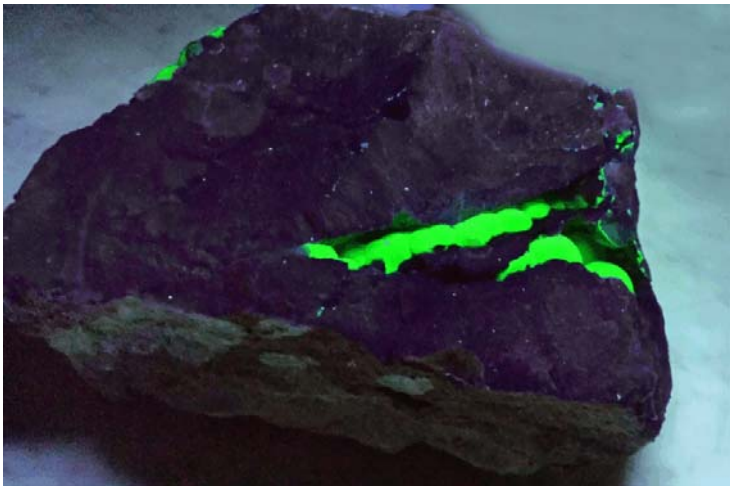
Friends of Mineralogy
Pennsylvania Chapter

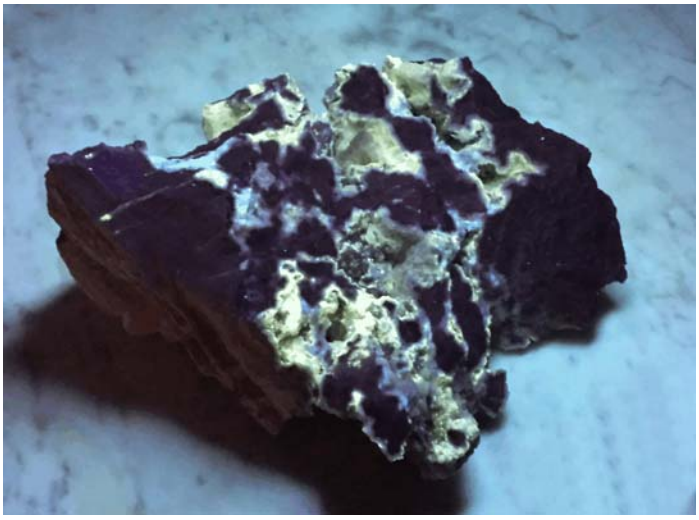
Fall Symposium
Recent Advances in Mineralogy: Pennsylvania and Universal Applications
November 7 & 8, 2015

Presented at
Franklin and Marshall College, Lancaster, Pennsylvania



Wavellite, National Limestone Quarry property, Mount Pleasant Mills, PA, fluorescing under shortwave ultraviolet light.

Joe Marchesani photo, D. Glick color editing



Strontianite and calcite, National Limestone Quarry, Mount Pleasant Mills, PA, fluorescing under shortwave ultraviolet light.

Joe Marchesani photo, D. Glick color editing

Friends of Mineralogy

Dedicated to the advancement of serious interest in minerals and related activities

We are collectors, professionals, and curators who share a love of mineral specimens and the desire to promote understanding and appreciation of mineralogy.

FM's objectives are to promote, support, protect and expand the collection of mineral specimens and to further the recognition of the scientific, economic and aesthetic value of minerals and collecting mineral specimens.

National FM newsletters, links to other chapters, and much more can be found on their web site: **www.friendsofmineralogy.org**

Friends of Mineralogy - Pennsylvania Chapter

provides:

- the benefits of membership in the national organization
- an annual Symposium in November
- field trips
- quarterly illustrated Newsletter
- an extensive WWW site with news, downloadable books, and more

