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THE
MINERALS OF LANCASTER COUNTY

BY

HERBERT H. BECK

*Professor of Chemistry and Mineralogy, and Curator of the Mineral Collection
Franklin and Marshall College*

PUBLICATION OF THE LINNÆAN SOCIETY OF LANCASTER COUNTY
ON THE OCCASION OF ITS FIFTIETH ANNIVERSARY

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PREFACE

In the presentation of *The Minerals of Lancaster County* the author aims to describe, as clearly and simply as possible, within the limits of scientific terminology, the species, or definite inorganic compounds, which occur within the region. For the purposes of the work, general descriptions of the species involved are unnecessary. Reference to Dana's standard treatise is recommended for this data. It is important rather to treat of localities and to emphasize peculiarities of chemical composition or physical properties which may make the local minerals distinctive from the same species occurring elsewhere.

In the preparation of the pamphlet use has been made of the following references:

"*The Mineralogy of Pennsylvania*," F. A. Genth (published by the State), 1875. Dr. Genth was familiar with the two most prolific localities, Wood's mine and Gap mine, during the period when they were being worked, and his scholarly notes on species found there are complete and satisfactory.

"*List of Lancaster County Minerals*," E. S. Dana. This well-known authority follows Genth's report rather closely.

List of the minerals as published in Mumbert's "*History of Lancaster County*," J. B. Kevinski.

The abbreviations G., D., and K. stand for these references. R. is used for Professor Roepper, of Lehigh University, a mineralogist of attainment and reputation in the earlier days of the science. Where the author has not been able to confirm the records of these observers he uses their data with the letter indicating the authority. Many of our species, on account of limited occurrence, or closing of the sources, can no longer be found in the county, and in such cases reliable records are particularly valuable. Dana's text-book is used as the basis of classification and order. All analyses, unless otherwise specified, were made by the author or under his immediate direction.

Species which are abundant, prominent or especially interesting are named in heavy type; those rare or obscure, in italics.

Acknowledgment is made to H. L. Willig, of Lancaster, Pa., whose enthusiasm and energy have brought to light much new material; to Franklin and Marshall College students, L. Humphreville, I. C. Rhodes, J. L. K. Snyder, D. C. Colebaugh, W. E. Weissgerber, H. Hassenplug and others for assistance in collecting and analysis; to the Steinman Hardware Company, by whose courtesy the excellent map of the county became available; and to several past members and active colleagues of the Linnaean Society, whose painstaking and brilliant work on the natural history of Lancaster County has done much to stimulate the author's interest in the local mineralogy.

HERBERT H. BECK.

MINERALS OF LANCASTER COUNTY.

NATIVE ELEMENTS

Graphite. Plumbago. Carbon. True graphite occurs in a small deposit in Providence township. Shining black graphitic material, sometimes called "slickensides," is found at many points in the county, and is often mistaken for graphite or coal. It is a carbonaceous argillite. Analysis of a typical specimen of this from E. Cocalico shows how far removed it is from graphite: graphitic carbon 18.5 per cent., impure hydrous aluminium silicate 81.5 per cent.

Gold. Occurs as traces in Pequea argentiferous galenite. Also reported by Genth in ores from the Gap mine, though several assays failed to confirm this statement.

Copper. Native arborescent sheets, at Gap mine (G.).

SULPHIDES, ARSENIDES, ETC.

Galenite. Galena. Lead sulphide. PbS . Bamfordville (E. Hempfield), in small lustrous crystals with sphalerite in dolomite; Salisbury township, in quartz (R.); Chestnut Riffles in the Susquehanna river (Haldeman); Pequea township, at the old silver mine as a highly argentiferous variety, for the most part coarsely crystalline, usually in quartz. The Pequea galenites are interesting as exhibiting octohedral cleavage in certain of the finely crystalline parts of the deposit, and as containing about 250 oz. of silver and a trace of gold to the ton. The Pequea mine was worked for silver before the Revolution.

Chalcocite. Copper glance. Cu_2S . Wood's mine, associated with chromite, very rare (G.); near Reamstown (E. Cocalico), associated with malachite and azurite as small scattered deposits in the mesozoic shales.

