Cerous oxide.....	0.26
Lanthana and didymia.....	0.50
Erbia and yttria.....	0.20
Lead oxide.....	4.20
Ferrous oxide.....	trace
Lime.....	0.85
Magnesia and alkalis.....	0.30
Water.....	1.21
Silica.....	0.08
Phosphoric acid.....	?
Nitrogen.....	0.37
Insoluble.....	0.10
	<hr/>
	100.99

Sp. gr., 9.086.

The material, which was received from Mr. W. E. Hidden, was slightly altered, containing minute crevices filled with gummite.

RUTILE.

In beautiful crystals at Crowder's and Clubb's Mountains, Gaston County; also granular at the same localities; rarely in small grains or crystals with the corundum of the Culsagee mine in Macon County and the Hogback mine in Jackson County; in acicular crystals, sometimes over 1 inch in length, near Beattie's Ford, Mecklenburg County; in long crystals in quartz on a hill near Buckhorn Falls, in Chatham County, at the head of Cane Creek, Mitchell County; in beautiful acicular crystals at Mrs. Daniel's farm near Mount Pisgah, at Mrs. Jordan's near King's mill, at Alex. Lackley's, Misses Bennett's, Thomas Adams's, and Mrs. Smith's farm, all in Iredell County; acicular crystals in limonite and quartz on John Lackey's farm near Liberty Church, and Wilson's near Poplar Springs; geniculated crystals at White Plains, at Crouch's, and at Milholland's mills, all in Alexander County. The first-named locality furnishes the most magnificent crystals, sometimes 3 or 4 inches in length, fully developed, with numerous brilliant planes, often geniculated and transparent, with a beautiful red color. According to Hidden, Alexander County must be credited with having produced the most beautiful rutile crystals known to science. He says:

Rutile is found there in a similar situation to the gems and quartz crystals, i. e., in open pockets; in fact, it is found intimately associated with and implanted upon the gems, and often preponderates over all the other crystal contents. The particular points of difference over the same product from other regions are their mode of occurrence, beautiful natural polish, and crystallographic features. Their color ranges from jet black to clear ruby red and pale yellow. They range from those of minute sizes to rare examples 3 inches long and one-half inch diameter. Their luster in some

cases approaches that of polished steel. Gems have been cut from the most solid crystals and the result compares favorably with the rare black diamonds from Brazil, Only experts could tell them apart.

Curiously jointed, mitered, and reticulated crystals and also masses of crystals thus united have been commonly met with ; all of which are found to follow certain arbitrary twinning laws and are not accidentally brought together into such strange shapes as a cursory examination might seem to indicate.

This description applies in particular to crystals found in or near the emerald and hiddenite mine. Rutile is also abundant in coarse crystals near Bryson City, Swain County ; in acicular crystals in brownish amethyst, at the head of Honey Creek, Wilkes County ; in dark, almost black, crystals in Clay County ; in quartz in Yancey County ; in small grains and crystals in the gold sands of Burke, McDowell, Rutherford, and Polk Counties ; acicular crystals in quartz at Dietz's, Van Horn's, and Hildebrand's, and in large crystals also at the latter point, Burke County ; in large crystals at E. Balch's, H. Balch's, Widow Balch's, Huffman's, and D. Lutz's, and in amethyst at the last two points—all in Catawba County ; in amethyst in Cabarrus near Concord, and in Randolph near Pilot Mountain ; penetrating corundum near Bakersville, Mitchell County ; at Ray's mine, and elsewhere in Yancey County ; in reticulated acicular crystals in the northwest corner of Lincoln County (Hunter).

Under the name of edisonite, Hidden describes a supposed fourth form of titanite oxide from the Whistnant gold mine in Polk County. It has been shown by Mügge to be only a variety of rutile.

ANATASE.

Anatase has been found in small, brilliant, tabular crystals, in the gold sands of Burke County, by myself and Mr. Hidden. The latter also reports it from Alexander County, in quartz, and from McDowell and Rutherford Counties. At Brindletown, in Burke County, the crystals were of unusual size; some were highly modified, and a few were transparent and glassy, and of a pale green or blue color.

BROOKITE.

In the gold sands of Rutherford, McDowell, and Burke Counties, brookite occurs in small, short, slender, rhombic prisms. At Brindletown Hidden found it varying in color from dull yellow to brown, a few crystals being of a fine red with highly modified terminations.

PYROLUSITE.

It is found near Murphy, Cherokee County; also 2 miles north of Hickory, Catawba County, and with silver ores at the McMakin mine, Cabarrus County; also in fine crystalline masses at Beck's ore bank, 3 miles from Ellison's ore bank, Gaston County; near Danbury, Stokes County; near Webster, Jackson County; in Surry County, near Dob-

son; and in Alexander, Swain, and Mitchell. No large deposits have yet been discovered in North Carolina.

BRAUNITE (?).

Found in quartz near Hillsboro, Orange County. K.

HAUSMANNITE (?).

Recently reported from near Dobson, Surry County, by H. C. Lewis; and it also occurs in Chatham. K.

DIASPORE.

Gen. Clingman observed this rare mineral associated with blue corundum from near Marshall, Madison County. I have not been able to distinguish it with certainty from any other of the corundum localities, but it was observed in very minute but beautiful acicular crystals of the usual form in a cavity of massive corundum from Culsagee, by John C. Trautwine, of Philadelphia.

GOETHITE AND LIMONITE.

I put these two species of hydrated sesquioxide of iron together, as without fuller examination it is impossible to distinguish the majority of the specimens. Large beds of hydrated sesquioxide of iron are found at Ore Hill and elsewhere in Chatham County, and in Johnston, 5 miles west and northwest of Smithfield; near the High Shoals, in Gaston County; in Lincoln and Catawba Counties; near Murphy and along Valley River and Notteley, in Cherokee; in Mitchell, Buncombe, Watauga, McDowell, Burke, Caldwell, Alexander, Wilkes, Surry, Haywood, Macon, Henderson, Transylvania, Davidson, Wake, and other counties; and superficial beds of it are also frequently found in the eastern counties—Nash, New Hanover, Pender, Jones, Duplin, etc. Brown hematites accompany in small quantities many of the magnetite and hematite beds, and form the upper part of many of the gold and copper mines; they are often the result of the alteration of siderite and pyrite, and show frequently the form of the original mineral: for instance, at Conrad Hill, in Davidson County; Cabarrus County, Guilford County, Gaston County, and at Beam's farm, near Center Point, Iredell County.

GUMMITE.

Discovered by Prof. Kerr in 1877, at Flat Rock, Mitchell County. Sometimes found in distinct cubical crystals with octahedral planes, usually in amorphous, compact, nodular masses of a faint resinous luster and of shades between reddish yellow and deep orange red. Fracture uneven to subconchoidal. Sp. gr. 4.840. The mean of three analyses which I have made gives its composition as follows:

Silica	4.63
Alumina	0.53
Baryta	0.98
Strontia	0.05
Lime	2.05
Plumbic oxide	5.57
Uranic oxide	75.20
Phosphoric acid	0.12
Water	10.54
	<hr/> 99.77

These analyses show that the so-called gummite is *not* a distinct mineral species but a mechanical mixture, the North Carolina variety being—

	Per cent.
Uranic hydrate	40.10
Uranotil	33.38
Lead uranate	22.66
Barium uranate	4.26
	<hr/> 100.40

Results from the alteration of uraninite. Found also at the Deake and Lewis mines, Mitchell County. A similar mineral is found in small quantity at Buchanan mine, Mitchell County.

The largest mass of gummite with uraninite found in the State weighed 6 pounds 6 ounces. The nodules often contain black uraninite at the center.

PSILOMELANE.

It is often an associate of gold and iron ores in coatings of the quartz at Scott's Hill, Burke County, together with pyrolusite at Beck's ore bank, on the High Shoals, Gaston County, and in botryoidal masses in a vein, said to be 4 feet wide, near Lenoir, in Caldwell County, near Bakersville, at Gillespie's Gap, in Mitchell County, on Cove Creek, and Richmond Creek, Haywood County, and at Buckhorn in Chatham. In Gaston County at the Long Creek mine, on Cross Mountain, Ormond ore bank, etc., a variety occurs, which contains a small quantity of cobalt and nickel. Also found in McDowell and Lincoln Counties.

WAD.

There is often an imperceptible change from pyrolusite into psilomelane and wad, so that, without analysis, it is often difficult to know to which a specimen may belong. The earthy varieties are generally called wad. A brownish black, earthy wad occurs near Murphy, Cherokee County, also near Franklin, in Macon County, and Webster, in Jackson County, at Gillespie Gap, Mitchell, in Burke, Catawba, Surry and Mecklenburg, and at the Ormond ore bank in Gaston County.

SENARMONTITE OR VALENTINITE.

The incrustation upon the native antimony of Burke County, which does not show any crystalline planes, belongs to either one or the other of these species.

BISMITE.

An earthy, greenish yellow and straw yellow mineral has been observed at the King's Mountain mine and the Asbury vein in Gaston County. It is probably bismite.

MOLYBDITE.

Found associated with molybdenite as a yellow, earthy powder, near Pioneer Mills, Cabarrus County.

QUARTZ.

As a constituent of most of the rocks of North Carolina, and the gangue rock of almost every vein, it occurs nearly everywhere throughout the State. Several of its varieties, however, are of more than usual interest. Rock crystal is found in numerous most beautifully modified forms on the farms of the Lackey family and others near Mahoffey's mill, Alexander County. These have been the subject of a highly important crystallographic investigation by Prof. Gerhard vom Rath, of Bonn. Unusually large masses of rock crystal from near Jefferson, Ashe County, were sent to New York in 1887. One perfect crystal weighed $20\frac{1}{2}$ pounds; another crystal weighed 188 pounds, and a third weighed 285 pounds. The last named was 29 inches long, 18 wide, and 13 thick. Some of the masses found would yield perfectly pellucid crystal balls of 5 inches in diameter. This occurrence has been described by G. F. Kunz.

Good doubly terminated crystals occur at Sugar Mountain, Burke County. Rock crystals are also found in Rutherford County; near Morganton, Burke County; near Hickory, Caldwell County; Catawba County, Iredell County; Mountain mine, in Cleveland County; at Hampton's, on Mining Creek, Yancey County; Stokesburg, in Stokes County; Macon County, Swain County, Rich Mountain, head of Cove Creek, in Watauga County; Mitchell and Transylvania, in Wilkes, Guilford, Lincoln, Gaston, Burke, Anson, Granville, Wake, Moore, Warren, and other counties. Quartz crystals, inclosing liquid (hydrolite, Humphreys), in beautiful specimens, are found on Isaac Price's farm, White Plains, Alexander County, also found by Prof. Humphreys, in pockets and drift veins in Catawba County, and in the South Mountains, Burke County, one with a bubble which moves nearly 2 inches, and a group of 13 crystals having 50 bubbles. He also found crystals with the basal plane in Burke, Catawba, and Alexander Counties. At the emerald locality, in Alexander County, some 7 years ago, Mr. Hidden discovered a remarkable "pocket" which yielded over 400 pounds of crystals,

many of them containing water bubbles of unusual size. Nearly all of these were destroyed by freezing, which shattered the crystals to fragments. Rutilated quartz crystals of great beauty are met with at several localities in Randolph, Catawba, Burke, Iredell, and Alexander Counties (enumerated under Rutile). Quartz crystals with scaly crystals of hematite occur at King's Mill, Iredell County. Quartz between laminae of muscovite, occurs at the Deake mine, on Toe River, Mitchell County. Radiated quartz is found at Dillahay's gold mine, in Person County and in Wake County. Amethyst, in very fine crystals and clusters of crystals, and of a good violet or pink color, but mostly of a dark, smoky color, is found at Randleman's, Lincoln County, also at the lead mine, Alexander County, at Hickory, Catawba County, in Rutherford, Chatham, and Wake Counties; amethyst of a deep purple color with rutile occurs in Catawba County, and a smoky amethyst with rutile, at the head of Honey Creek, Wilkes County. Rose quartz is found at Highlands, in Macon, near Franklinville, in Randolph (with acicular rutile), White Plains, Alexander County, and near Concord, Cabarrus County, likewise penetrated with rutile. Smoky quartz is found 3 miles from Taylorsville, Alexander County, on Cavin's and also on Pritchard's and Patterson's farms; it also occurs in large crystals on Brush Creek, Mitchell County, in the drift of Brindletown, Burke County, at the mouth of Beaver Dam Creek, Cherokee County, and in Alleghany County.

Milky quartz is found at Roseman's farm, Alexander County, at the forks of the Laurel, Madison County, and at War Hill, Surry County; opalescent quartz at Dan River, Stokes County. Quartz pseudomorphous after calcite, both crystallized and fibrous, is found 2 or 3 miles northwest of Rutherfordton, Rutherford County; the irregularly shaped fragments frequently contain water. Similar pseudomorphs occur at Crawford's farm, 5 miles east of Statesville, in Iredell County; and a peculiar variety of pseudomorphous quartz, after feldspar perhaps, occurs at Shooting Creek, Clay County. Concerning the quartz at Crawford's farm, Hidden says:

From a careful study of the rock in situ and of many specimens from the localities, I am forced to conclude that these forms of quartz are pseudomorphs of the interstices between crystals of some mineral that crystallized in thin, flat, tabular forms.

Sections of these water-bearing forms present an interior of bright transparent crystals, or of mammillary chalcedony, while the structure of the walls is semi-radiated from the exterior. Careful examination of the surfaces shows a series of triangular markings (angles 60°) on all sides. Now these markings are exactly what we would expect by the slow deposition of quartz on the basal pinacoid of a uniaxial crystal (rhombohedral), or of the deposition of quartz from solution in a vein filled up with meshed and netted crystals, which being thin, presented only basal planes for contact surfaces. What the original mineral was is not shown by the specimens. The casts of crystal cavities in the larger masses show an unmistakable hexagonal prism with a large development of the basal pinacoid (these two planes identified by striations on the quartz), and this characteristic is persistent.

Chalcedony is found near Franklin, Macon County; near Webster, Jackson County; at Hampton's Mining Creek, Yancey County; at

Martin's limestone quarries, in Stokes County; on Alamance Creek, Alamance County; and in Lincoln, Iredell, and Chatham Counties. Hornstone occurs at Martin's quarry, Stokes County; near Asheville, Buncombe County; in Madison County and Iredell County; and in Montgomery, Randolph, and elsewhere. Drusy quartz is frequently found on the decomposed outcrops of the chrysolite beds in Macon, Jackson, Clay, Buncombe, and Madison Counties. Itacolumite or flexible sandstone forms a stratum in the quartzite at Linville, Burke County; Sauratown Mountains, in Stokes County, and Bending Rock Mountain, in Wilkes County. Fossil wood is abundant in the Triassic beds in Anson County, and near Germanton, in Stokes County; near Cheek's Creek, in Montgomery County, and in Johnston County; and in the quaternary gravels of Halifax, Moore, Cumberland, Wayne, and other counties. Agate is found in many places; at D. Caldwell's, Mecklenburg County; near Harrisburg and near Concord, Cabarrus County; in Granville, Orange, and elsewhere. Jasper occurs banded (red and black) in Person County, in Granville (Knap of Reeds Creek), in Madison County (near Warm Springs and on Shut In Creek), in Moore County, in Wake, and elsewhere.

A peculiar purplish brown variety of quartz from Uwharie, Montgomery County, partially analyzed by me, gave:

Ignition	0.70
Silica	91.53
Ferric oxide	5.16
Magnesia	0.14
Lime	0.66
Undetermined	1.81

100.00

Sp gr., 2.663.

OPAL.

The only variety of opal which has come to my notice from North Carolina is "hyalite" in bluish white mammillary coatings upon the quartz of gold veins in Cabarrus County, and at the Culsagee mine, Macon County. It is rarely found in beautiful, colorless, and white botryoidal incrustations upon foliated chlorite. A peculiar yellowish to brownish hyalite, incrusting quartz, was collected by F. W. Clarke in 1883, at Foster's mica mine, near Jefferson, Ashe County.

TERNARY OXYGEN COMPOUNDS.

SILICATES.

ANHYDROUS SILICATES.

ENSTATITE.

Forms beds at the corundum mine of Culsagee, in Macon County, in coarsely crystalline masses of a brownish gray, yellowish color; in coarsely granular masses with chrysolite, at Webster, Jackson County;

also in small crystalline particles, disseminated through chrysolite, at Hampton's, Mining Creek, Yancey County, and $2\frac{1}{2}$ miles south of Bakersville, in Mitchell County. Bronzite is found at Bald Creek, Yancey County, and near Kernersville, Forsyth County. I had this mineral from the Culsagee mine analyzed in the laboratory of the University of Pennsylvania by Frank Julian, who found:

Water	1.21
Silica.....	57.30
Alumina	trace
Ferrous oxide.....	7.45
Magnesia.....	34.64

100.60

PYROXENE.

Black and brownish black, cleavable masses, with magnetite, at Cranberry, Mitchell County, and of pale greenish color, with magnetite, on Ivy River, Madison County, and on Horse Creek, Ashe County; in "traps" at Greensboro, Guilford County; green coccolite, in calcite, 2 or 3 miles from the mouth of Bear Creek, in marble, at Walnut Creek, 1 mile from French Broad River, Madison County, and at Goshen, Macon, County. Dark brownish black and black pyroxene is one of the constant constituents of the numerous "trap" rocks found in North Carolina.

SPODUMENE.

Occurs in Sharpe's Township, in Alexander County. The first crystals obtained were pale yellowish green, and were thought to be diopside. They had been found loose in the surface soil by some children living on a farm near Salem Church, and were shown to Mr. William Earl Hidden by Mr. J. A. D. Stephenson, of Statesville. The former gentleman sent specimens to Dr. J. Lawrence Smith, who, by analysis, proved them to be spodumene. The mineral has since been extensively mined under the direction of Mr. Hidden; and the new emerald green variety of spodumene has received the name of hiddenite. As a gem it ranks equal in beauty and value to the emerald, which latter stone occurs with the hiddenite. In color it ranges from fine emerald green through yellow to nearly white. It occurs almost invariably implanted upon the walls of open pockets, associated with a number of other minerals of considerable beauty. The emerald green variety has been analyzed by Dr. J. L. Smith (I) and myself (II), as follows:

	I.	II.
Sp. gr.	3.14	3.166
Silica	64.5	63.95
Alumina	27.0	26.58
Chromic oxide		0.18
Ferrous oxide	1.9	1.11
Lithia	7.5	6.82
Soda		1.54
Potash		0.07
	100.9	100.25

The sp. gr. of the yellowish hiddenite I found to be 3.177; that of the darkest green variety was determined by Smith to be 3.191 to 3.194.

AMPHIBOLE.

Amphibole is represented in North Carolina by numerous varieties. We find white and gray tremolite associated with talc at Marble Creek and Murphy, Cherokee County; also on the Tennessee Creek, Jackson County, in talc and chrysolite; at Webster, Jackson County; the Whiteside Mountains, Sugartown, $8\frac{1}{2}$ miles from Franklin; at the Culsagee mine, Macon County, $2\frac{1}{2}$ miles south of Bakersville, in Mitchell County; at Hampton's Mining Creek, Yancey County; on Toe River; at the Carter mine, Madison County; gap of Black Mountain, and the southeast slope of Three Top Mountain, in Ashe County. Gray and brownish grammatite occurs near the Tennessee Creek; anthophyllite occurs at Culsagee mine and at Gregory Hill, in Macon County; actinolite has been observed in talc near Belt's Bridge, Iredell County; at Shooting Creek, Clay County; Swannanoa River, near Asheville; and with chrysolite at Webster, Jackson County; Hampton's Mining Creek, in Yancey County, $2\frac{1}{2}$ miles south of Bakersville, Mitchell County; in talcose rocks near Tennessee Creek, on the East Fork of Tuckasege $1\frac{1}{2}$ miles from its mouth, Mecklenburg County; Rich Mountain, Watauga County; Franklin, in Macon County; at Bolejack's limestone quarry, in Stokes County; at Rogers's ore bank, near Danbury, in Stokes County; near Morganton, Burke County; and Ellison's, in Gaston County. Asbestos has been found at Webster, and at the head of Cullowhee Creek, Jackson County; on Sugartown Creek, near Franklin; at the Nantehaleh River, in Macon County; the Brushy Mountains; at Baker mine and on John's River and on King's Creek, Caldwell County; and on Smith's River, Rockingham County, in Franklin and Wilkes Counties; at Hampton's Mining Creek, in Yancey County; at Buchanan's and Cane Creek, near Bakersville, in Mitchell County; also in quartz crystals at J. W. Warren's farm, White Plain's, Alexander County. Black and greenish black hornblende is abundant throughout the State in the hornblende slates, hornblende rocks, syenite, and diorite. It has been found in rather large cleavage pieces 23 miles below Franklin, on the Swannanoa River, near Asheville; at the Cullowhee and Savan-

nah mines, in Jackson County; at Jarrett's, on the Nantehaleh, in Cherokee County; and at Polecat Creek and near Greensborough, in Guilford County.

True orthorhombic anthophyllite, well crystallized and transparent, has been described by Penfield from the Jenks corundum mine at Franklin, Macon County. Sp. gr. 3.093. Analysis (Penfield) as follows:

Silica	57.98
Ferrous oxide	10.39
Manganese oxide.....	0.31
Magnesia	28.69
Lime.....	0.20
Alumina	0.63
Water	11.67
Loss at 100.....	0.12
	<hr/> 99.99

SMARAGDITE (?); KOKSCHAROWITE.

A beautiful mineral, which may be a variety of hornblende, occurs at the Cullakenee mine, Clay County. It has a bright color between emerald and grass green, gradually passing into grayish green and greenish gray. Sp. gr. of the grass-green variety, 3.120. It is associated with pink and ruby corundum and a feldspathic mineral. The analysis of the pure material gave Thomas M. Chatard—

Silica.....	45.14
Alumina	17.59
Chromic oxide	0.79
Ferrous oxide.....	3.45
Nickelous oxide.....	0.21
Magnesia	16.69
Lime	12.51
Soda.....	2.25
Potash.....	0.36
Ignition (water)	1.34
	<hr/> 100.33

ARFVEDSONITE.

