SYMPOSIUM

SPECIMEN MINERALOGY OF THE MID-ATLANTIC REGION

Presented at West Chester University

November, 1991

SPONSORED BY

FRIENDS OF MINERALOGY, PENNSYLVANIA CHAPTER

ACKNOWLEDGEMENTS

The Symposium Committee wishes to express its appeciation to all those others who have contributed their time, effort and knowledge to make this symposium possible.

Especially to be thanked are Dr. Peter Leavens for his guidance and other help with the lecture program, Seymour Greenberg for his many-facetted efforts on our behalf as the representative of our host, West Chester State University, and Juliet Reed, for organizing and producing the printed program, as well as for many helpful suggestions.

Chapter President, Arnold Mogel, although not a formal member of the committee, was, of course, a principal participant in much of the work, and in the many decisions which are required to organize an activity of this kind, and we are pleased to express our thanks.

We would also like to express our appeciation to the participants in the exciting "What's New" program on Friday evening, and to the contributors to the Auction, which helps fund our Chapter activities.

Arthur Dorne, Chairman
Symposium Committee

PROGRAM

Fri., Nov. 8 6 p.m. to 7:30 p.m.	Social get-together and informal self-service supper in the University Cafeteria in Lawrence Hall.
7:45 p.m. to 9:30 p.m.	"What's New in Mid-Atlantic Mineralogy?", in Schmucker Hall. Capsule reports on active localities and recent finds. Bring slides, specimens, etc.
Sat., Nov. 9 8 a.m. to 8:30 a.m.	Registration in Schmucker Hall.
8:30 a.m. to 8:45 a.m.	Welcome by Seymour Greenberg, West Chester University, and others.
8:45 a.m. to 11:45 a.m.	Lecture Session Chaired by Peter Leavens, University of Delaware:
	"The Specimen Rescue Operation at the Sterling Hill Mine, Ogdensberg, New Jersey," by Bernard Kozykowski, collector/ rescuer.
	"Formation and Metamorphosis of the Orebodies at Franklin and Sterling Hill, New Jersey," by Peter Leavens, University of Delaware
	Break: Refreshments.
	"The West Branch, Newark, Delaware, Pegmatite: an Occurrence of Exceptional Schorl and Clinochlore Pseudomorphs after Garnet," by Roland Bounds, Delaware Geological Survey.
	"Pegmatite Minerals from the Amelia Courthouse District, Virginia: a Review and Update on This Notable Locality," by L.E. Kearns, James Madison University.
	"Minerals of the Serpentine Rocks of Maryland, Pennsylvania, and Delaware, " by Allen V. Heyl, U.S. Geological Survey, Denver, Ret'd.
Noon to 1:45 p.m.	Luncheon and Talk in the Faculty Dining Room, Lawrence Hall: "The Mineral Museum at the University of Delaware," by Peter Leavens, Curator. Anecdotes, illustrated with slides of many exceptionally beautiful specimens.
2 p.m. to 3:30 p.m.	Lecture Session, continued, in Schmucker Hall.
	"Zeolites and Associated Minerals, including Pyrite Crystals with Right-Angle Bends, from the Amygdaloidal Basalt of Sugar Grove, W. Va.," by L.W. Kearns, James Madison University.
	"Native Copper Occurrences of the South Mountain Region of Pennsylvania and Maryland: a Historical Perspective," by Jay Lininger, Collector/Historian.
	"Native Copper Occurrences of the Lake Superior Region of Northern Michigan," by Stanley Dyl, Seaman Museum, Michigan Technological University.
	These last two talks will be closely coordinated, with discussions by the speakers on the differences and similarities of the two localities.
4 p.m. to 5 p.m.	Benefit Auction
Sunday, Nov. 10 10:30 a.m. to 12:30 p.m.	Visit to the Mineral Museum, University of Delaware, Newark, hosted by Peter Leavens, Curator. Some specimens not normally on display will be shown.

WHAT'S NEW IN MID-ATLANTIC MINERALOGY?

These brief, informal reports, and others, were made at the Friday evening session of the 1991 Symposium.

Connecticut (guest state)

Marcelle Weber, former president of the national organization of the Friends of Mineralogy, reports that, among the localities currently available for collecting, Moosup produces quartz crystals and East Morris, the smoky variety.