Sphalerite. Zinc blende. Zinc sulphide. ZnS . Bamfordville (E. Hempfield), associated with dolomitic limestone, and, more rarely, with galenite. Near East Petersburg (Manheim), in dolomitic rock. Both deposits were worked with meager returns. The sphalerites are typically resinous in appearance.

Pentlandite(?). $(FeNi)S$. Gap mine (Bart), with pyrrhotite, constituting the non-magnetic part of the bronze yellow ore.

Millerite. Nickel sulphide. NiS . Gap mine, incrustations of radiating, closely set needles, usually with velvety surfaces on the unattached faces, with niccoliferous pyrrhotite. The form is characteristic and distinctive of the locality. Millerite is one of the notable minerals of the county. With brucite it has done more to bring into the academic circles of the world the name of Lancaster County, Pennsylvania, than any other natural feature within her borders. The more

common type of millerite, long, fine, separated needles, is also found, more rarely, at the Gap mine. At Wood's mine, with chromite, rare (D.).

Pyrrhotite. Magnetic pyrite. Fe_7S_8 . Gap mine, associated chiefly with amphibole, pentlandite and millerite. The variety is highly nickeliferous and contains copper with traces of cobalt and lead. The deposit was discovered in 1732 and was worked with intermittent regularity, first for copper—subsequently for nickel and copper—until about 1875. Between 1853 and 1875 the Gap mines were the chief source of the world's supply of nickel. The pyrrhotite averages about 2.5 per cent. of nickel. Quarryville, with orthoclase, in crystalline plates (G.); evidently rare, not confirmed.

Chalcopyrite. Copper pyrite. CuFeS_2 . Gap mines, associated with the pyrrhotite, etc. At Dillerville (Manheim), rarely in quartz veins running through the dolomitic limestone.

Pyrite. Iron pyrite. Iron sulphide. FeS_2 . Widely distributed throughout the county, usually in cubes imbedded in limestones and argillites; also in the soils of many localities in partly or wholly altered condition (see limonite). Interesting varieties occur at the Gap mine, cubes modified by octohedra; on the Boice farm (Fulton), combinations of cube, octohedron and pyritohedron, with brown tarnished surfaces, in talcose slates (G.); and in the rock underlying the city of Lancaster, large nearly perfect cubes.

Marcaisite. White iron pyrite. FeS_2 . Gap mine, a niccoliferous variety, nearly white in color, closely resembling arsenopyrite. An analysis shows Fe 44.96, S 52.25, Ni .25.

Tennantite. Sulpharsenide of copper, iron and zinc. At Bamfordville, as steel gray to black metallic masses in the limestones; rare. The mineral shows the constituents of tennantite qualitatively, though absolute identification awaits quantitative analysis.

HALOIDS

Fluorite. Fluorspar. Calcium fluoride. CaF_2 . Not uncommon in the limestones of the county, rather widely distributed. Particularly interesting localities are Millersville (Manor), where the species occurs in grayish white masses showing almost no crystalline structure; in the rock about Lancaster, well formed cubes of a deep purple color; and similarly about Ephrata.

OXIDES

Quartz, SiO_2 . Occurs almost everywhere in the county in one form or another; most commonly in pockets and veins in the bed rock or in free masses in the soil as the massive milky variety. Though much of the local quartz is ill defined in character the following typical varieties can be recognized:

- a. Rock Crystal, of varying transparency, throughout the county, chiefly in the limestone regions. Superior crystals of extraordinary size have been found in the Keller limestone quarries (Manheim), one half mile north of Lancaster and about Rossmere (Manheim).

- b. Amethyst. East of Quarryville, near Eden-Bart line, in the top soil. Specimens found are well crystallized but the true amethystine color is too strongly modified by brown to admit of their use as gem stones.

- c. Rose Quartz. Gap Hills (K.).

- d. Smoky Quartz, deeply colored, massive; common about the Gap nickel mine. Near New Holland a variety of smoky quartz, of uncertain color, has been found in crystals four to five inches long and about two inches thick (G.).

- e. Milky Quartz, abundant everywhere, chiefly massive.

- f. Sagenetic Quartz (containing needle-like crystals of tourmaline or rutile) (K.).

- g. Ferruginous Quartz. Specimens variously stained and colored by iron are met with throughout the county.