Membership application forms are available on our web site

Please explore the FM-PA web site at
www.rasloto.com/FM/

Recent Advances in Mineralogy:
Pennsylvania and Universal Applications

Friends of Mineralogy - Pennsylvania Chapter
Fall Symposium November 7 & 8, 2015

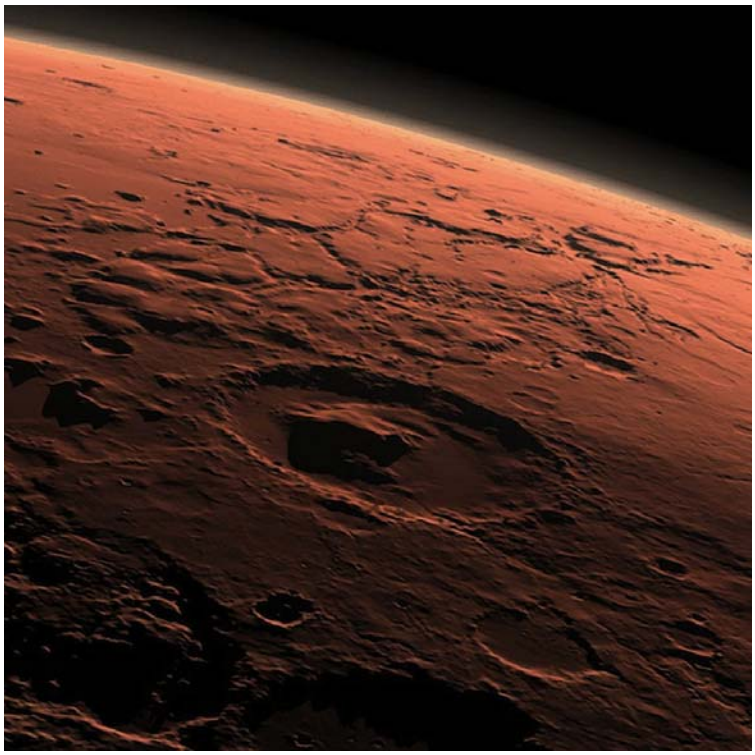
SCHEDULE of EVENTS

Saturday, November 7:	**SYMPOSIUM**	**page**
8:30 to 9:00 a.m.	Registration	
9:00 to 9:15 a.m.	Opening Remarks	
9:15 to 10:00 a.m.	**Stan Mertzman, PhD, Franklin & Marshall College** **Mineralogy of the Surface of Mars**	**4**
10:00 to 10:10 a.m.	**FM-Pa Members: Chapter Membership Meeting**	
	also	
10:00 to 10:45 a.m.	BREAK- Check out the silent auction and visit the dealers.	
10:45 to 11:30 a.m.	**Ronald A. Sloto, PG, West Chester University** **The Grace Mine, New Morgan Borough,** **Berks County, Pennsylvania**	**5**
11:30 a.m. to 1:00 p.m.	LUNCH BREAK - lunch on your own (local map on back cover) Silent auction continues until 1:15 - Room 119 open during lunch	
1:15 p.m.	Silent Auction ends	
1:30 to 2:10 p.m.	**Michael Stefanic, PG, Pa. DEP** **Phosphate Minerals in Pennsylvania**	**6**
2:10 to 2:50 p.m.	**Bill Stephens, PG, Stephens Environmental** **Preliminary Evaluation of the** **Mount Pleasant Mills Wavellite Occurrence**	**7**
2:50 to 3:00 p.m.	BREAK	
3:00 to 3:40 p.m.	**Ian Saginor, PhD, Keystone College** **Evolution of Volcanism in Central America**	**8**
3:40 to 3:50 p.m.	Field Trip Instructions	
3:50 to 4:00 p.m.	Distribution of Prof. Development Hours certificates to PGs	
4:15 p.m.	Chapter Board of Directors meeting	
Sunday, November 8:	**FIELD TRIP to Cornwall, Lebanon County** **For Symposium Registrants Only** ***See map & directions inside back cover***	**10**
9:00 a.m. to noon	Meet by 9:00 a.m. South end of Iron Valley Golf Club parking lot, Iron Valley Drive, Cornwall, Pa .	

Mineralogy of the Surface of Mars

Stan Mertzman, PhD
Franklin & Marshall College

During the 21st century the ever-increasing capabilities of orbital instruments making measurements on a planetary scale, and measurements made by both rover and lander missions on the surface at a small scale, have led to a much more robust understanding of the mineralogy, the composition, and geologic history of Mars. I hope to make current the audience's knowledge of where science stands in its understanding of the geologic evolution of the "red planet."



Gale Crater on Mars

Biography

Dr. Stan Mertzman is the Earl D. Stage and Mary E. Stage Professor of Geosciences at Franklin and Marshall College. He is shown at left with his students in the field.