New Jersey

Warren Cummings reports that there are a number of active basalt quarries at present, in which fine specimen material has been found recently.

Millington Quarry, especially at the south end of the pit, produces pectolite, thomsonite, apopnyllite (in large crystals), datolite, pyrite, and pyrrhotite.

At Bound Brook, small specimens of native copper and native silver have been found, as well as chalcopyrite and worthy natrolite crystals, smaller than the giants of the late 1970's.

At the Fanwood Quarry, in Watchung Borough, crystallized material of many species, including calcite, chalcopyrite, datolite, hematite, heulandite, and stilbite, is being collected, but not as showy specimens.

At Prospect Park, prehnite is among the minerals occasionally still found, even though the quarrying is no longer in the pillow lava.

At the Haledon Star Industries Quarry, Work now is reaching the pillow lava, and large quantities of fine datolite and calcite have been encountered. Some of the datolite includes anhydrite crystals.

None of these quarries are open to collectors, but nevertheless, fine specimens are being offered at New Jersey shows, especially that of the Franklin-Ogdensburg Mineral Society.

According to Ed Wilke, the Limecrest Quarry, at Sparta, was the site of an F.O.M.S. October ield trip.. Collectible pockets of excellent calcite and barite crystals, large masses of fluorescent norbergite, sprays of 1 to 2" crystals of

fluorescent tremolite, and difficult to collect sprays of allanite crystals of up to 2" were encountered. To participate in future field trips of the F.O.M.S., contact Ed Wilke, 202 Bollingspring Ave., E. Rutherford, N.J. 07073, or call (201)-438-8471.

Pennsylvania

Steve Gladfelter, of the York Mineral Club, reports that there are a number of limestone quarries to which the York Club has access, which regularly produce good and occasionally spectacular calcite crystals, as well as other interesting material. To participate, contact Steve at R./D.1, Box 86A, Seven Valleys, PA 17630.

Steve also reports that nice micro-zeolites and other minerals usually found in amygdaloidal basalt are available in a roadside exposure just north of Dillsburg. This is an open locality; go any time. .Jay Lininger has information on piemontite localities in Adams County, as well as the Dillsburg cut.

Anrold Mogel says that the Mandata Quarry, above Harrisburg, is active, and sporadically yields excellent calcite and celestine. If you can't find minerals, you can look over the many structural (faults, etc.) and sedimentary (mud cracks, mud-curl conglomerates, etc.) features of the limestone beds.

Bill Yocom collected, and George Buchanan provided fine microphotographs, of an amethyst from Chester County. The crystal contains remarkable inclusions of rutile and what appears to be thin mica plates, which seem to be pierced by the needles, either at right angles to (giving a parasol-like effect), or parallet to the c axis of the mica, presenting six sides to the viewer. Under the microscope, the minerals appear to be floating in a lilac sea.

Allen Heyl and Gene Foord have identified a mineral new for Pennsylvania. Siegenite $(Ni,Co)_3S_4$) from the Wheatley Mine, Phoenixville, Chester Co., was found on a specimen from the Rand Collection, Bryn Mawr College, which was originally examined for the pink cobaltian calcite. A subsequent reexamination revealed the silver-white micro-crystals, at first thought to be linnaeite, a cobalt sulfide. A paper with details of the investigation will appear in a forthcoming F.M./Pa. Newsletter, and later be abstracted for the worldwide Mineralogical Abstracts., as are all the original papers on Pennsylvania mineralogy which appear in the Newsletter.

LECTURE ABSTRACTS AND SUMMARIES

The West Branch Pegmatite, Newark, Delaware

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In January, 1989, a small granitic pegmatite was uncovered during excavation for a new housing development at West Branch, Newark, Delaware. During the few weeks the excavation was open, several hundred pounds of schorl specimens were recovered, along with a limited number of other species including almandine-spessartine, muscovite, beryl, and clinochlore after garnet.

The composition and occurrence of this pegmatite is similar to those in Delaware and Pennsylvania. The quality of the tourmaline is what makes this location of interest to the collector. Nearly all of the schorls found exhibited at least one, well-formed, trigonal or pseudohexagonal termination. Another interesting feature is the occurrence of clinochlore peudomorphs after garnet.