- h. Chalcedony. Occurs with several other interesting varieties of cryptocrystalline quartz about Rock Springs (Fulton). The usual colors are light brown and gray. Much of it is fairly translucent.

- i. Carnelian. Of brownish-red hue and fair translucency, about Rock Springs.

- j. Agate. Moss agate of well-defined character, about Rock Springs.

- k. Agate Jasper; about Rock Springs.

- l. Jasper. Several localities of the county have the impure, opaque colored varieties of quartz of dull luster which may be classed as jaspers, though typical jasper is rare. That which approaches most closely to the true form occurs near Little Texas (Fulton), a reddish brown variety (G.); at Rock Springs, yellow (K.); and in the northern parts of Clay and West Cocalico townships, brown-yellow and red. Many of the local arrow heads are jasper, but much of this material undoubtedly was brought into the county by the Indians from elsewhere.

- m. Quartzite. In the Chiques quartzite region of East Donegal, the Hempfields and Manheim townships.

Opal. Mentioned by Kevinski.

Cuprite. Red copper ore. Cuprous oxide. Cu_2O . Occurs near Reamstown (E. Cocalico) in small, deep red masses associated with other copper minerals.

Tenorite. Melanconite. Black copper oxide. CuO . Associated with the several copper minerals mentioned as occurring in E. Cocalico township. Rare.

Corundum. Aluminium oxide. Al_2O_3 . Genth states that a small mass of grayish white and blue material showing perfect cleavage was found near the chrome mines. No other occurrence has been reported.

Hematite. Red hematite. Sesquioxide of iron. Fe_2O_3 . Wood's mine (D.). Probably occurs in some of the limonite deposits of the county. Rare.

Ilmenite. Menacconite. Titaniferous hematite. $(\text{FeTi})_2\text{O}_3$. Material containing varying amounts of titanium with the oxides of iron occurs throughout the southern and eastern portions of the county, usually in small isolated occurrences consisting of black sub-metallic plates in quartz. There is a small deposit near Baumgardner's Station

(Pequea), and it occurs at Wood's mine (D.), near Rock Springs (D.), and near New Holland (R.).

Magnetite. Magnetic iron ore. Fe_3O_4 . This valuable mineral occurs chiefly in Martic township, where it is found in considerable quantities as black grains, one sixteenth to one eighth of an inch in diameter, disseminated through milky quartz. Attempts to make the magnetite of this ore available for reduction, by magnetic concentration and briquetting, have as yet proved uneconomical. The mineral also occurs in the serpentines of the southern end, often in minute octohedra, as about White Rock (Little Britain), and near Rock Springs.

Chromite. Chromic iron. FeCr_2O_4 . Occurs in the serpentine rocks of Fulton and Little Britain townships as deposits ranging from scattered grains to lenticular vein-like masses of commercial value. Prominent among the latter are the occurrences of Wood's mine (Fulton) and Low's mine. The former working was an important source of chromite prior to 1875, about 125,000 tons having been taken from this deposit. Most of the ore was used in the preparation of potassium dichromate. Wood's mine was worked to a depth of 700 feet, with galleries about 1,000 feet long. It is of great interest to mineralogists on account of the many rare species, especially brucite, which are associated with the chromite. To-day Wood's mine is a gaping, water-filled cavern, surrounded by dumps covered with vegetation; commercially it is only a vague memory, but its name will always be perpetuated in the museums of the world by the superior specimens of brucite, kämmererite and genthite which were taken from it. Red Pit, Rock Spring mine, Little Horseshoe mine and Carter's mine were deposits which yielded from 30 to 1,000 tons of chromite. A typical analysis of the mineral from Wood's mine shows chromic oxide 63.4, ferric oxide 38.7, nickel oxide 2.3 per cent.

Rutile. Titanium dioxide. TiO_2 . Occurs in the older rocks and soils of most of the townships south of Lancaster City. In crystallized condition it is most abundant perhaps in Eden, Bart, and Sadsbury, where many large, well-formed specimens have been found, and where, indeed, it has been a source of profit to persons who collect it for its value as a coloring substance in the manufacture of artificial teeth. It occurs massive with quartz at the old Pequea mine; and it is reported as having been found as acicular crystals penetrating limpid quartz near Kinzer's (Paradise) (G.).