A brownish black or greenish black hornblende-like mineral, is found associated with the andesite, zoisite, and corundum of the Cullowhee mine and Shooting Creek, Clay County, and rarely at Culsagee, Macon County. It is easily fusible and gives a strong yellow flame, and is therefore probably arfvedsonite. An analysis of a black variety by J. L. Smith places it rather under the aluminous hornblende. He found:

Silica.....	45.90
Alumina	13.34
Ferric oxide	11.46
Lime	12.20
Magnesia	12.53
Soda.....	3.39
Water	0.66
	<hr/> 99.48

CROCIDOLITE (?)

This mineral I have received from Col. Joseph Willcox, and it is said to come from one of the western counties of North Carolina. The physical properties and the chemical tests which I have made indicate that it is crocidolite. It consists of long, delicate fibers of a blue color, is insoluble in acids, and fuses easily to a black glass, coloring the flame yellow.

BERYL.

Found in six-sided prisms, sometimes doubly terminated, from about half an inch to 4 inches in thickness, and from 1 to 6 inches in length; color yellowish and bluish green, small pieces of the latter color sometimes transparent enough to be cut for gems (aquamarine), associated with orthoclase, muscovite, tourmaline, etc., at Ray's mine, on Hurricane Mountain, Yancey County. Yellowish green crystals have been found at Buchanan mica mine, and elsewhere in Mitchell County. Clear green crystals occur at Balsam Gap mine, Buncombe County. Found also at the Carter mine, Madison County; Thorn Mountain mine, Macon; Casher's Valley, Jackson; on Green River, Henderson County; at E. Balch's, Catawba; Fort Defiance, Caldwell; at Well's, Gaston County. Some very large crystals were found (one 2 feet long and 7 inches in diameter), 4 miles south of Bakersville, and at Grassy Creek mine of still larger size. Green crystals appear at Point Pizzle mine and elsewhere in this county, and on Green River, Henderson County. The most beautiful varieties, similar to occurrences in Siberia, are found in Sharpe's Township, near Salem Church, at White Plains, Alexander County, also in pale green or bluish green modified hexagonal prisms and pale bluish crystals. This is the locality of the emerald and hiddenite mine, and here for 8 years past have been found most magnificent crystals of emerald as regards color, perfection of form, and crystallographic interest. Beryl in yellowish green, hexagonal prisms is also found at Lackey's farm, near Liberty Church, and Isaac Price's farm, White Plains, Alexander County. It also occurs in yellowish green crystals in Catawba County; one bluish green, transparent crystal, implanted in quartz, has been found at Capt. Mills's gold mine, in Burke County, and another of 1 inch diameter and 4 inches length, with a tourmaline crystal of the same length embedded in it. In greenish yellow and deep green crystals, similar to Siberian, in the South Mountains, 9 miles southeast of Morganton, Burke County, and in the Sugar Mountains; also at Shoup's Ford, at Dietz's, Huffman's, and Hildebrand's. In smaller crystals it is found in Jackson County.

I have analyzed a rounded, waterworn, greenish pebble of beryl exhibiting an uncommonly perfect basal cleavage (for this species) from Alexander County, with the following results:

Silica.....	66.28
Alumina	18.60
Glucina.....	13.61
Ferrous oxide.....	0.22
Alkalies.....	undet.
Ignition	0.83

 99.54

Sp. gr., 2.703.

CHRYSLITE.

This is one of the most interesting minerals of North Carolina, where it forms large beds between the hornblende and granite rocks. It is unnecessarily called dunyte, from the Dun Mountains in New Zealand, where it occurs under like circumstances. It is generally of a yellowish green color, but also greenish white, gray, and brownish green, mostly finely granular, rarely foliated, occasionally in larger grains disseminated through the fine-grained mass. Associated with chromite, enstatite, actinolite, tremolite, asbestos, talc, chromite, and corundum, at Culsagee mine, near Franklin, Macon County; in Haywood County; near Webster and Hogback, in Jackson County; at Bald Creek and at Hampton's, Jack's Creek, and South Toe River, 7 miles from Burnsville, Yancey County; $2\frac{1}{2}$ miles south of Bakersville, in Mitchell County, at Shooting Creek and Cullakenee mine, Clay County; at Rich Mountain, Watauga County; at the Carter mine, in Madison County; on Ivy, Buncombe County; near the forks of New River, Ashe County; on Little River, Alleghany County; and 4 miles south of Morganton, Burke County. It is also found with bronzite, in hornblende rock, in Guilford County, and near Raleigh, Wake County. I have analyzed two specimens from Webster, Jackson County, one (I) which was finely granular and of a pale greenish color, with a sp. gr., 3.280, the other (II) of a yellowish olive green color, and 3.252 sp. gr., and Thomas M. Chatard one from the Culsagee mine (III):

	I.	II.	III.
Loss by ignition	0.82	0.76	1.72
Chromite	0.58	1.83	.....
Silica	41.89	40.74	41.58
Alumina.....	trace.	trace.	0.14
Ferrous oxide.....	7.39	7.26	7.49
Nickelous.....	0.35	0.39	0.34
Magnesia	49.13	49.18	49.28
Lime.....	0.06	0.02	0.11
	100.22	100.18	100.66

The chrysolite is subject to extensive alterations, forming serpentine and talc with their usual associates.

GARNET.

Widely distributed through the State, and a constant constituent of many of the mica and hornblende slates, in which it occurs in minute dodecahedral and trapezohedral crystals of a brownish or brownish red color; it also occurs in many of the talcose and chloritic slates; larger trapezohedral crystals of a brownish red color, and sometimes almost black, are frequently met with in the mica mines of Mitchell and Yancey counties; imperfect dodecahedral crystals at Weaver's, Jeanstown, Rutherford County, and in talcose slate, in Rockingham, Cherokee, Madison, Surry, and many other counties. The most beautiful and perfect crystals are large trapezohedra, of a brownish red color, from Burke, Caldwell, and Catawba counties. A very excellent locality is about 8 miles southeast of Morganton, in Burke County, where very bright red crystals are found, some weighing nearly 10 pounds. Several tons of garnet from this locality have been crushed into different grades of fineness and sent to market for the manufacture of "sand-paper."

Another good location is 4 miles from Marshall, where large crystals are found embedded in chlorite slate. Some of these garnets are nearly transparent, and when cut show a peculiar play of colors.

In Alexander County, on Marshall's farm and elsewhere, garnets are found several inches in diameter. Large crystals and crystalline masses of a reddish brown garnet are found near Franklin, Macon County, and on Toe River, Mitchell County. Of good red color it has been observed in the sands from gold washings in Burke, McDowell and Warren counties. The massive manganese garnet or spessartite is abundant at Jeanstown, Rutherford County; at Buckhorn, Chatham County; near Moore's mills, Stokes County; near Gold Hill, in Cabarrus County; near Brevard's forge, $1\frac{1}{2}$ miles from the Vesuvius furnace; near Macpelah church, Lincoln County; near the High Shoals, and at Clubb's Mountain and Crowder's Mountain, Gaston County; near Madison, Rockingham County; near Salem, Forsythe County; on Horse Creek, Ashe County; Linville Mountains and Bridgewater, Burke County; in Guilford County; at Thorn Mountain mine, Macon County; near Marion, McDowell County; at Buchanan mine, Mitchell County; on Pacolet River, Polk County; at Weaver's, Rutherford County, and near Dobson, Surry County.

Mr. G. A. Koenig has analyzed a variety of manganese garnet or spessartite from Yancey County (I), and I that from near Salem, Forsyth County (II), which contain:

	I.	II.
Silicia	35.80	36.74
Alumina	19.06	16.55
Ferric oxide	6.25	undet.
Manganous oxide	28.64	25.80
Ferrous oxide	4.49	14.26
Magnesia	0.60	2.56
Lime		4.09
Sp. gr., 4.14.	99.84	100.00

ZIRCON.

Abundant with the gold sands of Burke, McDowell, Polk, Rutherford, Caldwell, Mecklenburg, Nash, Warren, and other counties, in very minute yellowish brown and brownish white, sometimes amethystine and pink crystals with many planes; large grayish brown crystals of zircons are found so abundant on the south side of the Blue Ridge near Green River, Henderson County, that Gen. Clingman easily obtained in a few weeks in 1869, 1,000 pounds of crystals. More recently, a commercial demand for zircons having arisen, over 30 tons of the mineral have been taken from this region. It is found here embedded in feldspathic gneiss, and also in a similar association at the Jones's mine, near Coleman's station. Found also by Dr. Hunter at Well's farm, Gaston County. It is rarely found at Ray's mine, Hurricane Mountain, Yancey County, and the Flat Rock mine, Mitchell County. It has been observed in dark red brown crystals in the magnetite beds of the Unaka Mountains; an irregular large crystal of about 2 inches in length and a pale brownish gray color has been found by J. A. D. Stephenson near Statesville, Iredell County; and by the same, small crystals embedded in allanite, near Bethany church.

Peculiar dark brown crystals from 1–3mm. in size are found at Low's and Tibbet's mine, in Macon County, which may be zircon. They need fuller investigation. Hidden reports, from the gold sands of Brindletown, good crystals of the variety malacone. The latter are jet black, with occasionally a grayish crust, and are larger than, and of different form from, the zircons directly associated with them. Sp. gr. 4.087. The same authority reports the variety cyrtolite from several places, namely:

Masses and distinct crystals having curved faces and gray brown color have been met with at the Wiseman mica mine in Mitchell County, associated with autunite, fergusonite, and samarskite. Also at Mill's mine, near Brindletown, and at the xenotime and polycrase locality on the Davis land, near Green River, in Henderson County.

With the monazite at Mars Hill, Madison County, zircon crystals of considerable size are sometimes found. One such crystal, sp. gr. 4.507, was analyzed by me as follows:

Loss on ignition.....	1.20
Silica	31.83
Zirconia	63.42
Ferric oxide	3.23
	<hr/>
	99.68

VESUVIANITE.

A mineral resembling vesuvianite occurs in brownish green, indistinct, crystalline masses, intermixed with quartz, and associated with reddish brown garnet, in Macon County.

Bull. 74—4

EPIDOTE.

Epidote is found abundantly in North Carolina, although fine crystals are exceedingly rare. The finest specimen which I have seen, is a crystal, in the cabinet of the University of Pennsylvania, from the gold washings of Rutherford County; it is strongly pleochroic, like the so-called "Puschkinite," from the auriferous sands of Katharinenburg, in the Ural Mountains. Fine crystals have been lately obtained by Hidden, at Hampton's, Yancey County. Yellowish and brownish green crystalline masses, sometimes with indistinct crystals, have been found near White's mill, Gaston County, and near Franklin, in Macon County. At the latter place occurs also a variety in short, stout crystals of a dark brown or greenish brown color (analysis below). In Mitchell County it is found in dark brownish green crystals and radiating masses. Crystals and crystalline masses in quartz at White Plains, Alexander County. Fragments of epidote in greenish crystals, also a granular variety, are frequently met with in the gold sands of Burke, McDowell, and Rutherford Counties.

Epidote of olive green or grayish and brownish green color occurs massive as a frequent admixture of hornblende slate (notably in Mitchell County) or diorite, sometimes forming pure masses of epidote, as at the foot of Grandfather Mountain, head of Watauga River, Watauga County. It occurs also abundantly and conspicuously, as bright green amygdules in the chloritic amygdaloidal gneisses on Watauga River. It constitutes, with a reddish feldspar, the so-called unakyte rock, which may be seen at Marshall, Madison County, and down the French Broad in occasional seams and thin beds for several miles. It has also been found in many of the magnetic iron ore beds, as at Cranberry, Mitchell County, at Smith's ore bed on Ivy, Madison County, in the beds on Horse Creek, Ashe County, at Buckhorn, Chatham County, etc.

I have analyzed the brown epidote from Macon County, and found the sp. gr. 3.269, and its composition:

Silica	36.95
Alumina	25.82
Ferric oxide.....	9.97
Ferrous oxide.....	1.34
Manganous oxide	0.56
Magnesia	0.56
Lime	21.86
Ignition (water).....	3.02
	<hr/>
	100.08

ALLANITE.

Allanite is found in jet black or brownish black, slender crystals, sometimes of 6 to 12 inches in length, and also in crystalline masses in a granite vein at Balsam Gap, Buncombe County. Also under similar circumstances at the Buchanan mine and Wiseman's mine, Mitchell

County, in unusually perfect crystals 2cm. long by 1cm. thick. At the Hiddenite mine it occurs in small, well polished prisms. In massive form it occurs near Bethany church, Iredell County, in large quantities, with small crystals of zircon imbedded in it.

Another promising locality is near Democrat P. O., Madison County. It has also been identified by Hidden among the minerals from Brindletown, and from the Henderson County zircon mines. At some of the localities the allanite undergoes an alteration and changes into a pale brownish or brownish yellow mineral which has not been further examined. A mineral of an orange color from the Buchanan mine, resembling gummite, may be the so-called yttro-gummite; the quantity at hand was too small and impure for analysis, but it contains uranic oxide and some of the rare earths of the cerium or yttrium groups.

I have analyzed the allanite from Balsam Gap (I), and the Hiddenite mine (II); Dr. J. W. Mallet has examined the pitchy black variety from Wiseman's mine (III), and Mr. Harry F. Keller that from Bethany Church (IV). The analyses are as follows:

	I.	II.	III.	IV.
Sp. gr.....	3.400	3.005	.....	3.63
Silica	32.79	32.05	39.03	31.685
Alumina.....	18.10	22.93	14.33	17.330
Ferric oxide.....	1.64	11.04	7.10	7.052
Ferrous oxide	10.08	.....	5.22	.....
Cerium oxide.....	6.07	.....	.....	10.110
Didymium oxide.....	14.40	14.81	1.53	18.990
Lanthanum oxide.....				
Yttrium oxide.....	1.84	0.85	8.20	1.120
Erbium oxide.....				
Manganese oxide	1.23	1.99	trace.	1.025
Magnesia.....	0.15	1.28	4.29	0.540
Lime	10.95	9.43	17.47	10.785
Soda.....	0.33	0.54	.....	0.210
Potash.....	0.12	0.20	.....	trace.
Water.....	1.89	3.64	2.78	1.460
	99.75	98.76	99.95	100.307

ZOISITE.

The beautiful variety of zoisite, "thulite," has been found in slender, rose-red crystals in the feldspars at the Flat Rock mine, Mitchell County. At the Cullakenee mine it is found as one of the products of the alteration of corundum. Some of the pink as well as the bluish gray corundum is changed into compact and cleavable columnar masses of zoisite of a grayish, greenish, and brownish white color. G. A. Koenig has analyzed the slightly greenish white cleavable variety (I), which has resulted from the alteration of pink corundum. I have made an analysis

of the white, slightly grayish zoisite (II), containing still nuclei of unaltered bluish gray corundum:

	I.	II.
Sp. gr.	3.286	3.224
Silica	40.70	39.86
Alumina	33.86	33.84
Ferric oxide	0.81	1.62
Manganous oxide	trace.	trace.
Magnesia	0.22	0.18
Lime	24.05	23.82
Soda (trace of lithia)	undet.	0.22
Potash	undet.	0.09
Loss by ignition	0.63	0.78
	100.27	100.41

Some 40 years ago, about half a mile southwest of Silver Hill, while searching for the continuation of the vein, a grayish white, foliated and columnar mineral was found which had the appearance of zoisite. No further examination of it was made, and there is probably no specimen preserved. Dr. Hunter reports zoisite from Alleghany County, and it also occurs in Swain County.

PHLOGOPITE.

Small brownish scales of it have been found in the granular limestone of Bolejack's quarry, near Germantown, and at Martin's quarry on Snow Creek, Stokes County, on Walnut Creek, one mile from the French Broad River, in Madison County, on Valley River, in Cherokee County, and at Judge Pearson's, near the Yadkin River, Yadkin County. It is found also near Coleman's Station, in Henderson County.

BIOTITE.

Biotite is a constituent of many of the granites, gneisses, and mica schists of North Carolina. It is found only in small black or brownish black plates or scales. The localities are too numerous for particular mention. It occurs in large plates and in very regular crystals in the mica mines of Mitchell, Haywood, Yancey and especially Macon, notably at Lytle and Thorn Mountain mines.

MUSCOVITE.

The mica of the gneiss and mica schist is mostly muscovite, hence it is one of the commonest minerals of North Carolina. In a few localities it is found in beautiful crystals, for instance, with magnetite, at Buckhorn, in Chatham County, with quartz, at Hickory, Catawba County, and with pyrite, in Stokes County. The most remarkable crystals of muscovite are associated with the minerals of the Emerald and Hiddenite mine in Alexander County. They are hexagonal plates implanted edgewise on the walls of pockets, and are dusted over with a chloritic coating, possibly of hisingerite (q. v.), which gives the mica

a peculiar bronzy appearance. An analysis by F. W. Clarke is given below.

Since the year 1868 mica has been mined in many places and has been obtained in large plates, at times over 3 feet in diameter, generally of a brownish color, in masses or large crystals, associated with gray, smoky, or yellowish brown quartz, orthoclase, albite, etc., in numerous localities in Macon, Jackson, Haywood, Buncombe, Ashe, McDowell, Mitchell, Yancey, Alexander, Cleveland, and other counties. A pink colored muscovite in fine scales, much resembling lepidolite, for which it was mistaken, occurs with mica at Ray's, mine in Yancey County, and at the Flat Rock mine in Mitchell County.

A compact variety of this species, often in very fine cryptocrystalline scales or fibrous, radiating masses, frequently resulting from the alteration of corundum and other minerals, was formerly, under the impression that it was distinct hydrous mineral, designated as damourite.

Very fine white and yellowish white pearly scales are found with the cyanite at Crowder's and Clubb's mountains, which result from alteration of the cyanite. Under similar circumstances it is found in Yancey, Cherokee, and Iredell counties. A slaty variety, much resembling the pyrophyllite slates of Chatham and Moore Counties, occurs near Warm Springs, Madison County. The most interesting occurrence of muscovite is that resulting from the alteration of corundum. In this connection it is found in many varieties. It is sometimes in compact masses, with a crystalline structure and a yellowish white color, surrounding the corundum as at the Haskett mine, Macon County, or it envelops the nodules of corundum, as at Belt's Bridge, Iredell County, and has a very fine fibrous structure with delicate silky luster, the fine particles gradually assuming a scaly structure and large size. At Crowder's and Clubb's mountains and Culsagee mine, Macon County, the muscovite, surrounding corundum, occurs in the form of small silver white scales, usually discolored by a thin coating of oxide of iron. At the Hogback mine, in Jackson, and especially in Haywood County, it occurs in a similar manner, but it frequently surrounds large masses of corundum with a compact or semi-fibrous coating with silky luster, which towards the margin becomes more crystalline and scaly; at the Presley mine, Haywood County, it is found in very fine scales, gradually increasing to plates of an inch in diameter, and sometimes directly into large hexagonal crystals of 3 to 4 inches in diameter, still inclosing nuclei of the original mineral.

The following have been analyzed in the laboratory of the University of Pennsylvania, I to IV:

- I. The finely fibrous from Belt's Bridge, by Miss Mary T. Lewis.
- II. The fine scales from Crowder's Mountain, by Thos. M. Chatard.
- III. The fine scales from Culsagee, by Geo. A. Koenig.
- IV. Plates of about 1 inch in diameter from the Presley mine, by myself.

V. Carefully purified crystals from the Emerald and Hiddenite mine, analyzed by F. W. Clarke in the laboratory of the U. S. Geological Survey.

The following are the results :

	I.	II.	III.	IV.	V.
Sp. gr.		2.860	2.867		
Silica	45.96	43.51	45.62	44.89	45.40
Titanic oxide					1.10
Alumina	38.22	} 37.85	35.93	38.02	33.66
Ferric oxide	0.61		2.93	1.96	2.36
Magnesia		0.31	0.34	0.14	1.86
Lime	0.37	0.42	trace.	0.30	
Lithia		trace.	trace.		trace.
Soda	0.74	1.04	0.71	0.60	1.41
Potash	9.21	11.35	9.40	10.26	8.33
Fluorine					0.69
Ignition	4.89	7.73	4.93	4.50	5.46
	100.00	102.21	99.86	100.67	100.27
Less oxygen					0.29
					99.98

The soft, pseudomorphous crystals in the form of staurolite from Cherokee County are probably muscovite.

LABRADORITE.

A white, and in some portions colorless, very lustrous, cleavable variety with very few triclinic striæ, occurs at the Cullakenee mine, in Clay County. It has a sp. gr. of 2.62. I had it analyzed in the laboratory of the University of Pennsylvania by Mr. W. H. Jarden, who found :

Silica	55.61
Alumina	26.90
Lime	9.60
Soda	6.97
Potash	0.55
Ignition (water)	0.35

99.98

It has been found in gray, granular, cleavable masses, but only at a few localities.

Near the road, 6 miles north of Burnsville, in Yancey County, it is associated with mica, garnet, etc., as one of the constituents of a stratified rock ; it occurs in a trap near the Tuckasegee Ford, half a mile from the Catawba River, on the road to Charlotte, in Mecklenburg County ; also at Shiloh Church in Granville County, and in large crystals in the heavy trap on Toe River below Bakersville, Mitchell County. The latter locality furnishes specimens which show slightly the play of bluish colors. It is one of the constituents of the cryptocrystalline trap-rock found throughout the State.

ANDESITE.

In snow white and bluish white, cleavable masses, showing fine striæ upon the cleavage planes, associated with black hornblende or arfvedsonite at the Cullakenee mine, Clay County; and from the same locality as a very fine-grained, white feldspar associated with zoisite and margarite, and like the latter, resulting from the alteration of corundum. Both have been analyzed—the first by G. A. Koenig (I), the latter by T. M. Chatard (II):

	I.	II.
Sp. gr.	2.611	2.610
Silica	57.29	58.41
Alumina	26.52	25.93
Ferric oxide	0.21	0.38
Magnesia	0.15	0.18
Lime	7.80	5.82
Soda	6.75	6.45
Potash	0.33	2.0
Loss by ignition	1.43	0.93
	100.48	110.20

There are similar white feldspars at the Hogback mine in Jackson County, and at the Culsagee mine in Macon County, which may belong here. No others have been analyzed.

OLIGOCLASE.