None of the minerals found at West Branch are anything out of the ordinary for pegmatites, but, for the state of Delaware, the pegmatite is a rarity, because of its slightly more complex composition. Most pegmatites in the state are composed of simple mixtures of feldspars, quartz, and muscovite, but West Branch, and at least two others, have additional elements, such as beryllium, present.

Although the locality is inacessible to additional collecting, West Branch will be viewed as one of Delaware's most productive collector specimen localities in recent and even historical times.

Minerals of the Serpentine Rocks of Maryland, Pennsylvania, and Delaware

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The belt of serpentine bodies in the Piedmont Upland of Maryland, Pennsylvania, and Delaware is 2 to 10 miles wide and about 50 miles long. The serpentine bodies are part of a much longer belt that extends from Georgia northeastward to New York, the Berkshire and Green Mountains of New

England, and into Quebec. Most of the serpentine rocks were originally peridotite, pyroxenite, and dunite (a magnesium olivine rock). Most of these ultramafic rocks have been partly or completely altered to serpentine and talc; they are all designated by the general term "serpentine." The bodies of serpentine are commonly elongate and conformable with the metamorphic gneiss, schist, marble, gabbro, and granite, which they intrude. Some of the larger serpentine bodies are probably parts of old layered mafic massifs or ophiolite flows. They lie northwestward and northward of the old Appalachian subduction zone of eastern North America. Many bodies of serpentine have been quarried for crushed, decorative, and building stone. In addition, chromite, titaniferous magnetite, rutile, talc and soapstone, amphibole asbestos, magnesite, albite-rich pegmatite, and corundum have been mined, or prospected for, in the serpentine.

A second type of serpentine rock formed from the metamorphism of late Precambrian-age dolomite, the Franklin Limestone, forms an east-trending belt about 1000 feet wide in the northern part of Easton, Northampton County, Pennsylvania; the belt extends into New Jersey north of Philipsburg. This serpentine was extensively quarried for paint filler and talc, as well as building and decorative stone. It, too, contains a wealth of minerals, such as zircon, amphibole asbestos (tremolite and calcian crocidolite), chrysotile, talc, thorium and uranium minerals, phlogopite, and vermiculite. The Williams Quarry, along the Delaware River at the north edge of Easton , was one of the best mineral collecting localities in the state for many years. It was purchased by mineralogist Arthur Montgomery, in 1973, and given to Lafayette College, where he was a professor, as a permanent mineral collecting locality, especially for The Friends of Mineralogy.

Many of the Piedmont serpentine bodies have been, and some still are, mineral collecting localities. They include, from the southwest, in Maryland, near Washington, D.C., to the Pennsylvania line: Rockville crushed-stone quarry (chromite, diopside, spressartine, coalingite); Etchison body (chromite, chromian tourmaline, chromian chlorite); Soldier's Delight (chromite, amphibole asbestos); Bare Hills body, at the north edge of Mt. Washington (chromite, magnesiochromite, the variety kammererite of clinochlore, magnesite); Jarrettsville area (chromite, kammererite, the steatite variety of talc); Clarmont

and Cardiff area (rutile, magnetite crystals, the verde antique variety of serpentine) ; and the Pilot serpentine area (albite, talc, chromite).

In Pennsylvania, localities include: the Line Pit (chromite, magnesite, lavendar chromian antigorite, chromian dravite, deep-green and gemmy antigorite, margarite); Cedar Hill quarry (antigorite, mcguinessite, brucite, chrysotile, chromite, magnesite, nakauriite, pokrovskite); Wood Mine (chromite, brucite, chromian antigorite, clinochlore, forsterite, kammererite, zaratite); Mineral Hill, near Media (chromite crystals in placers, the amazonstone variety of microcline, chromian actinolite); Corundum Hill, Unionville (corundum, diaspore, margarite, paragonite); and Brinton's Quarry, near West Chester (vermiculite, type locality clinochlore, antigorite, brucite, magnesite).

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Pegmatite Minerals from the Amelia Court House District, Amelia County, Virginia

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Just north of Amelia Court House, are 18 or so pegmatite dikes exposed throughout a northwest-trending area, 18 miles long and 16 miles wide. The enclosing country rock is predominantly a quartz-biotite gneiss. These pegmatites were originally mined for mica, beginning in the 1870's.