Brookite. Monoclinic TiO_2 . One typical crystal was found at Carter's chrome mine (G.).

Pyrolusite. Manganese dioxide. MnO_2 . Occurs in more or less hydrated form, sparsely scattered through the copper-bearing rocks of E. Cocalico township.

HYDROUS OXIDES

Turgite. $2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$. An interesting ore of iron closely related to limonite, with which it is associated at many of the localities of the county where the latter mineral is found. It differs from limonite in having less water and a red streak; otherwise it resembles limonite physically and is often mistaken for it. An impure sample from

Providence township shows on complete analysis, Fe_2O_3 70.55, Al_2O_3 8.29, CaO .84, MgO .90, SiO_2 14.32, TiO_2 0.28, H_2O 2.66.

Göthite. $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$. As fibrous, crystalline coatings, of deep ruby red color, on the limonites of the Chestnut Hill deposits (E. Hempfield); probably also at several other localities similarly associated.

Limonite. $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$. Occurs in considerable deposits in the eastern, western and southern parts of the county. The ore is usually found distributed through the soil in masses, often geodic, varying from a few pounds to several hundredweight. It has been quarried, with large output in the aggregate, at about twenty-five places in the county, though none of these workings is active at the present time. The most important banks perhaps were those at Chestnut Hill (E. Hempfield), about Quarryville (Providence and Eden) and at Beartown (Caernarvon). The local limonites are high in phosphorus, particularly that about Beartown; and those of the southern end usually contain titanium (see analysis of turgite).

Var. Pseudomorph after Pyrite. Many interesting crystals occur in the soils of the county, chiefly in townships immediately north of Lancaster. The cube is the most common form, the small deep brown blocks being familiar objects on many farms. In Manheim township, immediately south of the Neffsville ridge, may be found nearly perfect pyritohedra; twinned pyritohedra showing re-entrant angle; combinations of cube, octohedron and pyritohedron; and globules formed by complex repeated twinning.

Var. Ocherous or earthy, brown yellow to ocher yellow, mixed with the more compact forms at Chestnut Hill and several other localities.

Var. Bog Ore. Reported in W. Cocalico township (K.).

Brucite. Magnesium hydroxide. $\text{Mg}(\text{OH})_2$. Occurs at Wood's chrome mine. The specimens are remarkable for their beauty and variety of crystalline form, being far superior to any from the few other parts of the world where this rare mineral is found. During its period of activity the mine was in high favor by mineralogists as a source of brucite; and even to-day when it is difficult to find so much as a fragment of the mineral on the weathering dumps, Wood's mine still maintains its world-wide reputation for its brucites. The species occurs here in large tabular crystals, groups of crystals in rosettes and globular masses, and most commonly in foliated plates; more rarely in radiating masses inclining to fibrous. The predominating color is delicate pale green. Also at Low's mine (Fulton) in similar forms of somewhat inferior character. Chemical analysis shows traces of manganese in the brucites from both localities (G.).

Psilomelane. Hydrated manganese manganate, of uncertain and widely varying composition. Occurs in several of the limonite beds of the county, especially about Beartown. Analysis from this locality shows: MnO_2 56.75, MnO 31.30, Fe_2O_3 6.44, $\text{Co}(\text{Cu Ni})$ oxides 1.27, siliceous matter 1.80, water, 2.44.

Var. Wad. Similar composition; loose structure. Occurs as thin

coatings on the disintegrating sandstone at the sand pit in the eastern part of Lancaster City.