A fine-grained, grayish white feldspar, through which minute particles of black tourmaline are disseminated, occurs in considerable quantities at Culsagee, Macon County, and at the Carter mine, in Madison County. In 1887, at the Hawk mica mine near Bakersville, a peculiar transparent oligoclase was discovered. It was of a faint greenish tint, and clear enough to cut small gems; in fact, it resembled glass more than it did feldspar, especially as it contained stellate tufts of microliths. Analyses as follows:

- I. From Culsagee, by J. L. Smith.
- II. From Culsagee, by Harry M. Keller.
- III. From Bakersville, by F. W. Clarke.
- IV. From Bakersville, by E. S. Sperry.

	I.	II.	III.	IV.
Silica	64.12	62.32	62.92	62.60
Alumina	24.20	25.19	25.32	23.52
Ferric oxide	0.14		trace	0.08
Manganese oxide			trace	
Lime	2.80	5.01	4.03	4.47
Soda	9.28	8.02	6.18	8.62
Potash		0.25	0.96	0.56
Ignition			0.25	0.10
	100.54	101.79	99.66	99.95

Sp. gr. of the Bakersville mineral, 2.651.

A beautiful variety of "sunstone" oligoclase has been found by Mr. J. A. D. Stephenson near Statesville, Iredell County, associated with yellowish white titanite.

ALBITE.

It is found in large, cleavable masses of a white color, at Point Pizze, Mitchell County, showing upon the cleavage planes more or less distinct striation. I had it analyzed in the laboratory of the University of Pennsylvania by Frank Julian (I), (see below). Sp. gr. 2.638. There are probably many of the white and grayish or brownish white striated feldspars from mica mines, such as from the Gibbs mine, South Toe River, Yancey County; the Flat Rock mine and the Buchanan mine, in Mitchell County; Ainslie's, in Jackson County; and Thorn Mountain mine, in Macon; and many others, which belong to this species or to oligoclase, which can be distinguished only by analysis. An interesting occurrence is that at the Presley mine, Haywood County, where it, together with muscovite, results from the alteration of corundum. Small white granular cleavable albite, and also compact masses, have been found at the Steele mine, Montgomery County, associated with prochlorite, gold, pyrite, sphalerite, etc. Finely crystallized at the Emerald mine, in Alexander County.

Some of the granitic rocks 3 miles west of Leasburg, Caswell County, contain small grains of a triclinic feldspar, which may be albite.

The compact grayish white variety from the Steele mine has been analyzed by Geo. J. Popplein (II):

	I.	II.
Silica	67.51	60.29
Alumina	20.46	19.66
Ferric oxide	trace	4.63
Manganese oxide		trace
Magnesia	0.34	0.23
Lime	3.08	1.83
Soda	9.15	9.90
Potash	trace	1.71
Loss by ignition		1.20
	100.54	99.45

ORTHOCLASE.

This is one of the most widely distributed minerals in the State, forming an essential constituent of all the granite, gneiss, etc. It is found in beautiful crystals in a band of porphyritic granite, near Salisbury, Rowan County; the High Shoals and White's mill, in Gaston County; and on Hitchcock's Creek, and elsewhere in Richmond County; also in the "chesterlite" form at Silver Hill, associated with pyromorphite and quartz. Cleavable masses of orthoclase are found

at Houp's farm, near Statesville, and near Belt's Bridge, Iredell County. A peculiar variety with satiny luster upon the cleavage planes occurs in Clay County, near Cullakenee. Large lamellar masses of a white, grayish or reddish color occur at Ray's mine, Yancey County; at Flat Rock, Blalock's, and near Bakersville, in Mitchell County; also in Caldwell County; at Hampton's Mining Creek, near Burnsville, Yancey County; on Sugartown Turnpike, 10 miles from Franklin; at the Whiteside Mountain, in Macon County; on French Broad River, in Madison County; and in the mica mines everywhere. The Burnet mica mine, Buncombe County, furnished the museum with a crystal weighing 800 pounds. The peculiar compact variety of orthoclase which is spotted with hydrated sesquioxide of manganese, the so-called "leopardite," is found near Charlotte, Mecklenburg County, and also in Gaston County. It is a variety of porphyry with crystals of quartz disseminated in it. I have made an analysis of the feldspathic constituent, which has a yellowish white color and a cryptocrystalline structure (I). Miss Mary T. Lewis has analyzed in the laboratory of the University of Pennsylvania the orthoclase from Houp's farm, Iredell County (II).

	I.	II.
Silica	75.92	64.56
Alumina	14.47	20.60
Ferric oxide	0.88	
Magnesia	0.09	.....
Lime	0.02	0.36
Soda	4.98	trace.
Potash	4.01	14.85
	100.01	100.37

TOURMALINE.

The tourmalines, found in many localities in North Carolina, are mostly of the black variety. A small, well terminated, transparent green crystal was found by Col. Mills on Silver Creek, Burke County; also a black crystal 4 inches long, embedded in a green beryl crystal. Crystals of from 1 to 2 inches in size have been found near Mountain mine, Cleveland County; on Upper Little River, Caldwell County; at Hanging Dog Creek, in Cherokee; and in Rutherford, Mecklenburg, Yancey, Mitchell, Macon, Haywood, Transylvania, Polk, Buncombe, Caldwell, Stokes, Johnston, Wake, Granville, and other counties. In beautiful, well terminated crystals of 2 to 3 inches in length it is found in the South Mountains 16 miles southeast of Morganton, in Burke County; also near King's mill, Iredell County; and at Warren's, near Salem Church; and at John Lackey's and Isaac Price's, on the White Plains, Alexander County. In slender black crystals, often radiating and needle-shaped, frequently flattened between the plates of muscovite, it is

found at Ray's mine, near Burnsville, where also a greenish and yellowish green, fibrous, and finely columnar variety occurs. It is frequently and in large masses associated with the corundum of Culsagee mine, in Macon County. At the Cullakenee mine, Clay County, it is found in small quantity; also at the Hogback mine, Jackson County, and with the corundum and muscovite at Belt's Bridge, in Iredell County. A large outcrop of fibrous and granular tourmaline, with quartz, is found about two hundred yards northeast of the Ellison mine, on the High Shoals property, in Gaston County, and a peculiar finely striated variety, with quartz, at Clubb's Mountain; similar finely fibrous, wood-like masses occur at Leasburg, Caswell County, and in Wake. It has also been observed in the gold bands from Burke County. Tourmaline rock and slate have been noticed at Kernersville, Guilford County; at Bee Rock, head of Turkey Creek, in McDowell County; at Jeanstown, Rutherford County, 6 miles south of Asheville, on the Hendersonville road, and in Cleveland County.

At the Emerald and Hiddenite mine, in Alexander County, Mr. W. E. Hidden found some brilliant black crystals of tourmaline with fine, polished terminations. An analysis of this tourmaline, made by K. B. Riggs in the laboratory of the U. S. Geological Survey, gave results as follows:

Silica.....	35.56
Alumina.....	33.38
Ferrous oxide.....	8.49
Titanic oxide.....	0.55
Manganous oxide.....	0.04
Lime.....	0.53
Magnesia.....	5.44
Soda.....	2.16
Potash.....	0.24
Water.....	3.63
Boric oxide.....	10.40
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	100.42

Sp. gr., 3.13.

FIBROLITE.

A reddish white, finely fibrous mineral, with silky luster, from Macon County, probably belongs to this species.

A very interesting occurrence of fibrolite has lately been discovered near Shoup's ford, in Burke County, where it is the result of the alteration of corundum and envelops a core of the original mineral. The fibrolite may, in part, have been changed into muscovite, as it occurs in the micaschist of the neighborhood in small, needle-shaped crystals. A mineral resembling fibrolite is found in quartz in the gold gravel of Burke and McDowell Counties.

CYANITE.

This is one of the characteristic accessories in many of the mica and hornblende schists of Macon, Haywood, Transylvania, Yancey, Mitchell,

Caldwell, Catawba, Gaston, and other counties, and is generally of a grayish white or gray color, and in imperfect crystals. Fine crystals occur at Clubb's and Crowder's Mountains, Gaston County; coarsely bladed masses of a blue and greenish color at Swannanoa Gap, Buncombe County; also near Ray's mica mine, on Hurricane Mountain, and elsewhere in Yancey County; Mitchell, Cherokee, and Wilkes counties; six miles east of Danbury, in Stokes County; and near Davidson College, Mecklenburg County. In blue and white bladed crystals in quartz at Hoover's farm, 6 miles southwest of Statesville; also in gravel near Statesville, Iredell County. A grayish white, radiating cyanite is found at Ararat River, 4 miles southeast of Mount Airy, in Surry County, and a white cyanite at the foot of Barnett's Mountain, in Person County. Cyanite also occurs on Valley River, in Cherokee; at Tipton's, in Clay County; in quartz at the head of Jonathan's Creek, in Haywood County; on Bear Creek, in Madison County; at the Buchanan mine, Mitchell County; in the northwest corner of Wake County, and in Moore and elsewhere. At Hunting Creek, north of Statesville, rheticite in columnar and radiating masses is found, resulting from the alteration of corundum. On Yellow Mountain, near Bakersville, cyanite occurs in very deep blue crystals, equal in color to the finest sapphire. Fine gems have been cut from this mineral.

The white cyanite associated with the lazulite of Clubb's Mountain has been analyzed by Smith and Brush (I); and a brownish white variety from the gravel near Statesville (II) was analyzed by myself:

	I.	II.
Ignition		0.38
Silica	37.60	36.85
Alumina	60.40	63.15
Ferric oxide	1.60	trace.
	99.60	100.38

At many localities, notably in Cherokee County, cyanite occurs largely altered into a fine, scaly muscovite.

TOPAZ.

Topaz is reported as occurring at Crowder's Mountain, but it is very doubtful; crystals from there, which were considered topaz, are cyanite. The variety pycnite occurs in finely columnar aggregations of a yellowish and brownish yellow color, associated with garnets, near White's mill, Gaston County.

EUCLASE.

Gen. Clingman mentions a very handsome crystal of this rare mineral from the gold mine of the late Morril Mills, in the eastern part of Polk County.

TITANITE.

Gen. Clingman mentions titanite, or sphene, as occurring in Buncombe County. I have observed it at Morganton Springs, Burke County, in minute brown crystals; in hornblende slate and in granite at White's mills, in Gaston County; at Rogers's ore bank, near Daurbury, in Stokes County; and on Hurricane Mountain, Yancey County. To this species probably belongs Prof. Shepard's very doubtful species. pyromelane, from the gold washings of McDowell County. Hidden reports titanite also in Alexander County.

Shepard's xanthitane (q. v.) is an alteration of titanite from Green River, in Henderson County. It often contains unaltered titanite as a nucleus.

I have analyzed a yellowish white titanite which occurs near Statesville, Iredell County, in mica schist, associated with sunstone oligoclase. The crystal was 15mm. broad and 2mm. thick. Sp. gr., 3.477. It contained—

Silica	29.45
Titanic oxide	38.33
Ferric oxide	1.61
Manganous oxide	trace
Magnesia	trace
Lime	29.11
Loss by ignition	0.60
	<hr/> 99.10

STAUROLITE.

Very large, brownish red crystals, from $2\frac{1}{2}$ to 3 inches in length and 1 to $1\frac{1}{2}$ inches wide, single individuals as well as twins, occur at the Parker mine, in Cherokee County. There are many other localities in Cherokee and Macon Counties where it occurs abundantly in argillaceous and talcose slates, as on Persimmon Creek and Hanging Dog Creek; on Bear Creek, Madison County, and Tusquittah Creek, in Clay County. It is found in very small quantity with corundum and chlorite in small, reddish brown grains of vitreous luster, but without distinct form, at the Culsagee mine, Macon County. They have a sp. gr. of 3.711. An analysis which I have made gave—

Silica	27.91
Alumina	52.92
Ferric oxide	6.87
Ferrous oxide	7.80
Magnesia	3.28
Lime and manganous oxide	traces
Ignition (water)	1.59
	<hr/> 100.37

HYDROUS SILICATES.

CHRYSOCOLLA.

Inferior specimens, generally much mixed with other copper ores, have been observed at many of the copper mines; for instance, at the

Gardner Hill and Cambridge mines in Guilford County, the Pioneer Mills in Cabarrus County, the Gillis mine and at Mill Creek in Person County, Northington's dam in Harnett County, Wolf Creek mine in Jackson County, at Welch's in Moore County, at Grupy mine and elsewhere in Rowan County, near Elkin in Surry County, the Hopewell in Mecklenburg County, at the Clegg mine and at Snipes' iron mine in Chatham County, Gap Creek mine in Ashe County, and many other places.

CALAMINE.

The only specimen of calamine which I have observed came from Silver Hill, Davidson County, where it occurs sparingly as an incrustation of fibrous and radiating structure upon argentiferous galenite.

TALC.

Resulting from the alteration of chrysolite, foliated talc of a white or greenish white color is found in many of the chrysolite beds west of the Blue Ridge; at Shooting Creek, Clay County; Culsagee, Macon County; Webster, Jackson County; Hampton's, Mining Creek, and Young's, on South Toe River, Yancey County; near Bakersville, Mitchell County, and other localities; in sheets of three-quarters to one inch in thickness and of a somewhat columnar structure near Pilot Mountain, and near Dobson, Surry County; fibrous talc with silky luster and of a white or green color, also compact crystalline white talc with a splintery structure, on Valley River, Cherokee County, and in Macon County. Talcose slate and coarse soapstone are found in many localities throughout the State; it has been noted in some thirty counties: for instance, near Belt's Bridge, Iredell County; in the South Mountains of Burke County; in Caldwell; in Haywood County; near Waynesville; in the north of Wake County, etc. I have analyzed a specimen from Webster, Jackson County (I), and Mr. J. B. Adger has analyzed a compact, faintly greenish variety found 8 miles from the mouth of the Nantahala River (II), as follows:

	I.	II.
Sp. gr. ....	.....	2.82
Water .....	.34	6.01
Silica	64.44	57.72
Alumina .....	.48	2.52
Ferrous oxide	1.39	.64
Nickel oxide .....	.23	.....
Magnesia	33.19	33.76
	100.07	100.65

PYROPHYLLITE.

In white, yellowish, greenish, and brownish white, stellate aggregations, and in fibrous and radiated masses at Cotton Stone Mountain, Montgomery County; also at Pilot Knob, Randolph County; Davidson College, Mecklenburg County; Hillsboro, Orange County; on Bowlings Mountain, in southern Granville County, in great abundance; Crowder's and Clubb's Mountains, in Gaston County; and on Linville Mountain, McDowell County. The slaty variety forms large beds of yellowish white or greenish color in Chatham, Moore, and Orange Counties.

A schistose imperfectly lamellar variety from the Deep River has been analyzed by Samuel T. Tyson (I), and a similar one, of a somewhat whiter color, from Carabonton, by O. D. Allen (II):

	I.	II.
Sp. gr.	2.92	2.82
Silica	65.93	66.25
Alumina	29.54	27.91
Ferrous oxide		1.08
Water	5.40	5.25
	100.87	100.49

STILPNOMELANE (?).

A mineral, similar to stilpnomelane, has been found in compact greenish black masses at the Cosby mine, Cabarrus County.

GLAUCONITE.

The green grains forming one of the constituents of many of the so-called marl beds in the eastern part of the State are glauconite. It occurs in most of the counties of that section south of Tar River.

SERPENTINE.

The massive varieties are found in many localities. The best appears to come from the neighborhood of Patterson, Caldwell County. It has a dark, greenish black color, contains fine veins of the yellowish green, fibrous and silky chrysotile, and admits of a fine polish; greenish gray, massive serpentine, also with seams of greenish and grayish white chrysotile, is found at the Baker mine in Caldwell County, at which place are also found the varieties marmolite and picrolite; this last also occurs abundantly in the Buck Creek corundum mine, Clay County. Dark green serpentine has been observed in the neighborhood of Asheville in Buncombe County, and in Forsythe and Wake Counties. A grayish or yellowish green serpentine occurs in Caldwell, Wilkes, Surry, Yancey, Stokes, Orange, and Wake Counties, and in the chrysolite beds of Macon, Jackson, Yancey, Mitchell, Watauga, Burke, and other

counties; it results from the decomposition of the chrysolite, which, however, is not always complete and gives rise to intermediate stages, in which we have to deal with mixtures of both species. Such a mixture from the Cullakenee mine, Clay County, has been analyzed by me (I), also a compact massive serpentine resembling the variety williamsite, from the chrysolite beds of Webster (II).

The picrolite from Buck Creek has been recently analyzed by Dr. E. A. Schneider, of the Geological Survey (III), who has also analyzed an alleged deweylite from Corundum Hill (IV), which proves to be only serpentine:

	I.	II.	III.	IV.
Silica	35.19	43.87	42.94	41.99
Alumina	0.64	0.31	1.72	0.71
Ferric oxide			3.33	0.91
Ferrous oxide	9.70	7.17	1.88	undet.
Nickel oxide		0.27	0.61	0.10
Manganese oxide		trace		
Magnesia	40.99	38.62	36.53	40.16
Lime		0.02		
Water	13.48	9.55	13.21	16.16
Chromite		0.57		
	100.00	100.38	100.22	99.94

DEWEYLITE.

This mineral is found in all the chrysolite beds of the western counties, in yellowish and greenish masses, in thin veins or seams through the decomposed rocks.

For the supposed deweylite of Corundum Hill see serpentine.

CEROLITE.

In small veins or seams in decomposed chrysolite at Culsagee mine, Macon County, forming white or yellowish masses. It has not been analyzed.

GENTHITE.

In amorphous apple-green coatings upon decomposing chrysolite, at Webster, Jackson County, sparingly at the Culsagee mine, Macon County, and also on Ivy River, Buncombe County.

KAOLINITE.

Snow-white kaolin is found as the result of the decomposition of orthoclase at most of the mica mines in Mitchell, Yancey, Macon, Ashe, and other counties. Good qualities are found 6 or 7 miles from Newton, Catawba County; also in Lincoln, Burke, and many other counties. Clay for firebricks and earthenware occurs in many localities throughout the State.

SAPONITE.

Found in Mitchell County, near Bakersville, in the cavities of the cellular hornstone of the chrysolite; popularly known as mountain tal-low. Has not been analyzed.

HALLOYSITE.

Found near Salem, Forsyth County; is of an olive green color and waxy luster. The variety lithomarge occurs in Burke County.

A white, compact halloysite from Chatham County, analyzed by myself, gave:

Water	17.78
Silica	44.40
Alumina	36.88
Ferric oxide.....	0.95
	<hr/>
	100.01

PINITE.

This mineral is found as a light gray to pale or dull greenish coating in the joints and seams and between the laminæ of the conglomeritic and felsitic slates of the Huronian series in the middle counties, and also in the granulites of the Blue Ridge. Has not been analyzed.

PARAGONITE.¹

Is found in the so-called talcoid and talco-micaceous schists of the Piedmont section, especially in Burke, Caldwell, and Catawba; it is a common constituent of the soft brown and purple schists so common as to be characteristic of the region. It is also to be seen at Round Knob, in McDowell, in the altered schists and slates exposed in the railroad cuts, in similar rocks in Wake County, near Raleigh, and in many other localities. Has not been analyzed.

HISINGERITE (?).

The chloritic dust which coats the mica and dolomite of the Emerald and Hiddenite mine, in Alexander County, probably belongs to this species. Partial analysis by F. W. Clarke:

Ignition	20.50
Silica.....	31.16
Alumina.....	8.06
Ferric oxide	35.86
Magnesia	5.43
	<hr/>
	101.01

The iron is undoubtedly present chiefly, but not wholly, as *ferrous* oxide; and the alumina is due to admixed mica. Very little material was available for the analysis.

¹The species saponite, pinite, and paragonite are inserted upon the authority of the late Prof. W. C. Kerr. They need further investigation.

CULSAGEEITE.

The mineral which I had described as jefferisite from Culsagee, has been distinguished by Prof. Josiah P. Cooke, jr., as *culsageeite*. It occurs in broad laminae or plated masses of a yellowish brown color, sometimes 4 or 5 inches in diameter, which when heated exfoliate in a remarkable manner. It is also found at the same locality in greenish, or brownish, yellow scales, not over one-eighth of an inch in diameter. Both varieties have been analyzed, the former by Geo. A. Koenig (I), the latter by Thos. M. Chatard (II). J. P. Cooke, jr., has also analyzed the large plates, but his analyses represent the mineral after having been dried at 100° C. (212° F.) by which operation it lost from 10.19 to 10.27 per cent of water.

	I.	II.	III (dried).
Sp. gr			2.225
Silica	33.93	34.00	37.58
Alumina	17.38	20.36	19.73
Ferric oxide	5.42	4.01	5.95
Ferrous oxide.....	0.50	0.42	0.58
Nickelous oxide.....	0.35	0.57	.....
Magnesia	23.48	21.71	25.13
Water	19.17	18.50	11.09
	100.18	100.47	100.06

It likewise occurs on Ivy River near Carter's, Buncombe County, at Carter's mine, Madison County, and in Henderson County, at Coleman's Station.

KERRITE.

Consists of innumerable fine scales of pale greenish yellow color and pearly luster. Exfoliates when heated, but less so than culsageeite. From the Culsagee mine.

Analyses (I) by T. M. Chatard, mean of two; and (II) by E. A. Schneider :

	I.	II.
Sp. gr	2.303	.....
Silica	38.29	38.13
Alumina.....	11.41	11.22
Ferric oxide	1.95	2.28
Ferrous oxide.....	0.32	0.18
Nickel oxide.....	0.25	0.48
Cobalt oxide		trace
Magnesia	26.40	27.39
Water	21.25	20.47
	99.87	100.15

MACONITE.

Closely resembles fine, scaly culsageeite. Dark brown, with pearly luster, inclining to submetallic. Largely exfoliating, when heated. Numerous fragments of bluish gray corundum are embedded in it.

The carefully selected pure scales were analyzed by Thos. M. Chatard, who found as the mean result of two analyses:

Silica.....	34.22
Alumina.....	21.53
Ferric oxide.....	12.41
Ferrous oxide.....	0.32
Nickel oxide.....	0.12
Magnesia.....	14.46
Lithia.....	trace
Soda.....	0.51
Potash.....	5.70
Water.....	11.85
	<hr/>
	101.12

Sp. gr., 2.827.

LUCASITE.