Only about four of the pegmatites of the area are zoned, and, of these, the two most interesting are the Morefield and Rutherford pegmatites. These pegmatites are noted for their deep blue and green microcline (varlety, amazonite), exceptional specimens of albite (variety, cleavelandite), and

gem minerals, such as spessartine, beryl (variety aquamarine), topaz, and oligoclase (variety, moonstone). In addition, the rare and unusual minerals microlite, monzonite, columbite, cassiterite, and zinnwaldite also occur. Nice specimens of all of these, with the possible exception of monzonite, and cassiterite, have been found recently. Collecting in the area is still possible, especially at the Morefield mine, which was recently reopened for collecting by Mr. W. Baltzley. The Rutherford dumps are usually open to collectors only on Labor Day weekend. Just this past Labor Day, the largest gem spessartine ever found there was discovered; it weighs 2800 carats.

Zeolites and Associated Minerals from Sugar Grove, West Virginia

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An exposure of amygdaloidal basalt, south of Sugar Grove, Pendleton County, West Virginia, hosts an assemblage of more than ten different secondary mineral species. The mineralized basalt is situated on the east limb of the Stone Mountain anticline, concordantly emplaced within the Harrell Shale Formation, of Devonian age.

X-ray diffraction, scanning-electron microscopy, and energy-dispersive spectroscopy techniques were employed in the identification of the mineral species. Microscopic examination of hundreds of mineralized vesicles suggest the following paragenetic sequence: pyrite - nontronite - analcime -harmotome - thomsonite - mesolite - chabazite - nontronite (second generation) - barite - calcite.

The locality is open for collecting and easy to find. It is on route 23, five and one-half miles south of Sugar Grove.

10.

Formation and Metamorphism of the Orebodies at Franklin and Sterling Hill, New Jersey

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Recent research in a number of fields makes it possible to define the formation and metamorphism of the Franklin and Sterling Hill deposits more exactly. The chemistry of the rocks of the Highlands metamorphic suite, which includes these orebodies, indicates that they were deposited in a rift at the edge of a continent. The Franklin Marble, the formation which contains the orebodies, has bands of minerals such as amphiboles, humites, and especially fluoborite, which contains F and B , indicating that the rift waters were isolated, largely or completely, from the ocean. The zoning of the orebodies, and the distribution of minerals between them, indicates a good deal about their deposition. Sterling Hill is composed of a relatively few, massive zones, with few interlayers of calcsilicate skarns. The dominant minerals of the ores are franklinite, calcite, willemite, tephroite, and zincite, as at Franklin, but locally sphalerite and loellingite occur as apparently primary constituents. Graphite, possibly primary, has been found in the black willemite zone. Sterling Hill franklinites have high Fe/Mn, and the calcite is manganoan, extending locally to kutnahorite, and perhaps calcian rhodochrosite. The skarns contain augite, garnet, wollastonite, rhodonite, and gahnite in varying proportions.

Franklin, in contrast, is composed of numerous flattened lenses or pancake-like layers of ore, with interbeds of skarn. Franklin franklinites have higher Mn contents than those from Sterling Hill, extending, in at least one example, to hetaerolite, $ZnMn_2O_4$. Glaucochroite, manganosite, and hematite are local constituents of the ore. The skarns contain feldspars, hendricksite, bustamite, and hardystonite, in addition to the minerals found in the Sterling Hill skarns.

These textural and mineralogical differences are compatiible with the deposits forming remnants of a once-continuous, but spatially limited, rift-floor exhalative spring deposits, with the Sterling Hill deposits being proximal (nearer) to the vent, and the Franklin deposits being distal (further) from it. The large size of the Franklin orebody indicates that the vent solutions were

relatively cool and traveled a long distance, becoming somewhat more oxidizing, but without being diluted significantly by seawater.

The original deposits were perhaps like the bedded Mn Buckeye deposit in California, which contains rhodochrosite, hausmannite, caryopilite, and gageite as primary minerals. Zn was most likely present as minerals which are common in secondary Zn deposits today: hemimophite, willemite, smithsonite, and hydrozincite. Other deposits with somewhat similar character include Balmat, New York; Broken Hill, New South Wales, Australia; Langban, Sweden; and the Desert View Mine in California.