CARBONATES

Calcite. Calcium carbonate. CaCO_3 . This mineral occurs abundantly in Lancaster County. As limestone, mostly magnesian and grading into dolomite, it comprises the underlying bed rock of nearly one half of the total area. Considering its usefulness and extensive application for structural and agricultural purposes limestone is the most permanently valuable mineral of the county. The following varieties are deserving of special description:

- a. Nailhead Spar. Flattened rhombohedra, transparent and nearly colorless, resembling the driven head of a hand-wrought nail; in the rock about Lancaster City; rare. A beautiful specimen in the F. & M. collection was found near the city gas plant, west of South Prince Street.
- b. Iceland Spar. Transparent, crystalline masses with highly developed cleavage; at city gas plant (K.), and south of the city near third lock; rare.
- c. Dog-tooth Spar. Quarryville, in cut of low grade railroad.
- d. Marble. At several localities the limestones approach the color and texture of a true marble, as in Warwick township, north of Lititz; nowhere, however, has the material been commercially valuable on account of dry veins running through the mass.
- e. Tufa. At Gable's Park on the Conestoga, south of Lancaster City, in considerable masses. East of Lancaster City (K.).
- f. Hydraulic limestones (cement rock). Much of the rock about the confluence of the Cocalico and Conestoga creeks is chemically right for the manufacture of Portland cement.
- g. Stalactite and Stalagmite. Caves and caverns throughout the limestones.
- h. Mangano-calcite. A black crystalline variety of interesting chemical composition occurs in West Earl township, near the Cocalico creek. Analysis shows CaO 52.89, MgO 1.51, MnO .41, FeO 2.04, ZnO .19, Al_2O_3 .44, Fe_2O_3 .57, CO_2 41.23, SiO_2 .82.
- i. Limestone. The limestones of the county vary greatly in color, texture and chemical composition. Most are dolomitic in character. Compositions grade between the two extremes: on the calcite side a bank in the southeast corner of Warwick township, CaCO_3 98.5-99 per cent., to approximately the composition of a true dolomite at many points throughout the region.

Dolomite. $\text{CaCO}_3 \cdot \text{MgCO}_3$. Exists as limestone abundantly. True dolomite occurs at Wood's mine as grayish-white globular incrustations. Under the lens these globules are hexagonal prisms with rhombohedral terminations. Composition is CaCO_3 52.64, MgCO_3 46.83 per cent., which practically agrees with the theoretical $\text{CaCO}_3 \cdot \text{MgCO}_3$ (G.).

Var. Pearlspar. Crystals of curved rhombohedra with pearly luster occur in the seams of the massive dolomites.

Var. Ankerite. Brown Spar. $2\text{CaCO}_3 \cdot \text{MgCO}_3 \cdot \text{FeCO}_3$. Red brown rhombohedra on the dolomite; city gas plant, Quarryville, and elsewhere in southern central townships; rare.

Magnesite. Magnesium carbonate. MgCO_3 . Occurs as white masses at Wood's mine and Low's mine; also in the serpentine near Black Barren Springs (Fulton), where considerable quantities of it have been quarried. Reported at Landisville (E. Hempfield) (K.).

Siderite. Ferrous carbonate. FeCO_3 . Crystallized siderite and the concretionary variety, sphaerosiderite, occur rarely on the pyrrhotites at the Gap mine. Black band is also reported (K.). A specimen from Gap mine showed 36.3 per cent. Fe.

Smithsonite. Zinc carbonate. ZnCO_3 . Occurs at Bamfordville in massive, somewhat concretionary form, grayish white to brown in color. Analysis of typical sample showed 47.85 per cent. Zn.

Aragonite. CaCO_3 (Orthorhombic). Occurs at Wood's mine, often in groups of radiating crystals of superior character; reported near Safe Harbor (Conestoga) as tufts of acicular crystals (K.); at Wabank (Lancaster) (K.); and also in several caves south of Lancaster City in incrusting and coralloidal forms.

Cerussite. Lead carbonate. PbCO_3 . Occurs as minute crystals coating the galenites at Pequea mine (D.), and at Bamfordville (G.).

HYDROUS CARBONATES

Malachite. Basic copper carbonate. $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$. Green incrustations, inclining to dull and earthy; in parts of E. Cocalico township, as near Reamstown.

Azurite. $2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$. Occurs with malachite in E. Cocalico township; also reported as occurring near Reinhold's Station in crystalline seams (G.).

Aurichalcite. Basic carbonate of zinc and copper. $2(\text{ZnCu})\text{CO}_3 \cdot 3(\text{ZnCu})(\text{OH})_2$. Sparingly found at Bamfordville in fine pale bluish green scales or incrustations upon dolomite or smithsonite (G.).