Similar to culsageeite in appearance, yellowish brown in color, and made up of small foliæ, not over 2mm. in diameter; also compact and disseminated; basal cleavage eminent; luster submetallic, somewhat greasy; exfoliates much on ignition; found associated with grass-green actinolite at Corundum Hill, Macon County; described by Dr. T. M. Chatard, whose analysis is as follows:

Water, expelled at 110° C.....	3.78
Water, at red heat.....	6.98
Silica.....	31.81
Alumina.....	12.99
Chromic oxide.....	0.54
Ferric oxide.....	5.29
Ferrous oxide.....	0.11
Manganous oxide.....	0.05
Magnesia.....	24.83
Lime.....	0.14
Soda.....	0.20
Potash.....	5.76
	<hr/>
	100.48

PENNINITE.

The variety *kämmererite*, in violet and peach-blossom red scales, is associated with chromite at Culsagee in Macon County, Webster in Jackson County; Hampton's, Mining Creek, Yancey County; Rich Mountain, Watauga County, etc.; three-sided and six-sided plated crystals of a dark greenish and purplish color, associated with talc, etc., in the chrysolite beds at the same localities; also at Bakersville, Mitchell County, and Scott's Creek, Jackson County.

PROCHLORITE (AND CHLORITE).

Fine-grained, scaly prochlorite, of a dark green color, rarely in worm-like aggregations, is found associated with an albitic rock, from an alteration of which it has resulted, at the Steele mine, Montgomery County. At the Culsagee mine, prochlorite occurs as the result of the alteration of corundum, often showing the form and containing yet a core of the original mineral. Frequently the corundum has first changed into spinel and the latter has subsequently been altered into prochlorite, but in either case, where it touches the original mineral, it is frequently of a fine, scaly, pseudo-fibrous structure and becoming more laminated at a greater distance. But this is not always the case, as very often broadly foliated prochlorite is in immediate contact with corundum. Both the laminated and fine scaly form beds of considerable size. Under similar circumstances it is found at the Hogback mine in Jackson County, at Shooting Creek in Clay County, near Marshall, at the Carter mine in Madison County, and at many other corundum mines.

The so-called corundophilite of Shepard, which was established by him on the prochlorite of Marshall, has no existence in North Carolina. Chlorite in scales and scaly aggregations is found in many of the gold and copper mines in the State, and chloritic slate at many localities throughout the whole slate belt, and in many counties outside of it, both in the Huronian and Montalban rocks.

I have analyzed the broadly foliated dark green variety (I), and the fine scaly variety diverging from corundum (II), both from Culsagee; and the fine scaly prochlorite from the Steele mine (III):

	I.	II.	III.
Silica	27.56	29.48	24.90
Alumina.....	22.75	22.22	21.77
Ferric oxide	2.56	0.70	4.60
Ferrous oxide	5.43	5.30	24.21
Nickelous oxide	0.30	0.11	.....
Manganous oxide.....		0.17	1.15
Magnesia	28.47	30.99	12.78
Water	13.60	11.63	10.59
	100.87	100.60	100.00

Analyses of other specimens from Culsagee, made by Thos. M. Chatard and J. L. Smith, gave similar results. It will be seen from these analyses that they are varieties in which a large portion of the ferrous oxide is replaced by magnesia.

A massive chloritic mineral in aggregations of minute scales, much resembling thuringite, has been found at Mount Pisgah, Iredell County. I have made an analysis of it, but as it was too much oxidized, the amount of ferrous oxide could not be ascertained with accuracy, and

therefore a doubt exists as to the species to which it belongs. The analysis gave:

Silica	24.22
Alumina	19.34
Ferric oxide	17.77
Ferrous oxide	20.98
Manganous oxide	0.07
Magnesia	5.72
Water	12.22
	<hr/> 100.32

Several other chloritic minerals from Corundum Hill have been analyzed by Dr. T. M. Chatard in the laboratory of the U. S. Geological Survey, but microscopic examination would be necessary to establish identity of species.

CHLORITOID.

In small scales of a greenish black color, disseminated through slaty pyrophyllite, from Evans's mill, in Chatham County. I have made an analysis of the carefully purified scales:

Silica	26.13
Alumina	40.11
Ferric oxide	3.44
Ferrous oxide	23.01
Manganous oxide	trace
Magnesia	0.94
Water	6.91
	<hr/> 100.54

Sp. gr., 3.353.

WILLCOXITE.

Greenish and grayish white fine scales of a pearly luster, much resembling talc, occur occasionally as the result of the alteration of corundum. One specimen from Shooting Creek, Clay County, is a fragment of a semi-globular mass with a core of white corundum; it also occurs in small quantity at Cullakenee, Clay County, and probably at Culsagee, Macon County.

Both, that from Shooting Creek (I) and that from Cullakenee (II), have been analyzed by George A. Koenig:

	I.	II.
Silica	28.96	29.50
Alumina	37.49	37.56
Ferric oxide	1.26	1.40
Ferrous oxide	2.44	2.38
Magnesia	17.35	17.20
Lithia	trace	trace
Soda	6.73	6.24
Potash	2.46	2.42
Water	4.00	3.32
	<hr/> 100.69	<hr/> 100.02

MARGARITE.

In small foliated masses of silver-white color and pearly luster, some of the folia showing planes of crystals associated with the corundum at the Culsagee mine (I); it has also been found with the mass of blue corundum found at Marshall, Madison County; but the most beautiful varieties are found at Cullakenee, Clay County, where it occurs in groups of laminated crystals, sometimes 2 inches long, $1\frac{1}{2}$ wide, and five-eighths inches thick, of a slightly pinkish white color and pearly luster (II). These groups contain sometimes a nucleus of corundum, from which they are derived. The second variety from the same locality occurs in the form of broad laminæ of a pinkish color, intermixed with corundum and associated with zoisite (III); a third variety from Cullakenee is found in thin seams of a grayish green color, which are an aggregate of minute pearly scales of a greenish white and sea green color (IV). It is found rarely in Hogback mine, Jackson County. The gray corundum from Penland's, Clay County, is surrounded by a white and yellowish-white cryptocrystalline and pseudofibrous margarite, and a similar incrustation is found upon the blue corundum at Crowder's Mountain.

A peculiar variety of soda margarite, of a compact and cryptocrystalline structure, surrounds the hexagonal corundum crystals from Hendrix's farm, near Belt's Bridge, Iredell County. It has been analyzed in the laboratory of the University of Pennsylvania by Frank Julian (V). I have analyzed the margarite from Culsagee (I); Thos. M. Chatard the first variety (II), and I the second (III) and third (IV) varieties from Cullakenee:

	I.	II	III.	IV.	V.
Sp. gr.	3.087	2.990	3.055	3.064	.....
Silica	28.11	29.34	30.72	29.63	33.10
Alumina	49.16	48.73	49.83	51.19	52.20
Chromic oxide				0.13	.....
Ferrous oxide	0.43	0.78	0.84	0.59	trace
Magnesia	0.45	0.78	0.76	1.09	.....
Lime	11.08	11.32	10.84	11.28	8.44
Lithia	0.45	trace	trace	.....	.....
Soda	0.67	2.61	2.19	1.22	2.59
Potash	0.22	0.10	0.26	0.20	.....
Water	6.43	6.55	6.21	4.73	4.85
Corundum	3.31	.....	.....	.....	.....
	100.31	100.21	101.65	100.06	101.18

DUDLEYITE.

Found in small quantity in soft, bronze colored or brownish yellow scales with pearly luster, slightly exfoliating when heated. They are probably the result of the alteration of margarite, and are found with it rarely at the Cullakenee mine, Clay County.

URANOTIL.

About one-third of the so-called "gummite" is an admixture of uranotil, but this mineral is also obtained in a nearly pure state by the further decomposition of the uraninite or rather gummite. It is then found in apparently amorphous, compact masses, without or with a waxy luster, and a pale straw or lemon yellow color; opaque and of uneven fracture; sp. gr. 3.834; incrusting the gummite, but sometimes the whole mass of the nodules changed into uranotil.

The mean result of two analyses which I made is:

Silica	13.72
Uranic oxide.....	66.67
Plumbic oxide	0.60
Baryta	0.28
Strontia	0.13
Lime	6.67
Phosphoric acid.....	0.29
Water	12.02
	<hr/>
	100.38

From the Flat Rock mine, Mitchell County. Found also with gummite at the Deake, Lewis & McHone mines.

The late Prof. W. C. Kerr also reported "uranochre" as a yellow to orange incrustation from Gibbs's mine, Yancey County, and the Flat Rock and Buchanan mines in Mitchell County. "Zippeite" is given by him on the authority of Julien as occurring at the Higdon mine, Macon County. Both species are extremely doubtful, and may be only varieties of uranite and phosphoranylite.

THORITE.

Identified by Penfield both microscopically and chemically as a mechanical admixture in the monazite sands of Brindletown, Burke County.

AUERLITE.

A new species discovered by Hidden and Mackintosh at the Zircon mine, in Henderson County, and also at Price's farm, 3 miles southwest of the first-named locality. Color, pale yellow to orange and brownish red. Hardness, 2.5 to 3; sp. gr. 4.4 to 4.766. Very brittle and easily crumbled. Form like zircon, and the crystals, simple in habit, are often attached to zircon in parallel position. Twins, like those of zircon, have been observed.

Analyses by Mackintosh :

	I.	II.	III.
Water	9.88	} 11.21	.....
Carbonic acid	1.00		.....
Silica		7.64	8.25
Phosphoric acid		7.46	7.50
Thorium oxide		70.13	.....
Ferric oxide		1.38	.....
Lime		0.49	.....
Magnesia		0.29	.....
Alumina, etc		1.10	.....
		99.70	.....

The lemon yellow variety found on the Price land has a sp. gr. of 4.03 to 4.08, and is richer in phosphoric acid and poorer in silica than the foregoing mineral. The data are water, 10.64; phosphoric acid, 8.58; silica, 6.84. The thoria determination was lost.

XANTHITANE.

Although not a silicate this mineral may best be placed here. It occurs abundantly in the Zircon mine at Green River, Henderson County, and is a yellow, earthy pseudomorph after titanite. The crystalline form is often well shown, and the xanthitane frequently contains an unaltered core of titanite, from which mineral it has been derived. Analysis by L. G. Eakins:

Water lost at 100° C	6.02
Water lost at red heat	9.92
Silica	1.64
Titanic oxide	57.46
Alumina	16.41
Ferric oxide	4.16
Lime	0.84
Magnesia	trace
Phosphoric acid	3.89
	100.34

Sp. gr., 2.941 at 24° C.

The mineral is evidently an aluminous clay, containing titanium in place of silicon.

TANTALATES, COLUMBATES.

PYROCHLORE OR MICROLITE.

Microscopic brownish yellow or honey yellow grains, and crystals which appear to be octahedra with dodecahedral planes, are associated with orthoclase, tourmaline, etc., at Ray's mica mine, on Hurricane Mountain, Yancey County, and are probably pyrochlore or perhaps microlite. Larger octahedra are reported to have been found at the Flat Rock mine in Mitchell County, and were called microlite. I have never seen any; those sent to me as microlite were garnet.

HATCHETTOLITE.

In octahedral crystals with cubical planes, of a yellowish brown color, with grayish opalescence, resinous luster, and subconchoidal fracture. Hardness, 5; sp. gr., 4.851.

Three analyses of it have been made by J. L. Smith, the mean results of which I give (I), and one by O. D. Allen (II):

	I.	II.
Tantalio oxide	67.04	29.83
Columbic oxide		34.24
Titanic oxide		1.61
Tungstic oxide	0.75	0.30
Stannic oxide		
Plumbic oxide	trace	trace
Uranic oxide	15.61	15.50
Ferrous oxide	2.24	2.19
Cerous oxide	1.17	
Yttria		
Magnesia		0.15
Lime	7.31	8.87
Soda		1.37
Potash	0.86	trace
Loss by ignition	4.87	4.49
	99.85	98.55

Found with samarskite at Wiseman's mine, Mitchell County.

TANTALITE.

A massive variety of tantalite, weighing a few ounces, has been collected by the late Prof. F. H. Bradley, in Yancey County. It had a black color and a specific gravity of 6.88; and has been analyzed by W. J. Comstock, who found:

Tantalio oxide	59.92
Columbic oxide	23.63
Ferrous oxide	12.86
Manganous oxide	3.06
Magnesia	0.34
	99.81

COLUMBITE.

It occurs in crystals and crystalline masses of a black color embedded in the samarskite of Wiseman's mine, Mitchell County. It has also been found at the Deake mine and other localities in the same county, at Ray's mine in Yancey County, near Burnsville; at Balsam Gap mine in Buncombe, and near Franklin, in Macon County. One crystal of it was kindly sent me by Mr. J. A. D. Stephenson, of Statesville, which he had found at Isaac Price's farm, White Plains, Alexander County. I have a crystal of about 2 inches in length, $1\frac{1}{2}$ in width and

$\frac{1}{2}$ in thickness, from Capt. Mills's mine, Burke County, which appears to belong to this species.

J. L. Smith has analyzed the crystals (I) and massive varieties (II) from Wiseman's mine, and I that from Isaac Price's farm (III):

	I.	II.	III.
Sp. gr.	5.562	5.485	5.758
Columbic and tantallic oxides	80.06	80.82	79.90
Tungstic and stannic oxides	1.21	1.02	0.56
Ferrous oxide	14.14	8.73	15.14
Manganous oxide	5.2 ₁	8.60	5.09
Cupric oxide		trace	
	100.62	99.17	100.92

YTTROTANTALITE (?).

According to Gen. Clingman, grains of this mineral have been found in several localities in the western counties. It is probably fergusonite or samarskite.

SAMARSKITE.

It has been found in the gold sands of Rutherford County, in small black grains and pebbles, sometimes weighing one-fourth of an ounce, which, when broken, had a vitreous resinous luster and a brownish black color, and a sp. gr. of 5.69. It is found also in the gold sands of Burke (at Capt. Mills's) and McDowell Counties. It has been analyzed by T. S. Hunt (I).

About 5 years ago large masses, one of them weighing more than 20 pounds, were found at Wiseman's mine, Mitchell County; usually in irregularly shaped pieces, sometimes coarsely crystallized, rarely in distinct modified rhombic prisms. The color is deep velvet black, in thin edges brown, the luster resinous, and the fracture conchoidal. Sp. gr., 5.72.

It has been analyzed by Miss Ellen H. Swallow (now Mrs. R. H. Richards) (II), J. L. Smith (III), and O. D. Allen (IV):

	I.	II.	III.	IV.
Columbic oxide	54.81	54.96	55.13	37.20
Tantallic oxide				18.60
Tungstic and stannic oxides		0.16	0.31	0.08
Uranic oxide	17.03	9.91	10.96	12.46
Ferrous oxide	14.07	14.02	11.74	10.90
Manganous oxide		0.91	1.53	0.75
Cerous oxide, etc	3.95	5.17	4.24	4.25
Yttria	11.11	12.84	14.49	14.45
Magnesia		0.52	trace	
Lime				0.55
Loss by ignition	0.24	0.66	0.72	1.12
Insoluble		1.25		
	101.21	100.40	99.12	100.36

Dr. Smith expresses his doubts about the true nature of the cerous oxide, etc., separated from the samarskite. This mineral has lately been the subject of investigation by numerous chemists, and several new elements, samarium, etc., have been discovered in it. The nature of these has not yet been sufficiently established to understand their exact relations. Samarskite has also been found in small pieces of 1 to 3 ounces at the Grassy Creek mine, Mitchell County, and in McDowell County.

A mineral associated with samarskite, and probably a product of its decomposition, has erroneously been called euxenite.

It occurs in reddish brown and hair-brown masses, translucent in thin fragments and with irregular to subconchoidal fracture, a yellowish brown streak, and a resinous to subadamantine luster. Hardness, 5.5 It has been analyzed by J. L. Smith (I) and M. H. Seaman (II):

	I.	II.
Sp. gr.	4.593 to 4.642	4.33
Columbic oxide	54.12	47.09
Stannic and tungstic oxides	0.21	0.40
Yttria	24.10	13.46
Cerous oxide		1.40
Lanthana and didymia .....	.....	4.00
Uranic oxide	9.53	15.15
Ferrous oxide	0.31	7.09
Manganous oxide	0.08	.....
Lime	5.53	1.53
Water	5.70	9.55
	99.58	99.67

RUTHERFORDITE.

In monoclinic crystals and grains of a blackish brown color and vitreo-resinous luster and conchoidal fracture. Sp. gr., 5.55-5.69.

A partial analysis by T. S. Hunt gave:

Titanic oxide	58.5
Lime	10.0
Not determined	31.5
	<hr/> 100.0

In the gravel deposits of Rutherford and Burke Counties.

These data give no clue to the identity of the mineral. It may be the same as the following.

FERGUSONITE.

Found by Hidden in July, 1879, at Mills's gold mine, Brindletown, Burke County. It occurs in small, reddish brown to brownish black, tetragonal, very acute pyramids, with basal and hemihedral planes,

generally covered with a gray crust. Also found by Hidden at the Wiseman mine, in Mitchell County, in fine crystals, but with nothing new as to form.

The Brindletown fergusonite has been analyzed by J. L. Smith (I) and J. W. Mallet (II), as follows:

	I.	II.
Sp. gr.	5.87	.....
Columbic oxide	48.12	43.78
Tantallic oxide		4.08
Stannic and tungstic oxides		0.76
Yttria	40.20	37.21
Cerous oxide		0.66
Lanthana and didymia		3.49
Uranic oxide	5.81	5.81
Ferrous oxide	2.75	1.81
Lime .....	.....	0.65
Water	1.50	1.62
	98.38	99.87

POLYCRASE.

Discovered by Hidden in decomposing granite on the Davis land, not far from the zircon mine in Henderson County. It occurs in separate crystals, associated with zircon, monazite, xenotime, cyrtolite, and magnetite. More or less altered at the surface to a mineral resembling xanthitane or gummite; color, nearly coal black; sp. gr., 4.78. A partial analysis by Mackintosh gave as follows:

Columbic oxide	} 48.97
Tantallic oxide	
Titanic oxide	
Yttria, etc	27.55
Ferric oxide	3.19
Uranic oxide	13.77
Ignition	5.18
	98.66

Additional experiments gave columbic oxide, 28.52, and titanic oxide, 20.27. The same mineral also occurs near Marietta, South Carolina, which is in the same general region.

ROGERSITE.

In white mammillary crusts and little pearly beads upon samarskite at the Wiseman mine, Mitchell County. Sp. gr., 3.313.

It has been partially analyzed by J. L. Smith, who found:

	I.	II.
Columbic oxide	18.10	20.21
Yttria, etc	60.12	.....
Water	17.41	16.34

PHOSPHATES, ARSENATES, ETC.

XENOTIME.

In minute tetragonal pyramids, in the sands from gold washings in Polk, McDowell, Burke, and Rutherford Counties. In some sands which I have received from Capt. Mills's gold mine, in Burke County, there were a few peculiar crystals of a pale grayish or yellowish white color. They were tetragonal pyramids, but were irregular and rough on the planes, and appeared to inclose some foreign substance, perhaps zircon. One had a nucleus of a greenish yellow color and resinous luster, which resembled monazite. A few tests which have been made with a fragment of a crystal, which appeared pretty uniform in composition, gave reactions resembling those of zirconia, yttria, and phosphoric acid, with a minute trace of cerous oxide.

Some very fine crystals of xenotime have also been found by Hidden at a locality about 3 miles from the Emerald mine, in Alexander County; sp. gr., 4.52. He also verifies the Brindletown mineral, and reports it from the Davis land on Green River, in Henderson County. At both the latter localities the xenotime crystals are sometimes symmetrically compounded with zircon, like the crystals from Norway described by Zschau.

APATITE.

This is rather a rare mineral in this State. I have observed it in imperfect crystals of a grayish and reddish green color in orthoclase, etc., at Ray's mine, Hurricane Mountain, Yancey County, and in small granular patches of a greenish color in granite; found 3 miles south of the Blue Ridge, 16 to 17 miles from Jefferson, on the road to Wilkesborough; found also in greenish white crystals, often inclosing quartz, sometimes from 2 to 3 inches in length and nearly 1 inch in thickness, implanted in albite, at Point Pizzle and at Cox's mine, Mitchell County, and at the Presnel and Gugenheim mines, Yancey County.

Minute crystals of apatite of highly interesting forms, with many planes, are found at the Emerald and Hiddenite mine in Alexander County; and opaque, minute, hexagonal prisms with pyramidal and basal planes are found in cavities of orthoclase, associated with the zircons of Green River, Henderson County.

Prof. W. B. Phillips has described phosphatic deposits similar to those of South Carolina, but nowhere in sufficient amount to give full assurance of economic importance, in eastern North Carolina in the counties of Duplin, Brunswick, Pender, and others. The best deposits opened occur 4 to 8 miles northeast of Magnolia, in Duplin County, where they form thin, irregular beds from 8 to 12 inches in thickness in sand deposits from 3 to 5 feet below the ground.

PYROMORPHITE.

This is one of the most beautiful minerals found in North Carolina, and formerly was quite abundant at the Silver Hill mine, which furnished very handsome specimens of hexagonal prisms and crystalline aggregations of different shades from colorless to almost black, also honey and wax yellow, green, brown, etc.; less abundant, and mostly of a yellowish green color, it is found at Silver Valley, Davidson County. In green and yellowish green crystals at the Troutman and McMakin mines, in Cabarrus County; also at the Stewart mine, in Union County, and in minute green crystals in the gold veins of the Baker and Miller mines, Caldwell County.

MONAZITE.

It is found in considerable quantities in small, brown, greenish, or yellowish brown monoclinic crystals in the gold sands of Rutherford, Polk, Alexander, Burke, and McDowell Counties; also in the neighborhood of Crowder's Mountain, Gaston County, and at Todd's Branch, in Mecklenburg County, where it occurs in association with diamond, zircon, etc.

Very fine crystals over an inch long were found by Hidden in Mitchell County. It is also found in mica-schist at the Deake mine, Mitchell County; in feldspar at Ray's mine, Yancey County, and in large cleavable masses, sometimes 3 to 4 inches across and of a yellowish brown color, from Mars Hill, Madison County.

Monazite is especially abundant in the gold sands at Brindletown, Burke County. About 15 tons of a sand containing from 60 to 92 per cent of small crystals have been found, the color varying from wax yellow to cinnamon brown; sp. gr. 5.10. Analyzed by Penfield, in triplicate, as follows:

	I.	II.	III.
Phosphoric acid.....	29.45	29.20	29.20
Cerium oxide.....	31.38	31.94	30.77
Lanthanum oxide.....	} 30.67	30.80	31.17
Didymium oxide.....			
Thorium oxide.....	6.68	6.24	6.56
Silica.....	1.40	.....	.....
Water, or loss by ignition.....	0.20	0.20	.....
	99.78	.....	.....