The Grace Mine, New Morgan Borough, Berks County, Pennsylvania

Ronald A. Sloto, P.G.
West Chester University

The Grace Mine was located north of Morgantown and west of Pennsylvania Route 10. The discovery of the Grace Mine ore body was the result of an airborne magnetometer survey. The survey consisted of 7,000 linear miles of flight lines spaced 0.25 mile apart and extending from the Delaware River on the east to Gettysburg on the west. The first core drilling rig arrived at the site on September 1, 1949. By January 1951, 17 core holes, averaging 2,200 feet, had been completed. The sinking of two shafts was begun in 1952. In 1955, shaft A reached a final depth of 2,208 feet, and shaft B, located 280 feet south of shaft A, reached a final depth of 3,079 feet. Mine production began in 1958. The processing plant produced iron ore pellets about 3/8 to 5/8 inch in diameter averaging 65 percent iron. Pyrite containing cobalt and copper was recovered by flotation. Cobalt concentrates were produced as early as 1961. The pyrite was shipped to a sulfuric acid plant in Maryland, for use in sulfuric acid production.

The Grace mine deposit is a Cornwall-type iron ore deposit. It occurs at the contact between diabase and Cambrian carbonate rock along the southern border of the Mesozoic basin. The bedrock in the vicinity of the mine includes Triassic-age shales, sandstones, quartzites, and conglomerates and Cambrian carbonate rocks. These rocks have been intruded by diabase varying in thickness from a few feet to 1,200 feet. The ore body is a replacement of Cambrian carbonate rocks of the Buffalo Springs Formation. The Grace mine magnetite deposit is a single ore body that has no outcrop. It is roughly tabular in shape, approximately 3,500 feet long by 700 feet to 1,500 feet wide and ranges from about 22 feet to about 425 feet thick. It lies between 600 feet and 2,200 feet below sea level. The ore body contained about 118 million short tons of ore.

The Grace mine produced 51 different mineral species. It is best known for world-class specimens of magnetite and pyrrhotite. It also is known for the occurrence of the rare mineral tochilinite.

The Grace mine's closing in 1977 was caused by cheap steel from abroad, top-heavy management, and a generous labor contract for the miners, who were members of the steelworkers union. The ore body was not exhausted. At the time of closure, a zone of ore 480 feet thick and rich in copper had been outlined by drilling to the northeast. A total of 45 million tons of crude ore was produced at the mine. Most of the mine dumps were crushed and used for aggregate and in highway construction.

Biography

Ron Sloto retired from the U.S. Geological Survey in January 2015 after a 41-year career that included publication of over 80 reports, journal articles, and abstracts. He is currently the curator for the mineral collection at West Chester University and conducts research on the minerals of southeastern Pennsylvania at the University. Ron has been a mineral collector since the age of 5 and also has a keen interest in mining history. He published a book on the mining history and mineralogy of Chester County in 2009 ("The Mines and Minerals of Chester County, Pennsylvania"), and is currently working on a similar effort for Berks County mining history and mineralogy.

Phosphate Minerals in Pennsylvania

Mike Stefanic, PG
PA DEP / Shippensburg University

Wavellite [$Al_3(OH)_3(PO_4)_2 \cdot 5H_2O$] is a secondary phosphate that forms as a result of weathering reactions in reactive environments. The orthorhombic dipyramidal crystals form botryoidal nodules with radiating structures. In Pennsylvania secondary phosphates typically occur as druses, vein filling, and aggregates.

Pennsylvania has numerous occurrences of phosphates along the Appalachian ridges, however only two localities have been mined; both for wavellite. The Ross Farm mine in Lack Township, Juniata County, operated from 1894 to 1904 and the Moore's Mills mine outside of Mt. Holly Springs, Cumberland County, was worked from 1905 to 1910. The Moore's Mill deposit is unique as it is the only occurrence where the nodules are soil hosted and do not occur as films or vein fillings in a host rock.