Hydrozincite. $\text{ZnCO}_3 \cdot 2\text{Zn}(\text{OH})_2$. Has rarely been met with in white incrustations upon smithsonite at Bamfordville (G.).

Hydromagnesite. Basic magnesium carbonate. $3\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 + 3\text{H}_2\text{O}$. A rare mineral found at Wood's and Low's mines, usually as chalky crusts. A mixture of hydromagnesite and brucite found at these localities was formerly called lancasterite.

Hydrodolomite, v. Pennite. Hydrous calcium magnesium carbonate containing nickel. Occurs at Wood's mine as pale apple green, globular incrustations on chromite or serpentine. The mineral is of somewhat uncertain identity. Analysis by G. shows NiO 1.25, MnO .40.

Zaratite. Emerald nickel. Hydrated basic nickel carbonate, $\text{NiCO}_3 \cdot 2\text{Ni}(\text{OH})_2 + 4\text{H}_2\text{O}$. Occurs at Red Pit and Low's mine (G.) in beautiful emerald green incrustations—usually minutely mammillary—on the chromite. Sometimes confused with pennite and genthite.

ANHYDROUS SILICATES

Orthoclase. Potash feldspar. KAlSi_3O_8 . Occurs in the igneous rocks of W. Cocalico township, associated with muscovite; usually in pale brown or pink well-cleaved masses. Analysis of this orthoclase shows that nearly one half of the theoretical potassium is replaced by sodium.

SiO₂ 62.42, Al₂O₃ 20.72, Fe₂O₃ 0.21, K₂O 7.60, Na₂O 5.96, CaO 3.67 (specimen from mica mine one mile northeast of Cocalico P. O.). Reported also in Bart (K.) and occurs at several points throughout Little Britain and (probably) Fulton.

V. Moonstone. Translucent Orthoclase with bluish opalescence; Little Britain (K.).

Albite. Soda feldspar. Reported by Genth as occurring at a chrome mine in Lancaster County; compact, granular, grayish white in color, resembling dolomite. Analysis of this material by Brush shows soda 9.36, with no potash.

Enstatite, var. Bronzite (MgFe)SiO₃. Occurs at Wood's mine (D.). Also on M. Boice's farm nearby (D.).

Pyroxenc. RSiO₃. Pyroxenes are rare if not absent in the county. The var. Augite, reported at Gap mine, has not been confirmed by any observer, and its occurrence there is denied by Genth. The latter (G.) reports a grayish green crystal, "which seems to be a pyroxene, in a micaceous rock near Texas."

Pectolite. HNaCa₂(SiO₃)₂. A pocket of this mineral, beautifully crystallized and of a cream white color, was opened recently (1911) in the dyke at Rock Hill (Conestoga). It is associated with phrenite. Analysis shows H₂O 3.27, SiO₂ 51.88, Al₂O₃ 1.42, CaO 31.50, Na₂O 10.79, K₂O 0.29, which agrees closely with the theoretical composition.

Anthophyllite. Reported near Texas (K.); identification possibly confused with enstatite.

Amphibole, var. Actinolite, Ca(MgFe)₂Si₄O₁₂. Occurs at Gap mine as grayish green, columnar to fibrous material, unattractive to the collector.

Var. Hornblende (aluminous). A common mineral about the Gap mine, where it is found in deep green masses associated with the ore. Good crystals, one inch in length by one half in thickness, are reported by Genth from this locality.

Garnet, var. Andradite, Ca₃Fe₂Si₃O₁₂. Considerable garnet, probably andradite, occurs throughout the southern townships, especially in the chlorites along the river hills. Most of it is badly decomposed, there being often little but rust-filled cavities left to mark the positions of former crystals.

Var. Ouvarovite. Lime-chrome garnet. This exceedingly rare and beautiful garnet has been found two or possibly three times at Wood's mine (G.), where it apparently occurs in small emerald-green crystals, not over one tenth of an inch in diameter, scattered through pale green, granular clinocllore, intermingled with brownish gray vermiculite. The few specimens found show planes of the rhombic dodecahedron distinctly.

Chrysolite. Olivine. (MgFe)₂SiO₄. This species, which probably was at one time abundant locally, is the mineral of which our talcs and serpentines are alteration products. Only traces still exist as chrysolite. It occurs of superior color (yellowish green) and translucency associated with chromite at Wood's mine (D.); apparently rare.