The thoria is due to admixed thorite. About 3 miles east of the Alexander County emerald mine some exceptionally fine crystals of monazite were found, says Hidden, associated with smoky quartz, rutile, and xenotime. They were mostly transparent, highly polished, and of a fine essonite-red color. They varied from one-fourth to one-

half an inch wide and from one-third to three-fourths of an inch long; sp. gr., 5.203. Penfield found in this monazite only 1.48 per cent of thorium.

VIVIANITE.

Found in dark bluish green, slender crystals, in a compact nodule of tertiary marl, in Edgecombe County; analyzed by W. B. Phillips, of the agricultural chemical station. It is a new and unnamed variety, resembling anglarite and ludlamite in its percentages of water (14) and iron oxide (56), but differing from both and occupying an intermediate position between them in containing equal percentages of both forms of the oxide—protoxide 28.05, sesquioxide 28.35. The normal *ferrous* oxide of vivianite is here, as usual, oxidized in part to the *ferric* form.

OLIVENITE.

Minute green crystals and brownish green, fibrous masses, associated with tetrahedrite, scorodite, etc., at George Ludwick's mine, in Cabarrus County, appear to belong to this species.

PSEUDOMALACHITE.

In reniform and fibrous masses, of a dark emerald green color, at the McGinn and Wilson mines, in Mecklenburg County; Cullen's mine, in Cabarrus County; Fisher Hill mine, in Guilford County; at Clegg's mine, in Chatham County, and about 1 mile from the Soapstone quarry, in Moore County; also at the Peach Bottom mine, in Alleghany County.

I have analyzed the pseudomalachite from the McGinn mine, which contains:

Phosphoric acid.....	24.58
Cupric oxide.....	68.60
Water	6.86
	<hr/>
	100.04

LAZULITE.

In dark blue crystals and crystalline masses, in quartz, and associated with cyanite and muscovite at Crowder's and Clubb's Mountains, in Gaston County; also in quartz, and with very little muscovite, at Coffee Gap, in the Sauratown Mountains, Stokes County. That from Clubb's Mountain has been analyzed by Smith and Brush, who found in two analyses:

	I.	II.
Sp. gr.....	3.122	.....
Phosphoric acid	43.18	44.15
Alumina	31.22	32.17
Ferrous oxide.....	8.29	8.05
Magnesia	10.06	10.02
Water	5.68	5.50
Silica	1.07	1.07
	<hr/>	<hr/>
	99.70	100.96

SCORODITE.

In small, leek green and yellowish green crystals, associated with tetrahedrite, quartz, etc., at George Ludwick's mine, in Cabarrus County. It is found in finely granular masses of a brownish or yellowish green color, associated with leucopyrite, from the oxidation of which it is formed, at Drum's farm on the White Plains, Alexander County, and at Dr. Halyburton's, in Iredell County.

WAVELLITE.

Globular and hemispherical aggregations of white and grayish white wavellite, associated with silver, galenite, pyrite, etc., are rarely met with at Silver Hill, Davidson County.

PHARMACOSIDERITE.

Exceedingly minute crystals of this mineral, of a brownish green color, are associated with the scorodite of George Ludwick's mine, Cabarrus County.

DUFRENITE.

It is rarely met with in grayish green tufts of silky luster with the so-called "black band" iron at Egypt, Chatham County.

PHOSPHURANYLITE.

In microscopic rectangular pearly scales or in pulverulent incrustations upon quartz, muscovite, and feldspar. Deep lemon yellow in color.

I have made an analysis of a specimen, which appears to have been slightly contaminated with cerussite, and found the composition, after deducting the plumbic oxide, as follows :

Uranic oxide.....	76.71
Phosphoric acid.....	12.08
Water	11.21

Associated with autunite and other uranium minerals at the Flat Rock mine and Buchanan mine, Mitchell County.

AUTUNITE.

In beautiful nearly square scales or small crystals of a greenish, yellow or yellowish green color, upon quartz and feldspar at the Flat Rock and other mines, Mitchell County. Hidden also reports it from Alexander County.

NITER.

Crystalline crusts on mica slate at Nantahaleh River, in Cherokee County.

TUNGSTATES, MOLYBDATES, ETC.

WOLFRAMITE.

In laminated masses with cuproscheelite and scheelite at the Cosby mine, and with barite at the Flowe mine, both in Cabarrus County; also, according to Gen. Clingman, frequently in Rutherford and Burke Counties.

I have made an analysis of the wolfram, which forms the nuclei in the rhombic tungstate of lime and found:

Ferrous oxide.....	19.80
Manganous oxide	5.35
Lime	0.32
Stannic oxide	trace
Tungstic oxide.....	75.79
	<hr/>
	101.26

Sp. gr., 7.496.

RHOMBIC TUNGSTATE OF LIME.

Associated with wolframite, in barite, at the Flowe mine, in Cabarrus County, in small crystals and laminated masses of a yellowish and grayish color, which frequently contain a nucleus of wolfram.

SCHEELITE.

Orange-colored tetragonal pyramids are found at the Flowe mine; yellowish brown and grayish imperfect crystalline masses at the Cosby mine; also at Cullen's mine, Cabarrus County, in rounded granular patches of a grayish-yellow color, with auriferous pyrite in quartz. I have analyzed the latter and found them composed of:

Stannic oxide	0.13
Tungstic oxide	79.52
Cupric oxide.....	0.08
Ferric oxide.....	0.18
Lime	19.13
	<hr/>
	99.22

CUPROSHEELITE.

In yellowish green and siskin green pulverulent coatings upon scheelite at the Cosby mine, Cabarrus County.

STOLZITE.

A few small tetragonal pyramids of a bluish gray, and one small, somewhat barrel-shaped crystal of a grayish yellow color of this very rare mineral have been found in a lump of quartz, associated with sphalerite, at Silver Hill, Davidson County.

SULPHATES, CHROMATES, ETC.

BARITE.

In small white tabular crystals, with pyromorphite and manganese ores at the McMakin mine, Phoenix mine, and White's mine, Cabarrus County. The laminated and coarsely granular white variety at the Flowemine and Orchard vein, in Cabarrus County; a vein of the coarsely laminated, grayish white barite, at the Latta mine, near Hillsboro', Orange County. It occurs coarsely granular, and has the appearance of white marble, at Col. Walkup's, Union County. A vein of very white compact and granular barite of from 7 to 8 feet in width has been found at Crowder's Mountain, Gaston County; west of the Blue Ridge, a vein of 8 feet in width exists at Chandler's, 9 miles below Marshall, in Madison County, where it is white and grayish white in color, and of a granular structure, containing small patches of laminated barite; also on Elkin Creek, in Wilkes County.

ANGLESITE.

In small, tabular, rhombic prisms, with very few additional planes, in the brown, granular zincblende of Silver Hill, Davidson County; also, according to Gen. Clingman, at the Baker mine, in Caldwell County.

CROCOITE.

I have observed this rare mineral associated with gold and small quantities of galenite in small cavities of saccharoidal quartz from Nash County, in very minute, dark hyacinth red crystals.

MELANTERITE.

As the result of the decomposition of pyrite, disseminated through many of the mica slates, etc., of Rutherford, Cleveland, and other counties, melanterite or copperas is formed, but no good crystallized specimens have come to my notice.

GOSLARITE.

In the water of the Silver Hill mine; also in fine, fibrous, crystalline masses upon sphalerite, formerly at the McMakin mine, Cabarrus County.

CHALCANTHITE.

Very fine crystals, with granular and fibrous crystalline masses of sulphate of copper, were formerly obtained from the upper works of the Silver Hill mine, Davidson County, principally at the 60-foot level.

ALUNOGEN.

I have once seen a beautiful specimen of fibrous, silky alunogen from the western counties, but could not learn the exact locality from which it came. It is found abundantly associated with melanterite, in Rutherford, Cleveland, and other counties, but not in good specimens; also in Iredell and Catawba Counties.

MISY.

This mineral has been observed in association with galenite and pyrite, in pulverulent greenish yellow masses, at Flint Knob, Wilkes County.

MONTANITE.

This very rare tellurate of bismuth has been found with tetradymite at David Beck's mine in Davidson County, and at Captain Mills's, in Burke County. The yellow "oxide of bismuth," observed by Dr. Asbury at the Asbury vein, in Gaston County, may belong to this species.

An analysis which I have made of that from Davidson County gave:

Ferrie oxide	1.26
Cupric oxide	1.04
Bismuthic oxide	68.78
Telluric acid	25.45
Water	3.47
	<hr/>
	100.00

CARBONATES.

CALCITE.

Perfect crystals are found at Whiteville, Columbus County, in marl, in the Clegg mine, Chatham County, and at the Emerald and Hiddenite mine, in Alexander County. It occurs coarsely granular in a vein at Hoover's mine, about 6 miles from Silver Hill; at Moore's mine, 10 miles southeast of Lexington; in Ore Knob mine, Ashe County; and rarely at Silver Hill, in Davidson County, and the Steele mine, Montgomery County. Small quantities of granular calcite were found in digging a well at Morrisville, Wake County. The granular varieties, which constitute marble, are sometimes found associated with the compact varieties of limestone in the band which passes through North Carolina, from Stokes County through Catawba, Lincoln, and Gaston Counties; as, for instance, at the quarries of Martin on Snow Creek; of Bolejack, near Germanton, in Stokes County; Pfaff in Forsyth; Hooper, in Catawba; and Stowe, in Lincoln County, and in the Eocene limestone of New Hanover County. A coarse, granular limestone occurs also at Goshen and at Haskett's, on Ellijay Creek, Macon County, and on Cullowhee Creek, Jackson County, again on Bear Creek and Walnut Creek and at Marshall, in Madison County. A veined gray

and white marble is found at Powell's quarry, near Catawba station, Catawba County. Very beautiful varieties of white, pink, and gray marble are found abundantly at the Nantahaleh River, Marble Creek, Valley River, and other places in Cherokee County. A band of compact limestone, sometimes finely granular, is found in Turkey Cove and Cedar Cove and on Linnville Mountain and Graveyard Mountain, in McDowell County; also in Jackson, Transylvania, and Henderson Counties, and at Warm Springs and on Shut In Creek and Laurel River, Madison County. It is also found in small seams and crystalline grains, replacing in part the orthoclase of a massive granite gneiss in Harnett County.

DOLOMITE.

Dolomite of a grayish white color, resembling marble, is found on Valley River, 10 miles from Murphy, Cherokee County; and in magnificent rhombohedral crystals, often coated with hisingerite, at the Emerald and Hiddenite mine in Alexander County.

MAGNESITE.

The lamellar white and grayish variety, from which distinct cleavage crystals can be obtained, is found at McMakin's mine, Cabarrus County; also, with chrysolite at Webster, Jackson County, and Hampton's, Mining Creek, Yancey County. At the latter locality are also found the white compact, and at Webster the white earthy and pulverulent varieties. Breunnerite occurs in serpentine, 4 miles south of Morganton, Burke County, and near Dobson, Surry County.

SIDERITE.

In fine rhombohedral crystals at the Emerald and Hiddenite mine, and also formerly at the McCulloch, the North Carolina, and several other mines in Guilford County, where it occurred in considerable masses in the vein. In the same manner it is of frequent occurrence in many of the gold veins of the State, especially in those which carry copper. It often forms almost the whole mass of the veins, frequently, however, decomposed into limonite, which still retains its rhombohedral form; for instance, at Conrad Hill in Davidson County, in Gaston County, at some of the mines in Randolph County, and at the Cosby mine in Cabarrus county. In smaller quantities it has been observed in Stokes County and in some of the mines in Mecklenburg and Alexander Counties. A white cleavable variety occurs at the Rudisill mine, near Charlotte. The earthy and argillaceous varieties of siderite form large beds in the Triassic coal strata and constitute the so-called black band or ball ore at Farmville, Egypt, the Gulf, etc., in Chatham County. It is also found in compact, grayish brown nodules in Halifax and Granville Counties.

RHODOCHROSITE.

In small globular pink and rose-red concretions, with earthy manganese, near Franklin, in Macon County; also mixed with magnesite, talc, etc., in compact and granular masses, at the McMakin mine, Cabarrus County.

CERUSSITE.

The most beautiful crystallizations, single individuals as well as twins, were found at Silver Hill, immediately after the discovery of of the mine; also white, yellowish, and greenish white, compact varieties, frequently highly argentiferous. A very interesting occurrence at the same mine is cerussite, pseudomorphous after pyrite. Yellowish white columnar cerussite occurs in Gaston County. Rhombic prisms with pyramidal planes, together with imperfect crystallizations and earthy masses, are found at Clegg's mine, Chatham County. At Elk Creek, in Wilkes County, earthy cerussite has been observed coating galenite. It is also found at Baker mine in Caldwell County, and at Murphy, Cherokee County.

MALACHITE.

Malachite, in its varieties, fibrous, compact, and earthy, being the result of the decomposition of other copper ores, is found in association with the latter in almost every copper mine in the State. The Guilford, Cabarrus, and Mecklenburg County copper mines contain it. I have observed the fibrous variety at Silver Hill and Conrad Hill, in Davidson County; the Gillis mine, in Person County; the Cheek mine, in Moore County, and both the fibrous and earthy malachite at Clegg's mine, in Chatham County. It has been found in the Brushy Mountains, Alexander County; the Peach Bottom mine, Alleghany County; the Ore Knob mine, in Ashe County; the Gap Creek mine, in Watauga County; the Cullowhee, Savannah, and Waryhut mines, in Jackson County; near Sassafras Fork, in Granville County, and at many other localities too numerous to be mentioned. Pseudomorphs of malachite, after cubical cuprite, have been found at Cullen's mine, Cabarrus County.

AZURITE.

This variety of carbonate of copper is far less frequently met with. Small but very beautiful and perfect crystals are found at Clegg's mine and at Snipes's (iron) mine, in Chatham County, and at the Cheek mine, in Moore County. It is rare at the Cullen and Boger mine in Cabarrus County, the Wilson mine in Mecklenburg County, and at Wells's, Gaston County.

BISMUTITE.

In yellowish white concretions, often of a pearly luster, or white incrustations upon gold-bearing quartz, at the Asbury mine, in Gaston County, where it was discovered by Dr. Asbury.

Bismutite has also been found in a narrow vein in Casher Valley, Jackson County, in small masses, the largest of the size of a pigeon's egg, of a light apple-green or dark gray, through yellow to light gray masses which are chalky white in the amorphous parts. Laminated, sometimes almost columnar. Sp. gr., 7.4 to 7.5. The analyses by Dr. A. H. Chester gave:

	I.	II (the pure).
Bismuthic oxide	86.36	89.80
Carbonic dioxide	7.79	8.10
Water	2.02	2.10
Insoluble	3.6	.....
	99.80	100.00

Quite recently (January, 1888) I have received the same mineral from Rev. C. D. Smith, from Highlands, Macon County, where it occurs in amorphous, grayish white masses, associated with beryl, muscovite, etc.

MINERAL COAL.

ANTHRACITE.

A very interesting occurrence of anthracite is that of masses with conchoidal fracture in the vein rock at the Clegg mine in Chatham County. The bituminous coal, both of the Deep and Dan Rivers, is frequently, especially near trap dikes, almost deprived of its hydrocarbons, often approaching true anthracite,

BITUMINOUS COAL.

The greater portion of the coal in the Deep River beds is bituminous coal, the volatile matter varying from about 8 to 32 per cent. The Dan River coal, which I had opportunity to examine, is so-called semi-bituminous coal, that from near Stokesburg, Stokes County, containing about 10 per cent of volatile matter.

LIGNITE OR BROWN COAL.

Frequently met with in the marl beds of the eastern counties, and in the Trias of Granville County, on Tar River, and on Brown's Creek, Anson County.

ORGANIC COMPOUNDS.

SUCCINITE (AMBER).

Found in lumps of several ounces weight in Pitt County and elsewhere, in the Tertiary marl beds of the eastern counties.

SYNOPSIS OF MINERALS AND MINERAL LOCALITIES, BY COUNTIES.

ALAMANCE.

Graham.—McAden mine: Gold; pyrite; actinolite.

Newlin's.—Gold; pyrite; chalcopyrite.

Holt mine.—Gold; also at Anthony mine.

Dixon's mine.—Gold on both sides of Haw River, in placers; Boyd mine, in placers.

Cane Creek Mountains.—Gold; epidote; chalcedony; magnetite.

Near Cane Creek Factory.—Pyrophyllite; halloysite.

ALEXANDER.

White Plains.—Scorodite; columbite; tourmaline (Lackey's and Price's); beryl (at Warren's, Lackey's, and Price's); rose quartz; smoky quartz, also near Taylorsville; rutile in geniculated crystals, and acicular crystals in limonite and in quartz; the latter also near Poplar Springs; spodumene, in emerald and yellowish green crystals (hiddenite), in Sharpe's township.

Barrett Mountain.—Graphite.

Price and Kever place.—Beryl; tourmaline; columbite; autunite; muscovite.

Lead mine.—Amethyst.

Roseman's farm.—Milky quartz.

Little River.—Tourmaline.

Hiddenite Post-office.—(The Emerald and Hiddenite mine)—Emerald (!); beryl (!); monazite in fine crystals (!); spodumene, transparent, green, and yellowish crystals (!); apatite; calcite; dolomite (!); siderite; rutile (!); muscovite (!); hisingerite; tourmaline.

Taylorsville.—Three miles distant, smoky quartz; rock crystal; tourmaline; beryl.

Headwaters of Snow Creek.—Foliated talc; hematite.

Bend of Catawba River.—Pyrope garnets.

Marshall's farm.—Garnets.

Brushy Mountains.—Malachite; chalcopyrite; graphite; asbestos; tabular quartz.

Elsewhere.—Green, brown, and black tourmaline; graphite; magnetite; tantalite; beryl, yellow, blue, green; quartz crystals with basal

plane, also with other singular modifications, also smoky, yellow, and milky; monazite, var. turnerite; asbestos; pyrite; magnetite; chalcopyrite; pyrolusite; limonite, pseudomorphous after siderite; siderite; kaolinite; orthoclase, large crystals (one of 40 pounds); biotite; muscovite; rutile, very fine at Milholland's mill and at Robt. Johnson's; tourmaline at B. Lyon's, with unusual terminal angles (Hidden).

ALLEGHANY.

Peach Bottom mine.—Pyrite; chalcopyrite; malachite; galenite; cuprite; sphalerite; molybdenite.

Roaring Gap.—At H. Harris's, chalcopyrite (auriferous); bornite.

T. Bryan's.—Pyrite.

Bullhead Mountain.—Cyanite; magnetite; garnet.

Elsewhere.—Graphite; chrysolite; gold, in placers; martite; pyrite; calcite; zoisite; smoky quartz.

ANSON.

Boggan's Out.—Calcite; serpentine; rock crystal and cellular quartz; lignite.

Mill Creek.—Muscovite.

Peedee Station.—Orthoclase.

Farm of T. J. Pack.—Siderite; chalcopyrite; quartz.

Wadesboro'.—Two miles south, gold in vein.

Elsewhere.—Quartz crystals of considerable size, at several points.

ASHE.

Blue Ridge, south of Jefferson.—Muscovite; black tourmaline.

Horse Creek.—At Hampton's: epidote; magnetite; manganese garnet. At Graybill's: magnetite; epidote.

Helton Creek, near mouth.—Magnetite at Ballou's.

Ore Knob mine.—Pyrite; calcite; chalcocite; arsenopyrite; malachite; metallic copper.

Jefferson.—Chalcopyrite, 2, 3, and 6 miles distant, and at Mulatto Mountain; graphite in gneiss; chlorite at Willis's mine; hyalite at Foster's mica mine; muscovite, beryl, and garnet at Little Phoenix mica mine; kaolin; tourmaline, 7 to 8 miles southeast; chrysolite, 6 miles east on New River.

Three Top Mountain.—Tremolite.

New River (South Fork, near mouth).—Chrysolite; chalcopyrite, magnetite.

Gap Creek (Copper Knob mine).—Gold; silver; hematite; epidote; bornite; chalcocite; chalcopyrite; chrysocolla; malachite. On Gap Creek: cyanite; hornblende.

Shady Spring.—Asbestos.

Elk Knob.—Chalcopyrite; epidote.

Phoenix Mountain.—Rock crystal (!).

Witherspoon mine.—Asbestiform actinolite.

Elsewhere.—Azurite; cuprite; actinolite; talc; chlorite; asbestos; graphite.

BEAUFORT.

Siderite, in nodules; calcite in marl beds, and in the Eocene (bottom of Pamlico River, and on Blount's farm); pyrite.

BERTIE.

Calcite, in marl beds.

BLADEN.

Calcite, in marl beds.

BRUNSWICK.

Calcite, in marl beds; glauconite, in green sand; phosphatic nodules.

BUNCOMBE.

Asheville.—Meteoric iron (!); garnet; magnetite, at L. W. Sams's; ferrous chloride (!), in the meteorite; ochreous hematite; hornstone; serpentine; barite (!), granular, on Fox Branch, 10 miles below Asheville; on road to Burnsville, 14 miles north, chrysolite; 17½ miles north, hornblende; 19 to 20 miles north, pyrrhotite; magnetite; hematite; corundum with hornblende and calsageeite; serpentine; prochlorite; asbestos; actinolite; kaolin; jefferisite.

Big Ivy.—Genthite, with chrysolite.

Black Mountain.—Almandite garnet; cyanite at Bowlen's Pyramid.

Flat Creek.—Foliated graphite in gneiss.

New Found Mountains.—Biotite.

Balsam Gap mine.—Allanite (!); beryl; muscovite; biotite; albite; black garnet; columbite; tourmaline.

Cane Creek.—Calcite; gold; hematite; limonite.

Ivy River.—Chrysolite; chromite; hornstone; genthite; talc; asbestos; tremolite.

Brushy Mountain mine.—Muscovite; kaolinite; orthoclase; albite.

Ream's Creek.—Garnet, large crystals.

Burnet mine.—Muscovite; orthoclase crystals, large (100 to 1,000 pounds).

N. P. Watkins's.—Corundum; cyanite; muscovite; tourmaline; garnet.

French Broad River.—Six miles north of Asheville, meteoric iron (!).