Metamorphism of the orebody reached at least 760 degrees C., as determined by franklinite solid-solution thermometry. The presence of the "high-grade" minerals glaucochroite, bustamite, and hardystonite in the Franklin ores and their absence or near absence at Sterling Hill in rocks of appropriate composition indicated that there was some difference in the conditions of metamorphism between the two deposits. Since metamorphic reactions to produce these Ca-rich minerals involve the breakdown of calcite, CO_2 is produced when they form. If the pore fluid in the Franklin ores was rich in H_2O, it would help dilute the CO_2 and encourage such carbonate-releasing reactions. One possibility is that the Zn minerals at Franklin were the hydrated species hemimorphite and hydrozincite, which would release water on heating, and that the species at Sterling Hill were willemite and smithsonite, which would not. Such a distribution would be compatible with the Sterling Hill ore-forming solutions being more acid than the Franklin solutions, as they would be if the Sterling Hill deposit formed closer to the vent region.

Native Copper in the South Mountain of Pennsylvania; a Historical Perspective

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The South Mountain of Pennsylvania represents the northernmost termination of the Blue Ridge Province. South Mountain is 50 miles in length, 10 miles wide at its broadest point, and occupies portions of Franklin, Cumberland, York, and Adams Counties, Pennsylvania. The major portion of its 175 square-mile mass lies within the boundaries of Adams County. The

mountain range is composed of metavolcanic rocks (metarhyolite and metabasalt) of Pre-Cambrian age, overlain with Cambrian quartzites and sandstones.

The presence of native copper within the metabasalt unit was recorded as early as 1787. The first serious attempt to mine copper ore in Adams County was about the year of 1836, when a small reverberatory furnace was erected at the Copper Furnace Mine on the Bingham property. The failure of the enterprise did not deter numerous other attempts to exploit profitably the copper deposits during the 19th century. Other important mining operations located in the district included the Reed Hill, Snively, Russell , Bechtel, and Headlight Mines, as well as the Jacks Mountain shafts. During the 1870's, numerous investigators, including Persifor Frazer, J.F. Bylandy, and C. Handford Henderson, attempted to correlate geologically the district with the successful Lake Superior copper regions. By 1890, all attempts to exploit known ore reserves had ceased.

Continued success in the Lake Superior district provided further inspiration to renew exploration orf the South Mountain region. In 1904, Owen Naugle of Fountaindale opened the Eagle Metallic Mine, and erected a smelting furnace. In 1907, the Virgin Mine was opened by C.E. Wills of Greenstone. Both operations failed, but the Virgin Mine penetrated numerous large masses of native copper, which proved the richest yet seen in the region. In 1956, an attempt to reopen the Snively Mine by the Ridge Exploration Company of Carlisle, Pennsylvania, represented the final attempt to mine copper in the South Mountain region.

In 1914, the beginning of an important new mining industry within the district was developed when the Advance Industrial Supply Company of Chicago, Illinois, began the quarrying of greenstone (metabasalt) for the manufacture of roofing granules. By 1928, the R.J. Funkhouser Company dominated the greenstone mining industry and continued an expansion which was eventually acquired by the Ruberoid Corporation in the 1960's, and by the GAF Corporation in the 1970's. The GAF Corporation continues to manufacture granules in 1991, and in the process of expansion, quarried the area earlier developed by the Virgin Mining Company. Numerous large areas of copper mineralization were exposed.

Earl Shindledecker of Fountaindale, Adams County, was first employed at the Advance Industrial Supply Company in 1920, as a waterboy in the quarry. The 14-year-old thus began a career in greenstone mining which would last his entire working life. During his many years at the Funkhouser/Ruberoid/GAF quarry complex, he came to recognize the unique character of the native copper whic occurred in the quarries and underground tunnels. From the 1940's through the 1970's, Shindledecker preserved and dispensed thousands of specimens of native copper and accessory minerals, which would have otherwise been destroyed. After his death, in May, 1990, the author acquired a dozen specimens of his personal favorites, which represented some of the finest found in the South Mountain metavolcanic occurrence. Among them was a three hundred-pound mass, which represents one of the largest and finest native copper specimens ever preserved from Pennsylvania.

NOTES