Cyanite. Al₂SiO₅. This attractive mineral occurs at Rawlinsville (Martic), where masses of it were taken out during the digging of a well. The local variety is typical—well-defined blades, centrally deep blue, shading to light gray at the edges.

Epidote. HCa(AlFe)₂Si₃O₁₁. Reported as occurring in Earl township (K.).

Phrenite. H₂Ca₂Al₂Si₂O₁₂. Found with pectolite in the trappe rock at Rock Hill. The local phrenite is a handsome mineral, light green and translucent, with a compact impalpable structure.

Chondrodite. H₄Mg₁₀Si₈O₃₄F₄. Occurs as bright orange yellow to brown yellow, nearly transparent grains, associated with purple fluorite, in the dolomites east of Ephrata (Ephrata township). It is crystalline and brittle. Not common.

Calamine. Hydrous zinc silicate. H₂Zn₂SiO₆. Occurs at the Bamfordville deposits (E. Hempfield). Occasionally as minute crystals.

Tourmaline. Complex silicate of boron and aluminium. This mineral, commonly coal black and finely columnar, is distributed more abundantly perhaps than elsewhere in the rocks of the Pequea, Providence, Eden, Bart belt. It also occurs in other southern townships, nowhere plentifully, however. Fairly good crystals may be found about the Gap mine, and an interesting black granular variety is not uncommon about Herrville, Pequea township. A green tourmaline imbedded in talc is mentioned by Dana as occurring near Rock Springs.

Muscovite. Mica. H₂KAl₃Si₃O₁₂. Occurs in the igneous rocks of W. Cocalico township. A deposit one mile east of Cocalico postoffice has been worked commercially. Much of the micaceous material of the rock masses of southern Lancaster County is probably muscovite.

Biotite. Black mica. (HK)₂(MgFe)₂Al₂Si₂O₁₂. Most of the dark-colored scales in the local gneisses and schists are probably biotite.

Lepidolite. Lithia mica. Reported by Kevinski.

Margarite. H₂CaAl₄Si₂O₁₂. Said to occur along Pequea Creek in Pequea township (K.); var. Phyllite is mentioned by G. as occurring in siliceous limestones at Pequea mine as minute greenish black scales.

Clinocllore. H₃Mg₃Al₂Si₃O₁₈. A common mineral at Wood's mine and in vicinity. Occurs usually as green flexible laminae. The green micaceous or scaly rock masses of the southwestern townships are chlorites, though their exact identity as this species or prochlorite has not as yet been determined.

(Penninite), var. Kämmererite, H₃(MgFe)₆(AlCr)₂Si₃O₁₈. An interesting and beautiful chrome chlorite occurring at Wood's mine as peach blossom red, scaly, fibrous aggregations with the chromite. A notable mineral of that locality. It polishes well and has a gem value. *Rhodochromc*, closely related to kämmererite, deep green, but violet or rose in thin splinters, also occurs there.

Prochlorite, a green chlorite, H₁(MgFe)₃Si₂O₉. A probable constituent of the chlorite schists of southern Lancaster County.

Serpentine. H₁Mg₃Si₂O₆. Occurs abundantly in Fulton and Little Britain townships, where it comprises the bed rock of considerable areas. Many varieties are found. The prominent types of these are:

- a. Massive, ordinary. Common about Wood's mine, Black Barren Springs and elsewhere; usually blackish muddy green, sometimes, however, of lighter shades and varying hues.
- b. Williamsite. A semi-precious serpentine, compact and impalpable, attractive for its fine light green color and bright translucency. It takes a good polish and has been used as a gem stone. Occurs at Wood's mine with chromite and similarly at Low's mine and Line Pit.
- c. Marmolite. A thinly foliated variety usually light grayish green. It is probably an alteration product of brucite.
- e. Asbestos. Chrysotile. Occurs in narrow seams running through serpentine at several points in the serpentine regions, as at White Rock (Little Britain) and elsewhere. The material consists of olive green or greenish white fibers with a submetallic silky luster. The fiber is usually delicate and easily separable but seldom over one half an inch in length.
- f. Picrolite. Occurs about the chrome mines as dark grayish or bluish green fibrous masses. The fibers are splintery and difficultly separable. Baltimorite is a subtranslucent kind of picrolite, found about Wood's mine, which has a grayish green color and a silky luster.