Hominy Creek.—Biotite.

Pisgah Mountain.—Ten miles southwest of Asheville, meteoric iron (!).

Turkey Creek.—Limonite; magnetite; chlorite; talc.

Swannanoa Gap.—Corundum in cyanite (!); muscovite; 2 miles southwest from gap, limonite; hornblende, one-quarter mile northwest; tourmaline, one-quarter mile west.

Swannanoa River.—Near Asheville, meteoric iron (!) with troilite; actinolite; black hornblende; beryl; 7 miles above Asheville, hematite; 9 miles east of Asheville, serpentine.

George Alexander's.—At mica mine: beryl; muscovite; kaolinite.

Elsewhere.—Gold; tourmaline; massive, 6 miles south of Asheville and on French Broad, near Buck Shoal; garnet; hematite; galenite, at L. Fortune's; muscovite in many mica mines; beryl, blue; talc; columbite; garnet; menaccanite; bed of limonite, at Blackwell's, 12 miles west of Asheville; chrysolite; graphite.

BURKE.

Brindletown.—At Mills's gold mine, crystallized gold; tetradymite; montanite; brookite; anatase; rutile; zircon; malacon; cyrtolite; monazite; xenotime; samarskite; columbite; fergusonite; hydrofergusonite; adelpholite (?); menaccanite; hematite; magnetite; chromite; limonite; pyrite; titanite; cyanite; fibrolite; corundum; muscovite; vermiculite; enstatite; hornblende, green and black; steatite; tourmaline, green and black; orthoclase; albite; zoisite (?); garnet; actinolite; beryl; talc; asbestos; quartz, clear, smoky, and amethystine; psilomelane; arsenopyrite (?); allanite; thorite; diamond. (This list is furnished by W. E. Hidden, and includes all discoveries to the close of 1889.)

Bear's Knob.—Corundum with muscovite, 4 miles southeast.

Brown Mountain.—Platinum, on Gen. Hoke's farm; fluorite; limonite; magnetite; albite; kaolinite; gold, in placers.

Linnville Mountain.—Menaccanite; hematite; itacolumite (!); radiated pyrophyllite; limonite; graphite; meteoric iron.

Bridgewater.—Manganese garnet; gold.

Morganton.—Lead, 4 miles north; graphite, at Morganton and 6 miles south; corundum altered to muscovite; quartz crystals; titanite at Morganton Springs; pyrite; garnet; magnetite; chlorite (?).

Pax Hill.—Gold (!); galenite.

Scott's Hill.—Gold; silver; cerargyrite; psilomelane; zircon; pyrite.

Shoup's Ford.—Beryl; garnet; corundum, in part altered to fibrolite (!); gold; magnetite; menaccanite; cyanite; tourmaline.

South Mountains.—Quartz crystals, inclosing liquid (!); garnet in trapezohedral crystals (!); granular hornblende; graphite, 8 miles southeast of Morganton; at Col. Gaither's 12 miles south of Morganton, gold in veins and placers; beryl (!), yellowish green and deep green (aquamarine), 9 miles southeast of Morganton; tourmaline (!), 16 miles southeast of Morganton; 4 to 6 miles south of Morganton, serpentine; talc; chlorite; actinolite; hematite; magnetite; asbestos; magnesite; breunnerite; chrysolite; garnet; tremolite; corundum, on lands of North Carolina State Company; arsenopyrite.

Piedmont Springs.—Four miles west, tourmaline.

Glen Alpine Springs.—Talc.

White's Knob.—One mile south, yellow ocher.

Sugar Mountains.—Quartz crystals, with double terminations, etc.; asbestos; gold; rutile; magnetite; beryl.

R. Havenar's farm.—Tourmaline; muscovite.

J. Huffman's farm.—Beryl; epidote; actinolite.

Laurel road.—Nine miles from Morganton; garnets, large.

J. London's farm.—Epidote; garnet; pyrite; gold.

Tate's farm.—Gold in placers.

G. Deitz's farm.—Beryl; tourmaline; albite; sagenite.

Hildebrand's farm.—Sagenite; beryl; asbestos; rutile.

Van Horn's farm.—Quartz crystals, inclosing fluid; quartz crystals, with basal plane; quartz crystals, smoky; sagenite; garnet.

(The last eight localities are furnished by Humphreys.)

Elsewhere.—In the gold gravel and sands of the county occur gold; palladium (?); corundum; menaccanite; chromite; rutile; anatase; brookite (!); pyrope; zircon (!); epidote; tourmaline, black and green; fibrolite; xenotime (!); monazite (!); wolframite (?); limonite; magnetite; hematite.

CABAREUS.

Gold in many veins and placers; meteoric stone; sulphur; chalcopryrite; magnetite; limonite.

Daniel Barnhardt's farm.—Barnhardtite.

Barringer's mine.—Gold; arsenopyrite.

Boger's mine.—Tetradymite (!); chalcopryrite; azurite.

Concord.—Rose quartz; hyalite; agate (also at Harrisburg); chalcopryrite; malachite; gold; bornite; asbestos, in rose quartz; tourmaline; magnetite; galenite.

Cosby's mine.—Stilpnomelane (?); wolframite; scheelite (!); cuproscheelite; siderite; barite.

Cullen's mine.—Tetradymite (!); cuprite in cubes (!); pseudomalachite; scheelite (!); malachite, in part pseudomorphous after cuprite (!); azurite.

Flowe's mine.—Wolframite (!); rhombic tungstate of lime (!); scheelite (!); barite.

Near Gold Hill.—Manganese garnet; magnetite.

House's mill.—Hematite.

George Ludwick's mine.—Gold; arsenopyrite (!); tetrahedrite (!); scorodite (!); pharmacosiderite; olivenite; pyrite; chalcopryrite.

McMakin's mine.—Silver; argentite; galenite; sphalerite; proustite (?); tetrahedrite, var. freibergite (!); pyrolusite; pyromorphite; barite; goslarite; rhodochrosite; magnesite; calcite; wad; barite; talc.

Harrisburg.—Quartz crystals; agate.

Phœnix mine.—Gold; tetradymite (!); in Orchard vein, barite; pyrite; chalcopyrite.

Love mine, North Barrier, Furness, Elwood, and No. 3, a group of mines around Phœnix.—Gold; pyrite; chalcopyrite.

Long's mine.—Gold; pyrite; chalcopyrite; galenite.

Crowell's mine.—Gold; pyrite; galenite.

Newell mine.—Gold; pyrite; chalcopyrite.

Pharr mine.—Gold, in veins and placers; pyrite; chalcopyrite.

Fisher mine.—Near Concord: gold; pyrite; chalcopyrite.

Blackwelder mine.—Gold.

Barrier mines.—North, Middle and South Barrier: Gold; pyrite.

California mine.—Gold; pyrite.

Pioneer mills.—Molybdenite; chalcocite; chalcopyrite; barnhardtite; molybdenite; chrysocolla.

Reed's mine.—Gold (!!).

Troutman's mine.—Sphalerite; pyromorphite.

Union mine.—Copper in arborescent crystals (!) and plates; chalcocite; chalcopyrite; cuprite (!), in octahedra; malachite, fibrous.

White's mine.—Chalcopyrite; aikinite (?).

Elsewhere.—Gold; pyrite; agate; barite; galenite; sphalerite; magnetite; steatite.

CALDWELL.

Baker's mine.—Galenite; serpentine; picrolite; chrysotile (!); chrysotile; pyromorphite; anglesite; cerussite; asbestos; marmolite; psilomelane; chromite.

Buffalo River.—At Patterson's mill: pyrite in quartz.

Lenoir.—Magnetite; native sulphur in quartz (!); psilomelane, 4 miles west; asbestos, 6 miles east; hornblende, 6 miles west; amianthus, 15 miles northwest.

King's Creek.—Asbestos; anthophyllite; steatite.

Puett's.—Kaolinite.

Little John mine.—Gold (!); galenite; graphite.

Miller's mine.—Gold; galenite; pyromorphite.

Fort Defiance.—Tourmaline; beryl; graphite; garnet.

Patterson.—Magnetite; hematite; menaccanite; compact serpentine.

Wilson's Creek, near mouth.—Serpentine; talc.

Upper Creek.—Gold; tourmaline; limonite.

Near Grandmother Mountain.—Gold in placers; pyrite; quartz.

Tuttle's mine.—Gold in placers.

Richlands.—Magnetite; hematite; chlorite; serpentine; talc; martite.

Middle Little River.—Limonite; paragonite (?); muscovite; hematite.

Lower Creek.—Gold, in the gravel of most of its tributaries below Lenoir.

Elsewhere.—Gold, in placers and veins; sulphur; cuprite; pyrite; quartz crystals; epidote; muscovite; orthoclase; cyanite; malachite;

tourmaline; paragonite (?), common in schists; muscovite; hematite; limonite; chlorite; tremolite.

CAMDEN.

Calcite in marl beds.

CARTERET.

Calcite in marl beds.

CASWELL.

Meteoric iron (!); garnet; magnetite; pyrite.

Leasburg.—Albite (?), 3 miles west of Leasburg; fibrous tourmaline (!); chlorite; epidote.

CATAWBA.

Ball Creek mine.—Magnetite; kaolinite.

Roberson mine.—Magnetite.

Abernathy mine.—Magnetite.

Littlejohn's mine.—Limonite; hematite.

Hickory.—Graphite, crystallized; pyrite (!); alunogen; wad; amphibole; hematite; pyrolusite; limonite; quartz crystals; amethyst (!); garnet (!); muscovite; pyrrhotite; magnetite; chalcopyrite; calcite and pyrrhotite near Hickory; graphite, 2 miles southwest.

Hooper's quarry.—Granular calcite; pyrite; gold; graphite; tremolite.

Newton.—Kaolin; magnetite, at the Barringer mines; pyrite; tabular quartz, 6 miles west and 10 miles northeast of Newton.

Keever'sville.—Quartz crystals; muscovite.

Ramscur's.—Muscovite.

Powell's quarry.—Calcite, granular (!); pyrite.

Shuford's mine.—Gold; pyrite.

Shuford's quarry.—Calcite; magnetite; rose quartz; amethyst.

South Mountains.—Graphite; cyanite; garnet.

Anderson's Mountain.—Magnetite; calcite; at Avery Shuford's, actinolite.

Forney's mine.—Magnetite.

Beard's mine.—Magnetite.

Powell's factory.—Manganese garnet.

Elsewhere.—Gold, in placers and veins; graphite; rutile, in acicular crystals in amethyst (!); rock crystal (!); quartz crystals inclosing liquid (!); beryl (!); garnet (!); cyanite; kaolinite; alunogen; wad; rutile in quartz (sagenite), at D. Lutz's; beryl; paragonite (?), common in the schistose rocks.

E. Balch's farm.—Muscovite; garnets; amethyst; smoky quartz crystals containing liquid; crystals of quartz with basal plane; graphite; black and brown tourmaline; rutile (acicular); beryl (blue, green, yellow); feldspar.

H. Balch's farm.—Liquid-bearing quartz crystals ; gold ; sagenite.

Widow Balch's farm.—Sagenite ; liquid-bearing quartz crystals, with basal plane ; tourmaline ; rose quartz.

Rev. Huffman's farm.—Tessellated quartz crystals ; same, liquid bearing ; menaccanite ; sagenite.

Spencer's farm.—Quartz crystals doubly terminated ; same, liquid-bearing ; same, inclosing mica ; same, with asbestos ; same, with pyrite ; rutile in quartz crystals ; amethyst ; cyanite ; tourmaline ; magnetite.

Near Canova.—Smoky quartz crystals, large ; crystals of amethyst, doubly terminated, inclosing rutile (yellow).

CHATHAM.

Buckhorn.—Hematite, foliated, granular, and micaceous ; magnetite ; rutile in quartz ; manganese garnet ; muscovite ; psilomelane ; limonite ; epidote.

Carbonton.—Pyrophyllite slate (!)

Olegg's mine.—Galenite ; bornite ; chalcopyrite ; pyrite in cubo-octahedra ; cuprite ; chrysocolla ; pseudomalachite (!) ; cerussite (!) ; malachite (!), fibrous and earthy ; azurite ; anthracite ; calcite ; galenite ; prochlorite (?).

Deep River.—Pyrophyllite slate (!) ; anthracite ; bituminous coal.

Egypt.—Siderite (black band and ball ore) ; dufrénite (!)

Evans's mine.—Hematite ; chloritoid in pyrophyllite slate.

Unthank's mine.—Magnetite.

Farmville.—Siderite (!) (black band and ball ore) ; bituminous coal.

Gulf.—Siderite (black band and ball ore) ; bituminous coal ; limonite.

Lockville.—One-half mile above Lockville, hornstone ; 7 miles west of Lockville, foliated and micaceous hematite ; 6 miles southeast of Lockville, fine granular and compact hematite ; 4 miles southeast, garnet.

Kelly's ore bed.—Hematite (!)

Glass's mine.—Magnetite.

Pittsboro.—One-half mile west, kaolin ; 6 miles south, on Rock Creek, chalcopyrite (!) ; at Gum Spring, limonite, pseudomorphous after pyrite ; 7 miles west, kaolin ; 10 miles southwest, micaceous hematite ; 16 miles west (R. J. Powell's), hematite ; magnetite.

Fearrington's mill.—Three miles west, hematite.

Lindley's mine.—Gold ; pyrite ; chalcopyrite.

Harper's Cross-Roads.—Kaolin.

Healy's Bridge.—One mile east, wad.

Ore Hill.—Hematite, compact, foliated, and micaceous ; limonite (!) ; magnetite.

Cane Creek.—Gold, in veins ; pyrite.

William's mine.—Galenite ; chalcopyrite.

Battle's Dam.—Rose quartz ; hematite ; garnet ; psilomelane.

Snipes's mine.—Magnetite; epidote; chrysocolla; azurite.

Danelly's Creek.—Gold; pyrite; chlorite.

Elsewhere.—Gold, in placers and veins; chalcopyrite, mouth of Rocky River; pinite; halite in brine; amethyst; kaolin; halloysite.

CHEROKEE.

Hanging Dog Creek.—Tourmaline; limonite; staurolite.

Marble Creek.—Tremolite; talc; calcite, (granular), white, pink, gray (!).

Murphy.—Galenite; pyrolusite; limonite (!); wad; tremolite; talc (!); cerussite; at Number Six mine, calcite; tremolite; gold; galenite (argentiferous).

Nantehaleh River.—Niter in slates; calcite (!), granular, white, and pink; talc, massive white.

Parker mine.—Staurolite (!); gold; garnet.

Peachtree Creek.—Hematite; garnet; biotite; limonite; asbestos; red ocher; talc.

Valley River.—Hematite; phlogopite; talc; calcite (granular); dolomite; yellow ocher; limonite; gold, in placers; staurolite; corundum in cyanite, half way between Murphy and Valletown.

Brasstown Creek.—Gold in veins and placers; calcite; limonite.

Notteley River.—Limonite; calcite; talc; staurolite; garnet.

Valletown.—Rutile; at Whittaker's, brown ocher.

Number Six mine.—Tremolite; calcite.

Beaverdam Creek.—Smoky quartz (at mouth of Creek).

Elsewhere.—Gold in placers; cyanite, more or less altered to muscovite; staurolite (!); pseudomorphs of muscovite after staurolite. The staurolite localities are 11½, 15½, and 17 miles west of Murphy, and 11 miles from Ducktown, on the Morganton road.

CHOWAN.

Calcite, in marl beds.

CLAY.

Cullakenee mine, Buck Creek.—Corundum (!), white, gray, pink, and ruby, frequently altered into other minerals; spinel (!), rare; chromite (!) drusy quartz; black hornblende or arfvedsonite (!); smaragdite; chrysolite (!); zoisite (!); andesite (!); labradorite (!); orthoclase (!) tourmaline; serpentine, massive and variety picrolite (!); willcoxite; margarite (!!); talc; albite; cyanite; enstatite; augite (?); prochlorite.

Brasstown.—Micaceous hematite.

Shooting Creek.—Corundum (!); pseudomorphous quartz after feldspar (?); actinolite; chrysolite; talc; prochlorite; willcoxite (!); margarite; rock crystal; magnetite; cyanite; muscovite; gold in placers; rutile in black crystals; garnet; pyrite; chalcopyrite; micaceous hematite; limonite; prochlorite (?).

Tusquittah Creek.—Gold in placers and veins; staurolite; rutile.

Tipton's.—Corundum; cyanite (green); muscovite.

CLEVELAND.

Whiteside mine.—Gold in placers.

Mountain mine.—Rock crystal (!); tourmaline (!); garnets; gold in placers; graphite; arsenopyrite; galenite; muscovite (!); melanterite; alunogen; pyrite, abundant in gneiss and mica schists; tourmaline.

Cleveland Mills.—Two miles distant, limonite.

Shelby.—Within a few miles, muscovite in large plates; magnetite; actinolite; tourmaline.

Double Shoals.—Arsenopyrite.

COLUMBUS.

Calcite, in marl beds; near Whiteville, in crystals.

GRAVEN.

Calcite, in marl beds; glauconite, in greensand.

CUMBERLAND.

Petrified wood, Fayetteville; calcite, in marl bed; lignite, limonite.

CURRITUCK.

Calcite, in marl beds.

DARE—(None.)

DAVIDSON.

Cid mine.—Chalcocite.

David Beck's mine.—Tetradymite (!); montanite (!).

Boss's mine.—Galenite, coarse grained.

Conrad Hill.—Chalcopyrite; hematite; limonite; siderite; malachite; barite.

Allen mine.—Gold; pyrite; chalcopyrite; arsenopyrite; tetradymite.

Emmons's mine.—Chalcopyrite; pyrite.

Loftin mine.—Chalcopyrite; pyrite.

Miller's mine.—Sphalerite; chalcopyrite.

Harris's mine.—Gold; pyrite; chalcopyrite.

Moore's mine.—Galenite; pyrite; calcite.

Silver Hill.—Silver (!); argentite; highly argentiferous galenite (!); sphalerite (!); chalcocite; pyrite; chalcopyrite; cuprite; melaconite; zoisite (?); orthoclase (!); calamine; pyromorphite (!); green, yellow, brown, black, and colorless; wavellite (!); stolzite (!); anglesite (!); goslarite; chalcantite (!); calcite; cerussite (!) in fine crystals, massive and in pseudomorphs after pyrite; malachite.

Thomasville.—Epidote; muscovite; biotite; magnetite; augite.

Silver Valley.—Galenite; sphalerite; pyromorphite.

Uharrie River.—Sphalerite.

Russell mine.—Gold; pyrite.

Ward's mine.—Gold; electrum(!); pyrite; chalcopyrite.

Delk mine.—Gold; limonite; hematite; pyrite.

Laughlin mine.—Gold; limonite; hematite; pyrite.

Miller mine.—Gold; pyrite; limonite; hematite.

Brown mine.—Gold; pyrite.

Midway.—Gold; pyrite; chalcopyrite; chalcedony; hornstone.

Lick Creek.—Meteorite.

Elsewhere.—Gold, in veins and placers; titaniferous magnetite.

DAVIE.

Magnetite; hematite, in several localities in beds; calcite, granular, on Yadkin river.

DUPLIN.

Calcite, in marl beds; limonite; glauconite; pyrite; lignite.

Near Magnolia, phosphatic beds.

DURHAM.

Durham.—Pyrite.

Near Knap of Reeds.—At James Woods's hematite (!); magnetite (!); steatite.

Red Mountain.—Epidote.

EDGECOMBE.

Vivianite, in marl; limonite; glauconite; pyrite; lignite; kaolinite, near Battleboro; calcite in marl beds; radiated and tabular quartz at Rocky Mount.

FORSYTH.

Plaff's quarry.—Calcite, granular.

Near Salem.—Magnetite, four miles south; manganese garnet; halloysite; hematite; micaceous hematite; graphite; emery variety of corundum; wad; halloysite.

Old Town.—Orthoclase; halloysite; asbestos; hematite; kaolin; talc.

Near Kernersville.—Enstatite, var. bronzite; chrysolite; tourmaline; magnetite; hematite; chlorite; pyrite.

Brookstown.—Calcite; tremolite.

Elsewhere.—Titaniferous magnetite (!); gold; also pure magnetite (!); serpentine.

FRANKLIN.

Portis mines.—Gold in placers (!); diamond (!); muscovite, in large plates; magnetite; asbestos; tabular quartz.

Franklin.—Kaolin.

Near Louisburg.—Halloysite; asbestos; tabular quartz.

Mann Arrington mine.—Franklinite (?).

Laurel.—Muscovite.

GASTON.

Asbury's mine.—Silver; tetradyomite; galenite; pyrrhotite; pyrite; leucopyrite; auriferous arsenopyrite; bismite; scorodite; montanite(?); cerussite; bismutite (!).

Cansler and Shuford mine.—Gold (!); galenite.

Clubb's Mountain.—Corundum, red and blue (!), also mammillary (Dr. Hunter); rutile (!!); tourmaline, granular and fibrous; leopardite; cyanite (!); pyrophyllite (!); muscovite (!); lazulite (!); talc; quartz crystals; margarite; hematite; muscovite; manganese garnet; magnetite; gold; iron garnet.

Clear Mountain.—Lazulite.

Crowder's Mountain.—Corundum, red and blue (!), also variety emery; rutile (!); in crystals and granular; gold; menaccanite; cyanite (!); topaz (?); pyrophyllite (!); muscovite (!); monazite; lazulite (!); barite, with galenite (argentiferous); hematite; limonite; sphalerite; tourmaline; pyrite; chalcopyrite; manganese garnet; pyromorphite.

Yellow Ridge.—Magnetite.

Stowe's Factory.—Magnetite.

Sloan mine.—Gold; pyrite.

Beck's.—Pyrolusite; manganese garnet; psilomelane.

High Shoals.—One mile above, granular calcite.

Ellison ore bank.—Hematite; magnetite; chlorite; orthoclase; epidote; tourmaline.

Ormond ore bank.—Limonite, compact and fibrous; psilomelane, nickeliferous.

Mountain mine.—Hematite, mammillary and cellular; pyrolusite; quartz.

King's Mountain.—Gold; galenite; altaite; chalcopyrite; sphalerite; tetrahedrite; nagyagite; magnetite; bismite; calcite; dolomite; pyrrhotite; chalcopyrite; limonite; barite; pyrite; graphite; cassiterite.

Long Creek mine.—Nickeliferous psilomelane (!); gold; pyrite; fluorite; sphalerite; mispickel; galenite.

Duffie mine.—Gold; pyrite; chalcopyrite; also at B. Wells's mine.

Oliver mine.—Gold; silver; galenite.

White's mills.—Epidote; biotite; orthoclase (!); pycnite; titanite.

Wells's farm.—Magnetite; hematite; pyrite; rutile; garnet; zircon (?); beryl; tourmaline; monazite; asbestos; menaccanite; azurite; boronite (?).

Rhodes's mine.—Epidote; actinolite; gold.

Ferguson mine.—Magnetite; pyrite.

All-Healing Springs.—Barite.

Elsewhere.—Sulphur; pyrite; magnetite; calcite; siderite; gold in placers and veins, at the Dew, Smith, Farrar, Beattie, McLean, High Shoals, and Cannon mines.

GATES.

Calcite, in marl beds.

GRAHAM.

Gold; calcite, granular, white, and flesh-colored; talc; pyrite.

GRANVILLE.

Young's Cross Roads.—Gold; pyrite; two miles southeast, malachite.

Near Oxford.—Magnetite; limonite; epidote; hematite; gold; lignite on Tar River, near Crews's.

Patterson mine.—Native copper.

Grissom.—Enstatite.

Bowling's Mountain.—Radiated pyrophyllite.

Sassafras Fork.—Gold; pyrite; a few miles north, malachite; tourmaline; quartz crystals; agate.

Near Shiloh Church.—Epidote; labradorite; calcite.

Elsewhere.—Stibnite, in the northern part of the county, on land of N. A. Gregory.

GREENE.

Limonite; siderite; glauconite; calcite in marl.

GUILFORD.

Cambridge mine.—Chalcocite; pyrite (!); chalcopyrite; barnhardtite; chrysocolla; malachite.

Fisher Hill.—Gold; pyrite; chalcopyrite; magnetite; hematite; menaccanite; limonite; pseudomalachite; siderite.

Beard mine.—Gold.

Friendship.—Granular corundum (emery); titaniferous magnetite.

Gardner Hill.—Bornite (?); chalcopyrite; chrysocolla; malachite.

Greensboro.—Hornblende, at Polecat Creek; pyroxene; pyrite; five miles west, gold; pyrite; chlorite; nine miles south, kaolinite, and also six miles west.

High Point.—Graphite; talc; chalcopyrite; orthoclase.

McLeansville.—Asbestos (?) in green quartz.

Near Alamance Church.—Kaolinite.

McCulloh mine.—Copper; cuprite in acicular crystals (!); pyrite; chalcopyrite; siderite; malachite.

Near Jamestown.—Gold; pyrite; steatite.

North Carolina (Fentress) mine.—Cuprite in acicular crystals (!); pyrite; chalcopyrite; siderite; malachite.

Phoenix mine.—Chalcopyrite; covellite.

Elsewhere.—Gold in veins; meteoric iron; molybdenite; limonite; rock crystal; pyrite; manganese garnet; magnetite; asbestos in green quartz (!), (Humphrey's); titaniferous magnetite, with hematite and limonite, chlorite, in a double range of outcrops of 20 miles length across the northwest section of the county, from the head of Deep River, on the Forsyth line, to the Rockingham line, near the Piedmont railroad at Haw River; kaolin at O. S. Leonard's, in the southern part of the county.

HALIFAX.

Near Ransom's Bridge.—Gold in placers; pyrite.

Fishing Creek.—Magnetite crystals and cubical pyrite in slate.

Gaston.—Hematite, micaceous and granular; magnetite; chlorite; limonite; 6 miles south, Hines's place, hematite; magnetite.

Elsewhere.—Petrified wood; epidote; zircon and garnet, in gold gravels; calcite and glauconite in marl; apatite; epidote.

HARNETT.

Harrington.—Calcite, granular.

Near Buckhorn.—Hematite; rutile in quartz; epidote; prochlorite (?).

Northington's Dam.—Chrysocolla; calcite, in gneiss rock.

Little River.—Magnetite, several places.

Douglass ore bed.—Magnetite.

Chalk Level.—Limonite (bog ore).

Hector's Creek.—Smoky quartz.

Elsewhere.—Talc; magnetite; kaolin, abundant at Spout Springs and at several other places.

HAYWOOD.

Big Ridge mine.—Muscovite; biotite; tourmaline; apatite; menaccanite; albite; autunite; kaolin.

Waynesville.—Corundum; two miles above, talc; asbestos; tremolite; on Richland creek, 2 miles below, psilomelane; garnet; limonite; muscovite; cyanite; 4 miles south, menaccanite.

Hall's mine.—Chrysolite; corundum; talc; chlorite; tremolite.

Presley mine.—Corundum, blue and gray, altered into muscovite and albite; albite; muscovite in large crystals, also in scales cryptocrystalline and compact.

Wilkins's Creek.—Magnetite with limonite; chalcopyrite; pyrite.

Cove Creek.—Psilomelane; limonite.

Pigeon River, east fork.—Corundum; pyrrhotite; wad.

Pigeon River, west fork.—At Sorrell's mine, nickeliferous (?) pyrrhotite.

Upper Pigeon Valley.—Graphite.

Ground Hog Creek.—Galenite.

Jonathan's Creek.—Cyanite; pyrrhotite; graphite; garnet.

Ruce's mine.—Opalescent quartz; pyrite; garnet.

Springdale.—Melanterite; pyrite.

HENDERSON.

Coleman's Station.—Zircon; phlogopite; jefferisite.

Green River.—On south side of Blue Ridge, at Freeman's, zircon; xanthitane; calcite, granular; titaniferous garnet at Jones's mine; auerlite; on Price's farm, zircon; auerlite; on the Davis land, polycrase; zircon; monazite; xenotime; cyrtolite; magnetite.

Elsewhere.—Beryl; limonite; hematite; vermiculite; meteoric iron.

HERTFORD.

Calcite, in marl beds.

HYDE—(None.)

IREDELL.

Belt's Bridge.—Pyrite in soapstone; corundum (!) in globular masses, partly altered into muscovite, etc.; near Belt's Bridge, limonite; Hendrick's farm, corundum in hexagonal crystals (!) partly altered into margarite; orthoclase; tourmaline; muscovite (!) soda-margarite at Hendrick's farm.

Center Point. At Beam's farm; limonite (!) pseudomorphous after nodular pyrite.

Crawford's farm.—Quartz pseudomorphous after calcite.

Damascus.—Menaccanite.

Dr. Halyburton's.—Leucopyrite (!); scorodite.

King's Mill.—Graphite (!); hematite in hexagonal plates in quartz; rutile (!), in quartz, at Mrs. Jordan's, Alex. Lackey's, Misses Bennett's, Thomas Adams's and Mrs. Smith's farms; rock crystal (!); quartz crystals inclosing liquid (!); chalcedony; tourmaline (!).

Mount Pisgah.—Rutilated quartz (!) at Mrs. Daniel's farm; chloritic mineral resembling thuringite.

Rocky Creek.—Graphite.

Spring Mountain.—Graphite (!).

Statesville.—Near Statesville, titanite in gneiss; quartz crystals; 6 miles north, allanite; 8 miles southeast, on road to Salisbury, tremolite; 2 miles west, corundum (!), rarely altered into cyanite (!); orthoclase (!) on Houp's farm; cyanite (!), 2 miles west and 6 miles southwest of Statesville on Hoover's farm, with muscovite (!); 4 miles distant, goethite in thin scales, in light red feldspar (sunstone); 5 miles west, on John Sumpter's farm, rutile; zircon; cyanite; transparent ripidolite. 7 miles north, on farm of G. W. Chipley, near South Yadkin River, gray corun-

dum in crystals. At Statesville rock quarry, sunstone; titanite; hornblende in large crystals.

Bethany Church.—Allanite, with small crystals of zircon; above Lock's Bridge, corundum altered into prochlorite and margarite.

Hunting Creek.—Albite; blue corundum altered into rhaetizite. On Sale's farm, near Campbell's Mill, large boulders of cyanite inclosing crystals of blue corundum.

Near Shiloh Church.—Red ocher.

Near Holland Springs.—Quartz crystals.

Davidson Township.—Quartz, inclosing transparent red goethite.

Rockwell.—Smoky quartz.

Elsewhere.—Marcasite; magnetite near Comb's, and on South Yadkin River.

JACKSON.

Casher's Valley.—Bismutite; talc; muscovite; amethyst; rock crystal; gold; pyrite; chalcopyrite.

Cullowhee mine.—Chalcocite; pyrite; melaconite; chalcopyrite (!); hornblende; malachite.

Hogback mine.—Corundum (!); rutile in corundum, rare; chromite; drusy quartz; chrysolite (!); andesite (!); tourmaline; muscovite (!); dudleyite; margarite (!).

Savannah mine.—Chalcopyrite; hornblende; tourmaline; malachite.

Horse Cove.—Muscovite; beryl.

Tennessee Creek.—Tremolite; grammite; chlorite; actinolite; talc; asbestos; prochlorite (?).

Whiteside Mountain.—Garnet; orthoclase; tremolite; actinolite; chalcopyrite; magnetite; asbestos; muscovite; biotite; wad.

Balsam Mountain.—Tourmaline; pyrolusite; chalcopyrite.

Waryhut mine.—Chalcocite; chalcopyrite; cuprite; malachite.

Georgetown and Fairfield.—Gold in placers.

Webster.—Corundum; chromite; pyrolusite; wad; chalcedony; drusy quartz; enstatite (!); tremolite (!); actinolite (!); asbestos; chrysolite (!); talc (!); serpentine; marmolite; deweylite; geuthite; penninite (!); magnesite (!), crystalline and earthy; magnetite; kaolin; kämmererite; 6 miles north, chrysolite and enstatite; 10 miles west, hornblende.

Wolf Creek mine.—Chalcocite; native copper; chrysocolla; chalcopyrite; malachite.

Ainslie's.—Chrysolite; chromite; talc; chlorite; enstatite; smaragdite (?); asbestos; tremolite; garnet; actinolite; albite.

Scott's Creek.—Chrysolite; chromite; talc; penninite (var. kämmererite); enstatite; chlorite; corundum (blue and pink).

Toxaway River.—Calcite, granular.

Elsewhere.—Gold in placers; psilomelane; calcite; asbestos; talc; limonite; muscovite in many mica mines; galenite; at Bryson's and in Hogback Valley, hematite; at Dr. Morgan's, psilomelane.

JOHNSTON.

Elevation.—Clay ironstone; pyrite.

Leechburg.—Limonite.

Near Clayton.—Chloritic talc slate; graphite; kaolin.

Near Princeton.—Epidote.

Near Smithfield.—Limonite in many places.

Elsewhere.—Fossil wood; kaolinite; magnetite; pyrite; tourmaline; graphite; epidote; muscovite; quartz crystals; hematite.

JONES.

Calcite, in marl beds; limonite.

LENOIR.

Calcite, in marl beds; glauconite, in green sand marl.

LINCOLN.

Lincolnton.—Calcite; 12 miles northwest, reticulated acicular rutile; halloysite; kaolinite; graphite; limonite, 7 miles northwest and 2 miles east; on land of S. W. Childs, arsenopyrite.

Brevard's Forge.—One and one-half miles from Vesuvius furnace, magnetite (!); manganese garnet; quartz crystals.

Cottage Home.—Diamond (!); gold; chalcopyrite.

Macpelah Church.—Manganese garnet; psilomelane; pyrite and chalcopyrite, 2 miles east.

Graham mine.—Chalcopyrite; gold.

McBee's.—Psilomelane.

Keener's quarry.—Chalcopyrite; bornite.

Iron station.—Vivianite.

Randleman's.—Quartz crystals; amethyst (!).

Stowe's quarry.—Calcite, granular and compact.

Elsewhere.—Gold in placers and veins; sulphur; graphite; hematite; magnetite; limonite; muscovite; kaolinite; epidote; pyrite; calcite, near Lincolnton (!); asbestos; chalcedony; garnet; psilomelane; talc; cuprite; cyanite, blue and red; galenite; graphite; limonite; menacanite; actinolite.

MACON.

Houston's mine.—Muscovite; corundum; talc; tremolite; chlorite; tourmaline.

Lyle's mine.—Muscovite; biotite; kaolinite.

J. Moore's.—Chromite; corundum.

Thorn Mountain mine.—Muscovite; biotite; manganese garnet; albité; uranochre (?); zippeite (?); beryl; pyrrhotite; chalcopyrite.

Culsagee mine or Corundum Hill.—Corundum (!) in beautiful varieties crystallized and massive, and frequently in part altered into other minerals; chromite (!); spinel (!) in crystals and granular; rutile (!), rare; diaspore (!), one specimen only known; drusy quartz (!) and quartz crystals; chalcedony; hyalite (!); enstatite (!); tremolite; arfvedsonite (!); chrysolite (!); andesite (?); oligoclase; tourmaline (!); talc; serpentine (!); deweylite (!); cerolite; genthite (!); culsageeite (!); lucasite; kerrite (!); maconite (!); penninite (!); prochlorite (!); willcoxite (!); margarite (!); anthophyllite; actinolite; magnetite.

Bryson's mines.—Muscovite (!); labradorite; almandite garnet; orthoclase; albite; biotite.

Near Franklin.—Sphalerite; chalcopryite; menaccanite (!); wad; garnet (!); epidote (!); fibrolite (!); cyanite (!); staurolite (!); kaolinite (!); rhodochrosite; corundum; pyrite; 7 miles south, chromite, chlorite; 9 miles south, chrysolite; 11½ miles south, prochlorite; 14 miles south, corundum and talc in chrysolite.

Highlands.—Bismutite; beryl.

Haskett's.—Limestone quarry; magnetite; corundum (!), in part altered into muscovite; tourmaline; calcite; garnet; molybdenite.

Jacob's mine.—Corundum; asbestos; tremolite; chrysolite.

Sugartown Creek.—Chromite; tremolite; actinolite; asbestos; chrysolite; garnet; biotite; orthoclase; magnetite; hematite; 8 miles from Franklin, prochlorite; talc; asbestos.

Nantehaleh River.—Asbestos; talc (!); compact limestone (!); niter; at mouth of river, orthoclase.

Tennessee River, below Franklin.—Garnet; staurolite; cyanite; muscovite; columbite.

Tibbet's mine.—Pleonaste; zircon.

West's mine.—Ruby corundum with cyanite.

Gregory Hill.—Chrysolite; anthophyllite; bronzite; foliated talc; prochlorite; asbestos.

Hall mine.—Muscovite (!); biotite; granular quartz; orthoclase; garnet; albite.

Rocky Face.—Garnet; muscovite; biotite.

Jarrett's.—Steatite; chalcedony; fibrous talc.

Potato Knob mine.—Mucovite; biotite.

West's Mills.—Psilomelane.

Ellijay Creek.—Near Higdon's: corundum; chlorite; asbestos; chromite; magnetite; hematite; garnet; chrysolite. At Goshen, calcite, granular; coccolite; graphite; spessartite.

Highlands.—Gold; rose quartz.

Catoogajay Creek.—Magnetite, at Sloan's.

Elsewhere.—Graphite; garnet; chalcopryite; magnetite; hornblende, 23 miles below Franklin; beryl; rose quartz; magnetite; muscovite and biotite in numerous mica mines; gold and galenite in Cowee Mountains.

MADISON.

Bear Creek.—Magnetite (!), 2 miles from mouth; green coccolite, in granular calcite; chlorite; epidote; cyanite; staurolite; talc; garnet, (large crystals); 1 mile from mouth, tremolite; hornblende; $1\frac{1}{2}$ miles from mouth, chrysolite; magnetite.

Mars Hill.—Monazite; zircon.

Big Laurel.—Magnetite (!); menaccanite (!); milky quartz; pyrite; calcite, granular, and massive.

Carter's mine.—Corundum (!) in peculiar white and pink varieties; spinel (!); chromite; hornstone; drusy quartz; tremolite; chrysolite (!); andesite (!); prochlorite (!); culsageeite; menaccanite; beryl (!).

French Broad River.—Orthoclase; calcite, with coccolite; limonite, in a heavy bed, near State line.

Duel or Jewell Hill.—Meteoric iron (!); ferrous chloride in meteorite; hematite.

Near Marshall.—Calcite; pyrite; rutile; limonite; magnetite (!); gale-nite; bornite; chalcopyrite; epidote; talc; fluorite; hematite, near Gudger's, 9 miles below Marshall; corundum (!), 3 miles below Marshall; diaspore (?); prochlorite (!); margarite; barite, at Chandler's, 9 miles below Marshall; 4 miles west of Marshall, smoky quartz, in doubly terminated crystals; 1 mile below Marshall, agate; hornblende; 3 miles below, augite (?); 6 miles below, penninite; orthoclase; 8 miles below, epidote; orthoclase; $9\frac{1}{2}$ miles below, penninite; orthoclase; 4 miles up Ivy Creek, hornblende.

Walnut Creek, near French Broad River.—Green coccolite, in calcite; phlogopite.

Hot Springs.—Cryptocrystalline muscovite (!); calcite; red jasper; pyrite; psilomelane; gold, in veins and placers; garnet.

Shut In Creek.—Calcite; jasper.

Spring Creek.—Magnetite, in large bed, massive.

Ivy River, two miles from mouth.—Smith mine: magnetite; pyroxene. At Radford's, hematite and magnetite.

Brush Creek.—Magnetite, at Freeman's and Sikes's; coccolite in calcite; barite.

Paint Creek.—Pyrrhotite.

Haynie mine.—Blue corundum; rutile; margarite; green crystals of hornblende; magnetite; chlorite; menaccanite.

MARTIN.

Calcite, in marl beds.

M'DOWELL.

Cave of Tantalus.—Stalactitic calcite.

Humpback Cave.—Stalactitic calcite.

Cedar Cove, at Dodson's mine.—Sphalerite; calcite, granular and compact.

Kirksey's mine.—Tetradymite.

Linville Mountains.—Itacolumite; radiated pyrophyllite; limonite, in many places; hematite; calcite, granular and compact, several places; meteoric iron.

Peter's Cove.—Stalactitic calcite; magnetite; limonite.

Turkey Cove.—Calcite, granular and compact.

Turkey Creek.—Bee Rock: epidote (!); tourmaline.

In the gold placers.—Gold; corundum; menaccanite; rutile; chromite; brookite; pyrope; zircon (!); epidote; fibrolite; xenotime (!); monazite (!); diamond; anatase.

Marion.—Within a few miles, limonite; manganese garnet; psilomelane; calcite.

Raccoon Cave.—Stalactitic aragonite.

Round Knob.—Cyanite; garnet; paragonite.

Graveyard Mountain.—Hematite; limonite; calcite.

Head of Tom's Creek.—Magnetite; muscovite; kaolinite.

Elsewhere.—Limonite; calcite; samarskite; dolomite, one-half mile east of Yancey's mine.

MECKLENBURG.

Beattie's Ford.—Rutile (!) in acicular crystals.

Capp's Hill.—Magnetite; gold; pyrite; chalcopyrite.

Charlotte.—Orthoclase var. leopardite (!); at the Rudisill mine, gold-bearing pyrite; chalcopyrite; white siderite; 2 miles from Charlotte, pyrite; chalcopyrite; magnetite, fine granular; at new cemetery, epidote.

Davidson College.—Radiated cyanite; pyrophyllite; gold; agate, 5 miles south at D. Caldwell's; hematite at Gibson's, 5 miles from Davidson College; 7 miles south, fine crystals of rutile; 12 miles southwest, granular hematite.

Hopewell mine.—Chalcopyrite; chrysocolla; pyrite; gold.

McGinn mine.—Gold; pyrite; chalcopyrite; barnhardtite; cuprite in acicular crystals; melaconite; pseudomalachite (!).

Old Harris mine.—Hematite; menaccanite.

Providence.—Twelve miles south of Charlotte, chalcopyrite; gold; pyrite; magnetite.

Todd's Branch.—Gold; diamond (!); zircon (!); garnet; monazite (!).

Tuckasegee Ford.—Epidote; labradorite near Tuckasegee Ford.

Stephen Wilson's mine.—Gold; pyrite; chalcopyrite; siderite.

Gibson mine.—Gold; also at Jordan mine, Brown mine, Carson mine, Icyhour mine, Burnett mine, Neal mine, Brawley's mine.

Roswell mine.—Gold; pyrite; also at Stearne's mine, Roger's mine, Stinson mine, Crosby mine, Johnson mine, Juggernaut mine, Frazer mine, Taylor mine, Maxwell mine, Nolen mine, Crump mine, Bane mine, McCorcle mine, Hunter mine, Henderson mine, Alexander mine, J. Alexander's mine, Caldwell mine, Davidson and Blake mine.

Sugar Creek.—Magnetite.

Faire's mine.—Gold; pyrite chalcopyrite.

Frederick mine.—Gold; pyrite; chalcopyrite; chrysocolla; malachite.

Maxwell mine.—Gold; pyrite; chalcopyrite; also at Clark's mine, Ray mine, Hipp mine, Trotter mine, Harris mine, Henderson mine, Kern mine, Cathey mine, G. C. Cathey's mine, Sloan mine, McLean mine, Charlotte mine, and Queen mine.

Steele Creek.—Pyrolusite.

Elsewhere.—Gold, in placers and veins; copper in quartz crystals; sulphur; magnetite, near Steele Creek Church; foliated hematite at Sol. Reid's; tourmaline.

MITCHELL.

Bailey mine.—Orthoclase; hyalite.

Toe River Ford.—Actinolite, large crystals in talc; muscovite.

Bakersville.—Muscovite; chalcopyrite; pyrite; $2\frac{1}{2}$ miles south, pyrophyllite; chromite(!); saponite; quartz crystals; chalcedony(!); enstatite(!); tremolite; actinolite; chrysolite(!); talc; rutile, penetrating corundum; serpentine; deweylite; penninite(!); magnesite; $1\frac{1}{2}$ miles southeast, asbestos; talc; limonite; corundum; 2 miles southeast, limonite; psilomelane; $3\frac{1}{2}$ miles north, apatite; at Hawk mine, oligoclase(!); on Yellow Mountains, cyanite(!).

Blalock's.—Garnet; muscovite(!); orthoclase(!); kaolinite; columbite.