Deweylite. $4\text{MgO} \cdot 3\text{SiO}_2 \cdot 6\text{H}_2\text{O}$. A curious substance found with serpentine at Wood's mine, and possibly elsewhere. It is amorphous, with a strong resemblance to gum arabic, or a light-colored resin. The usual colors are whitish yellow, wine yellow, greenish and reddish. It is brittle and often much cracked. Deweylite forms with comparative rapidity like calcareous incrustations in caves. It may be found at Wood's mine in process of formation on rock faces exposed less than forty years ago.

Genthite. $2\text{NiO} \cdot 2\text{MgO} \cdot 3\text{SiO}_2 \cdot 6\text{H}_2\text{O}$. Occurs at Wood's mine as amorphous, delicately hemispherical, mamillary or stalactitic incrustations; colors, apple green to yellowish green; luster resinous. Genthite is often confused with pennite and zaraitite.

Talc. $\text{H}_2\text{Mg}_3\text{Si}_4\text{O}_{12}$. Occurs somewhat commonly in the serpentine ranges of Fulton and Little Britain townships, as at the several chrome mines, at White Rock and about Rock Springs. Two varieties, foliated and steatite, may be found. A slightly off-colored steatite was quarried for a short period at White Rock and subsequently crushed, ground and bolted for the market.

Kaolinite. $2\text{H}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$. Occurs at Chestnut Hill, of several light tints; at Churchtown road (Caernarvon), of dead white color, and possibly elsewhere. Never strongly coherent, grading into ordinary clays. The Lancaster kaolinites apparently contain considerable admixed quartz or feldspar, as silicic acid is abnormally high, the Chestnut Hill material showing 67.1 per cent. (G.), and that from Caernarvon 72.90 per cent.

The compact variety, lithomarge, has also been reported (K.).

PHOSPHATES, ETC.

Vivianite. Hydrous ferrous phosphate. $\text{Fe}_3\text{P}_2\text{O}_8 + 8\text{H}_2\text{O}$. This mineral is reported as occurring rarely at the Gap mine in very fine, almost colorless, slender, prismatic crystals nearly one and one half inches long; also as small modified steel-blue crystals (G.).

Strengite. $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$. Occurs on the Beartown limonites as grayish white translucent globules and radiated aggregates seldom more than one sixteenth of an inch in diameter, associated with cacoxenite; exceedingly rare.

Wavellite. $4\text{AlPO}_4 \cdot 2\text{Al}(\text{OH})_3 + 9\text{H}_2\text{O}$. Reported by Genth as occurring rarely on the Chestnut Hill limonites as very small slightly reddish white concretions.

Cacoxenite. $2\text{Fe}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 12\text{H}_2\text{O}$. This beautiful and rare mineral occurs sparingly in cavities in the Beartown limonites as golden yellow radiating tufts. Cacoxenite is an attractive species to the mineralogist, as it is found at but three or four localities in the earth's crust. Only small amounts have been collected at Beartown on account of its scarcity and fragile nature.

SULPHATES, ETC.

Vauquelinite. A phospho-chromate of lead and copper. Reported as occurring at Pequea mine (D.).

Melanterite. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. Occurs as an alteration product on the ores of Gap mine. Water soluble and fugitive.

Chalcanthite. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Occurs with melanterite at Gap mine (R.).

Copiapite. $2\text{Fe}_2\text{O}_3 \cdot 5\text{SO}_3 \cdot 18\text{H}_2\text{O}$. Gap mines (R.).

HYDROCARBON COMPOUNDS

Coal. Occurs rarely in the mesozoic rocks above Newtown (Clay) and possibly elsewhere in that range. The material is found in small seams and veins, seldom more than one fourth of an inch thick. Specimens analyzed show volatile combustible matter 39.23, fixed carbon 57.01, ash 3.75. Several unsuccessful attempts have been made to find veins of commercial value.

Fossil Resin. Reported in bog iron ore near Schoeneck (W. Calico) (K.).