Buchanan mine.—Gummite; yttrogummite(?); asbestos; beryl; ananite(!); muscovite(!); albite(!); phosphuranylite(!); cyanite; graphite; manganese garnet; black garnet; magnetite; limonite; apatite; orthoclase.

Cane Creek.—Menaccanite(!); actinolite; talc; asbestos; near head, graphite; rutile; garnet; samarskite.

Crab Orchard.—Menaccanite(!).

Autrey's.—On Brush Creek: quartz crystals, smoky; black garnet; kaolinite.

Cranberry.—Magnetite(!); pyroxene; epidote; picrolite; 1 mile west, hematite; orthoclase.

Plum Tree Creek.—Corundum crystals; hyalite.

Roan Mountain.—Hornblende.

Near White Plains.—Gummite with uraninite in a mica mine.

Deake mine.—Quartz, flattened out between muscovite; muscovite(!); columbite(!); gummite; albite; gahnite; monazite.

Flat Rock.—Menaccanite(!); uraninite(!); gummite(!); zircon; garnet; epidote; zoisite, var. thulite(!); muscovite(!); pink muscovite(!); albite(!); orthoclase(!); uranotil(!); phosphuranylite(!); autunite(!).

Grassy Creek.—Samarskite; menaccanite; kaolinite; beryl, large muscovite; autunite; hyalite; columbite.

Point Pizzle.—Albite(!); apatite(!); pyrophyllite; actinolite; beryl; garnet; manganese garnet; muscovite.

Old Fields of Toe.—Miller's Gap: epidote; talc; chlorite.

Unaka Mountains.—Magnetite (!); zircon (!); epidote; hematite.

Wiseman mine.—Muscovite (!); kaolinite; hatchettolite (!); columbite (!); samarskite (!); altered samarskite; rogersite; epidote; garnet.

Gillespie Gap.—Psilomelane; monazite; epidote; chalcopryrite; one-half mile west, prochlorite; psilomelane.

Burnsville.—Six, 13, and 14 miles north, labradorite in trap; 14½ miles north, prochlorite; culsageeite (?); asbestos; actinolite; tremolite.

Pumpkin Patch Mountain.—Magnetite; labradorite; garnets.

Burlison's.—Asbestos; actinolite; talc.

Lick Ridge mine.—Muscovite; albite; garnet, red and black; biotite; pyrite; chalcopryrite; hyalite.

Cox mine.—Smoky quartz; manganese garnet; albite; autunite; muscovite; biotite; apatite; labradorite; pyrite; orthoclase (?).

Eagle Mine.—Kyanite; muscovite; orthoclase; albite.

Gibbs's Mine.—Muscovite.

North Toe River.—Orthoclase; muscovite; chrysolite; talc; chrysotile; asbestos; prochlorite; wad; garnet; serpentine; 2½ miles north-east, kaolin; chalcedony.

Young's.—On South Toe River; serpentine; garnet; talc; chrysolite; prochlorite; tremolite; pyrite.

Elsewhere.—Galenite (!); rutile; garnet; epidote; fergusonite; actinolite (S. Blalock's); rock crystal; muscovite; kaolinite in numerous mica mines; corundum, 1 mile from Stewart's.

MONTGOMERY.

Cheek's Creek.—Fossil wood.

Cottonstone Mountain.—Pyrophyllite (!!)

Crump Mine.—Gold (!) in placers.

Christian mine.—Same as Swift Island.

Steele mine.—Gold (!!); galenite; sphalerite; chalcopryrite; albite; prochlorite; calcite.

Burnett Mountain.—Gold in placers.

Swift Island mine.—Gold (!!) in fine crystals.

Beaver Dam mine.—Gold in placers.

Elsewhere.—Gold in veins and placers; argentite in slates; magnetite; 5 miles above mouth of Uwharrie River, hematite; ferruginous quartz.

MOORE.

Carthage.—Twelve miles east: hematite.

Cheek mine.—Chalcopryrite; malachite; azurite; galenite; red jasper; epidote; talc; calcite; argentite; pyroxene; limonite.

Jonesboro.—Two miles south, on Cane Creek; malachite.

Swan's Station.—Kaolin.

Sanford.—Pyrite; gold.

Johnson's mills.—Tourmaline; acicular hornblende in quantity.

Soapstone Quarry.—Slaty pyrophyllite (!); pseudomalachite.

Upper Little River.—Cyanite.

Welch's.—Chrysocolla; chlorite.

Elsewhere.—Gold in veins and placers; pyrite; fossil wood; at E. Kelly's, limonite; magnetite; enstatite; wad; at P. Martin's, agate; at J. Dunlap's, quartz crystals; at Johnson's mill.

NASH.

Battleboro'.—Kaolin.

Tom Arrington mine.—Gold in placers.

Mann mine.—Gold in placers; psilomelane.

Elsewhere.—Gold in placers; meteoric stone, near Castalia; crocoite (!); hematite; limonite; calcite, in placers; in Stony Creek township, chalcedony.

NEW HANOVER.

Calcite (!), granular and crystalline; lignite; glauconite; limonite; phosphatic nodules (!) in limestone at Castle Hayne.

NORTHAMPTON.

Calcite, in marl beds.

ONSLOW.

Calcite and phosphatic nodules (!) in marl.

ORANGE.

Aaron's Creek.—Jaspery quartz; radiated pyrophyllite (!).

Chapel Hill.—Hematite (!); limonite; epidote; near Chapel Hill, chalcopyrite; pyrite; magnetite; serpentine; hematite, pseudomorphous after pyrite; 4 miles west, limonite after pyrite; 7 miles west; pyrophyllite.

Hillsboro.—Pyrite in cubes; wad; limonite; hematite; pyrophyllite (!); chlorite in fine scales; epidote; barite (!), at Latta mine; braunite (?); hematite, 6 miles south; pyrite; chalcopyrite; 5 miles southeast, magnetite.

Eno River.—Serpentine; steatite.

University Junction.—Hornblende; hematite.

Elsewhere.—Halite in brine; micaceous hematite at Flat River and Elleby Creek; epidote; hematite, pseudomorphous after pyrite; serpentine; moss agate, slaty pyrophyllite.

PAMLICO.

Calcite, in marl beds.

PASQUOTANK—(None).

PENDER.

Calcite; glauconite; limonite; phosphatic beds; at Rocky Point, phosphatic nodules in limestone.

PERQUIMANS—(None).

PERSON.

Mount Tirzah.—Hematite, micaceous; menaccanite.

Barnett Mountain.—White cyanite (!).

Dillahay's mine.—Gold; radiated quartz.

Gillis mine.—Chalcocite; pyrite; covellite; micaceous hematite; chrysocolla; cuprite; malachite; calcite; garnet; quartz; epidote.

Leasburg.—Tourmaline; 3 miles north, albite (?).

Hico.—Felsite; graphite.

Roxboro.—Epidote in granite.

Mill Creek.—Chalcocite; chrysocolla.

Harris's mine.—Copper in epidote.

Woodsdale.—Gold in vein; pyrite.

Elsewhere.—Graphite, on Cane Creek; limonite; steatite; talc; hematite; magnetite; on W. A. Gillis's farm, chrysolite.

PITT.

Calcite; glauconite; siderite; limonite, in beds near Tranter's Creek; succinite.

POLK.

Sandy Plains.—At Davis's mine: gold; limonite; pyrite. At Morris's mine: gold; monazite; pyrite; epidote; asbestos; tourmaline. At Prince mine: monazite; rutile; zircon.

Morrill Mills's gold mine.—Euclase (?).

Hungary River.—Gold, in placers.

Pacolet River.—Gold, in placers.

Tryon Station.—Garnet; tourmaline.

Tryon Mountain.—Asbestos.

Elsewhere.—Gold in placers; monazite; xenotime; rutile; epidote; quartz crystals; manganese garnet; turgite.

RANDOLPH.

Near Ashboro.—Pyrophyllite.

Franklinsville.—Five to 7 miles west-northwest, leucopyrite.

Pilot Klob.—Pyrophyllite (!); gold, in placers; acicular rutile in quartz.

Hoover Hill mine.—Gold; galenite; calcite.

Kinley mine.—Gold; pyrite.

Jones mine.—Gold; pyrite; limonite.

Parish mine.—Gold; talc; tremolite; actinolite.

Elsewhere.—Gold in veins and placers; meteoric iron (!); magnetite; siderite; hematite (micaceous).

RICHMOND.

Rockingham.—Eight miles southeast: kaolin.

Hitchcock Creek.—Orthoclase (!); oligoclase.

Hamlet.—Kaolinite.

Elsewhere.—Pyrophyllite, in quartz schists; chlorite; on Yadkin River, 7 miles above mouth of Little River, calcite and shell limestone.

ROBESON.

Calcite, in marl beds; near Maxton, kaolin.

ROCKINGHAM.

Madison.—Chalcopyrite at W. Lindsay's; manganese garnet.

Leaksville.—Semi-bituminous coal.

Meadows.—Bog iron ore.

Smith's River.—Two miles east of Morehead's factory: hematite; gold; asbestos.

Troublesome Creek.—Magnetite; hematite; limonite.

Smith's Mountain.—Meteoric iron (!!) with schreibersite and ferrous chloride. Also on Deep Spring farm.

Reidsville.—Muscovite; near Reidsville, halloysite; 6 miles north, magnetite.

Wentworth.—Asbestos; near Wentworth, tourmaline; one-half mile south, pyroxene and tourmaline.

Elsewhere.—Halite in brine; titaniferous magnetite (!); garnet; cyanite; on Dan River, 4 miles above Town Fork, hornblende.

ROWAN.

Gold Hill.—Gold (!); bismuthinite; pyrite; chalcopyrite; arsenopyrite (!) at Honeycutt's; magnetite.

Salisbury.—Orthoclase (!); 7 miles south, Gold Hill road, pyrite; chalcopyrite; chrysocolla; talc.

Yadkin mine.—Gold; pyrite.

Dunn Mountain mine.—Gold; pyrite; chlorite.

Snider mine.—Gold; pyrite.

Grupy mine.—Chalcopyrite; pyrite; chrysocolla.

Cope mine.—Gold; also at Haynes mine, Cady mine, Bringle mine, Trexler mine, Yadkin mine, Bane mine, Roseman mine, Earnhardt mine, Holtshauser mine, in veins and placers.

Rhymer mine.—Gold; pyrite; hematite.

Elsewhere.—Orthoclase, in large and twin crystals; gold; pyrite.

RUTHERFORD.

Brindletown Creek.—Diamond (!).

Jeanstown.—Platinum; palladium (?); at Weaver's, garnet; epidote; tourmaline; gold; manganese garnet.

Laurel Springs.—Garnets.

Rutherfordton.—Quartz, pseudomorphous after calcite (!).

Shemwell mine.—Arborescent gold (!).

Second Broad River.—Head of it, gold in veins and placers; pyrite.

Twitty's mine.—Diamond (!).

At the gold placers generally.—Gold; corundum in grains and crystals; menaccanite; rutile; chromite; brookite; rock crystal; garnet; zircon (!); epidote; samarskite; fergusonite; xenotime (!); monazite; wolframite (?).

Elsewhere.—Amethyst; melanterite; alunogen; fergusonite; anatase; corundum; fibrolite; tourmaline; gold; pyrite; meteoric iron.

SAMPSON.

Calcite in marl beds; lignite.

STANLEY.

Hearne mine.—Gold; pyrite; chalcopyrite; calcite; chlorite; serpentine.

Crowell mine.—Gold.

Elsewhere.—Gold in veins and placers.

STOKES.

Bolejack's quarry.—Calcite (!); phlogopite; actinolite.

Coffee Gap.—Lazulite (!) with muscovite in quartz.

Danbury.—Magnetite (!); pyrolusite; cyanite; actinolite; at Roger's ore bank, titanite; sulphur (!) in a limonite quartz geode; asbestos; hornblende; pyrite in muscovite; 7 miles east of Danbury, hornblende.

Dan River.—Opalescent quartz; anthracite and bituminous coal; prochlorite; hematite; magnetite.

Germanton.—Fossil wood (!); 2 miles east, serpentine; calcite; garnet.

Moore's Mill.—Manganese garnet.

Peter's Creek.—Sulphur (!).

Sauratown Mountain.—Itacolumite (!); asbestos.

Snow Creek.—Hematite, at Martin's quarry; chalcedony; hornstone; phlogopite; granular calcite; agate; amethyst; hyalite; jasper; hematite; albite; 6 miles east, pyrolusite.

Stokesburg.—Rock crystal; anthracite and bituminous coal.

Elsewhere.—Copper; graphite; chalcopyrite; muscovite in pyrite; gold in pyrite; siderite; tourmaline; talc; muscovite (large plates); epidote; limonite; calcite, granular, on Little Yadkin and Dan Rivers.

SURREY.

Dobson.—Ten miles north, manganese garnet; pyrolusite; talc in green crystals; serpentine: steatite; actinolite; breunnerite; magnetite; magnetite; chlorite; hausmannite (?); wad; near Dobson, magnetite in prochlorite.

Ararat River.—Four miles southeast of Mount Airy, pyrite (!); magnetite (!); garnet; white cyanite (!).

Chestnut Mountain.—Octahedral magnetite (!).

Fisher's Peak.—Octahedral magnetite.

Pilot Mountain.—Talc (!).

Tom's Creek.—Magnetite.

Rockford.—Steatite.

War Hill.—Milky quartz.

Williams's mine.—Magnetite.

Elkin.—Barite; galenite; pyrite; chalcopryite; 2 miles east, chalcopryite; 10 miles north, limonite; hematite; 5 miles northeast, pyrite; chalcopryite; chrysocolla.

Elsewhere.—Graphite; tourmaline; garnets; magnetite; limonite; chalcopryite; sulphur; galenite; pyrrhotite; pyrite; psilomelane; asbestos.

SWAIN.

Bryson City.—Rutile; zoisite; limonite after pyrite.

Oconaluftee River.—Gold; galenite, argentiferous; pyrite; chalcopryite.

A. Nichols's.—Pyrolusite; chalcocite; tourmaline.

Quallatown.—Gold, in placers.

Elsewhere.—Itacolumite; magnetite; hematite; limonite; talc.

TRANSYLVANIA.

Boyston River.—Gold, in placers; granular calcite; limonite.

Davidson River.—Chalcopryite; pyrite; flinty quartz.

Mills's River.—Calcite.

Brevard.—Chlorite; graphite; limonite after pyrite; kaolin.

Elsewhere.—Pyrite; chalcopryite; rose quartz; pyrrhotite; tourmaline; graphite; near mouth of Looking-glass Creek, kaolin.

TYRRELL—(None.)

UNION.

Lemmond mine.—Gold (!); electrum (!); galenite; sphalerite; pyrite; arsenopyrite; pyromorphite.

Long mine.—Gold; galenite.

Moore's mine.—Gold; sphalerite; pyrite; chalcopryite; galenite.

Pewter mine.—Electrum.

Phifer mine.—Gold; silver; galenite; also at Lewis mine and Wash-ton mine.

Stewart mine.—Gold (!); electrum (!); galenite; sphalerite; pyrite; arsenopyrite; pyromorphite.

Union mine.—Gold; also at Davis mine, Dulin mine, Fox Hill mine, Crump mine, Cureton mine.

Walkup's mine.—Barite (!), granular.

Smart mine.—Gold; pyrite; chalcoppyrite; galenite; sphalerite.

Elsewhere.—Gold, in veins and placers.

VANCE.

Near Henderson.—Pyrite; chalcoppyrite; talc; calcite.

Kittrell's.—Chalcedony.

WAKE.

Forestville.—Seven miles west, magnetite; menaccanite; prochlorite.

Barton Creek.—Pyrite, large cubes; hematite, pseudomorphous after pyrite; tourmaline; chlorite.

Brassfields.—Calcite; chalcedony.

Witherspoon's.—Granular calcite.

Wyatt's.—Limonite.

Cary.—Pyrite; hematite; martite; sulphur.

Northwest corner of county.—Serpentine; asbestos; actinolite; stea-tite; cyanite.

Soapstone Church.—Talc; asbestos; serpentine.

Morrisville.—Granular calcite.

Raleigh.—Menaccanite (!); epidote; hematite; magnetite; chryso-lite (?); malachite in granite; muscovite; paragonite (?); near Raleigh, pyrite; chalcoppyrite; graphite; smoky quartz; garnet; biotite; 3 miles west, orthoclase; 4 miles northwest, amethyst; $4\frac{1}{2}$ miles west, pyrite; chalcoppyrite; psilomelane; 8 miles west, pyrite and limonite after pyrite.

Elsewhere.—Graphite (!), at Tucker's Mill; pyrite; magnetite; ame-thyst; tourmaline; calcite; at mill on Clifton's Branch, vermicular quartz; in Little River Township, halloysite.

WARREN.

Middleburg.—Micaceous hematite; quartz crystals.

Warrenton.—Eight miles south, limonite after pyrite; 9 miles south, asbestos.

Ransom's Bridge.—Gold; garnet.

Elsewhere.—Quartz crystals; magnetite; epidote; gold, in placers; garnets.

WASHINGTON.

Calcite, in marl beds.

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WATAUGA.

Beech Mountain.—Fine-grained galenite (!); pyrite; magnetite; hematite; at Pogie, galenite.

Cooke's Gap.—Arsenopyrite; hematite (!); magnetite (!); itacolumite (!); limonite; martite.

Cove Creek.—Magnetite; limonite.

Rich Mountain.—Head of Cove Creek; chromite; quartz crystals; actinolite; chrysolite; epidote; penninite; tremolite.

Beaver Dam Creek.—Magnetite.

Elk Knob.—Pyrite; chalcopyrite; pyrrhotite; epidote; limonite; garnet.

Flannery mine.—Argentiferous galenite.

Miller mine.—Pyrite; chalcopyrite; limonite; epidote; chrysolite.

Watauga River.—Calcite; epidote; chlorite.

Elk River.—Jasper; epidote; chlorite; calcite; at L. Banner's, prochlorite; pyrite; quartz.

Hardin mine.—Gold, in placers.

Boone Fork.—Quartz crystals (fine).

Near Boone.—Actinolite; cyanite.

Elsewhere.—Gold in placers; galenite; fluorite; epidote; limonite; magnetite; cyanite; talc; chromite; chlorite; menaccanite; asbestos.

WAYNE.

Fossil wood; lignite; pyrite; calcite, in marl beds.

WILKES.

Wilkesboro.—Two miles north, serpentine; talc; garnet.

Mulberry River.—Magnetite.

Blue Ridge.—Three miles south, on road to Jefferson, garnet; orthoclase; apatite.

Bending Rock Mountain.—Itacolumite.

Brushy Mountains.—Asbestos.

Roaring River.—Magnetite.

Elk Creek.—Galenite; cerussite.

Flint Knob.—Galenite (argentiferous); pyrite.

Elkin Creek.—Barite; limonite; galenite; cerussite.

Honey Creek.—Rutile (!) in acicular crystals in brownish amethyst

Stony Hill.—Chalcopyrite; muscovite.

Trap Hill mine.—Galenite; pyrrhotite; chalcopyrite (auriferous); pyrite; rutile; garnet; tourmaline; magnetite.

Reddie's River.—Serpentine.

Elsewhere.—Graphite; corundum (!), mostly altered into cyanite; pyrite; cyanite (!); mixture of muscovite, margarite, etc., resulting from the alteration of cyanite.

WILSON.

Contentnea Creek.—Orthoclase; biotite.

Stantonsburg.—Pyrite.

Turkey Creek.—Amethystine quartz.

Elsewhere.—Calcite in marl beds; limonite.

YADKIN.

Near Yadkinville.—Gold.

Boyden's quarry.—Calcite, compact and granular.

Campbell mine.—Magnetite.

Hobson's mine.—Magnetite; tremolite; magnetite (!) at East Bend and elsewhere.

Near Forks of Yadkin River.—Calcite.

Jonesville.—Pyrite in cubes in slate; chalcopyrite.

YANCEY.

Grassy Knob (Black Mountains).—Cyanite; muscovite.

Black Mountain.—Graphite.

Bald Mountain.—Grayish green actinolite; magnetite.

Burnsville.—Platinum (?); labradorite (!) 6 miles north of Burnsville; tourmaline at Parrot's Ford, 3 miles from Burnsville; tantalite (!); 4 miles north of Burnsville, chromite and talc; 1 mile west, kaolin; 3½ miles west, margarite.

Hampton's, Mining Creek.—Chromite (!); chalcedony; enstatite; tremolite (!); actinolite; asbestos; chrysolite (!); orthoclase; talc (!); serpentine; deweylite; penninite; magnesite; epidote, in fine green crystals; bronzite; hornblende; prochlorite (?).

Hurricane Mountain.—Cyanite (!); titanite; muscovite.

Bald Creek.—Chrysolite; talc; asbestos; serpentine; tremolite; chlorite; pyrite; actinolite; epidote.

Ivy River.—Menaccanite.

Ray's mica mine.—Fluorite (!); pseudomorphous after apatite; yttracite (?); beryl (!); garnet; zircon; rutile; muscovite (!), also a scaly pink variety; orthoclase; tourmaline (!), black and yellowish green; kaolinite; columbite; apatite; monazite, very rare; autunite; amazon stone; cyanite; albite; smoky quartz; quartz crystals; actinolite; talc; glassy feldspar.

Mitchell's Peak.—Cyanite; fibrolite; garnet; biotite; tourmaline.

South Toe River.—Uranochre (?); muscovite; garnet; hyalite; gumite; autunite; garnet.

Proffit's.—Corundum; muscovite; asbestos; garnet; penninite (?); talc; near Proffit's, chrysotile; fibrous talc.

Young's mine.—Enstatite; chlorite; serpentine; chrysolite; chromite; talc; asbestos; tremolite; pyrite; manganese garnet, and garnet crystals; bronzite; tourmaline; muscovite.

Westall mine.—Cyanite.

Presnell (Young's) mine.—Muscovite; albite; apatite; autunite.

Gibb's mine.—Muscovite; albite; garnet; glassy feldspar.

Guggenheim's mine.—Muscovite; albite; manganese garnet; apatite; hyalite; tourmaline; autunite.

Rocky Creek.—Muscovite; pyrite; graphite.

Elsewhere.—Graphite; allanite; cyanite; columbite; magnetite; on Crabtree Creek, massive reddish garnet; rutile; muscovite; in many mica mines, pyrite.

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