Appalachian phosphates are associated with weathering of transgressive carbonates. Transgressive sequences begin with terrestrial-siliciclastic lithologies that preserve fracture and joint traces. These fractures provide a pathway for fluid migration and a precipitation source for secondary supergene mineral deposits. In the case of Moore's Mill, a unique series of events occurred. During the Alleghenian Orogeny, the Lower Cambrian Sauk I carbonates detached from the Chilhowee siliciclastics. This slippage lead to the formation of the South Mountain Fault Zone and the development of a mylonite. During the Mesozoic Era, hydrothermal activity in the area metosomatically altered the mylonite to phyllonite, which eventually weathered into white kaolin clay. The Cenozoic Era brought heavy rains causing climatically-controlled leaching. The alternating wet-dry conditions created an oxidizing-reducing state in the soil, enabling hydromorphic effects. Moderately warm, relatively shallow, slightly acidic ground waters dissolved phosphorus from the marine shells. This fluid was captured by the clay. In the high alumina clays, phosphorus rich weathering fluids combined with aluminum to form wavellite before they could be deposited in the fractures of the Antietam Quartzite.

Biography

Michael Stefanic is a geologist in PA DEP's Environmental Cleanup and Brownfields Program. He received his bachelors of science in geology from Juniata College in 2007 and is currently a master's student at Shippensburg University. His research focuses on using structural geology and statistics to fill gaps and describe geologic processes.

Preliminary Evaluation of the Mount Pleasant Mills Wavellite Occurrence, National Limestone Quarry, Mount Pleasant Mills, Snyder County, Pennsylvania

Bill Stephens, PG
Stephens Environmental Consulting, Inc.

Wavellite was first discovered at the National Limestone Quarry near Mount Pleasant Mills on or about 2002 when a perimeter mine road was cut across the south side of the permitted quarry, along the crest of the ridge known as Lime Ridge. Limestone of the Silurian Tonoloway and upper Devonian Keyser Formations are quarried at this location, which lies along the axis of a plunging, breached anticline on the south limb of the Shade Mountain Anticlinorium. The ridge forming unit along the crest of Lime Ridge at the quarry is the lower Devonian Old Port Formation, a unit consisting primarily of chert underlain by calcareous shale and thin limestone beds, that overlies the Keyser and is steeply dipping at this location. The Ridgely member, a relatively clean quartz sandstone correlative with the Oriskany Formation elsewhere in the state is typically found at the top of the Old Port Formation Section. At this location, the gemmy wavellite is found exclusively in the Ridgely member sandstone and immediately adjacent cherty beds, which also contain other phosphate minerals including cacoxenite, planerite, vauxite, variscite and turquoise according to other workers.

Structurally, the deformation observed in the limestones exposed in the quarry and the Old Port Formation beds is complex, and typical of Valley and Ridge Alleghenian brittle deformation with flexural slip along bedding providing vugs within which crystals can form. Younger and older joints and fractures as well as faults marked by slickensides are common and exhibit predictable orientations. Secondary mineralization commonly observed in the limestones includes carbonates such as drusy calcite crystals in veins, vein calcite, and Strontianite, and less common sulfates such as Celestite. Our recent observations from this year's collecting activities proves quartz veins with and without small quartz crystals cut/fill fractures in the Ridgeley. Several specimens contain shattered microcrystals of quartz bound together by Wavellite. Other specimens of cherty beds show fossils replaced by planerite (?), and fracture surfaces with planerite (?) sometimes followed by wavellite (?). The calcite in the limestones and the quartz veins in the Ridgeley are interpreted to have crystallized at or following the acme of low grade metamorphism and tectonism. The wavellite and associated phosphates are interpreted to have been deposited much later, at lower temperatures and pressures aided by re-opened fracture systems. Further study is needed, but recovered specimens suggest that the wavellite deposition occurred following a rather violent event that reopened the fracture systems allowing fluid migration and phosphate deposition.

The wavellite recently obtained from the Mount Pleasant Mills Quarry rivals any specimens from famous collecting localities in Arkansas and presents collectors with a new and exciting opportunity in a region where many famous sites have been closed for decades. We remain optimistic that the best is yet to come!

Biography

Bill Stephens is a licensed professional geologist and owner of Stephens Environmental Consulting, Inc. Mr. Stephens holds a bachelor of Science and a Master of Science, both in Geology, from the University of Pittsburgh. Mr. Stephens has owned and operated a private environmental consulting and civil design firm for over 20 years. Mr. Stephens has been collecting since the age of 12, and is a candidate for the FoM-PA Chapter Board of Directors.

Evolution of Volcanism in Central America

Ian Saginor, PhD
Keystone College

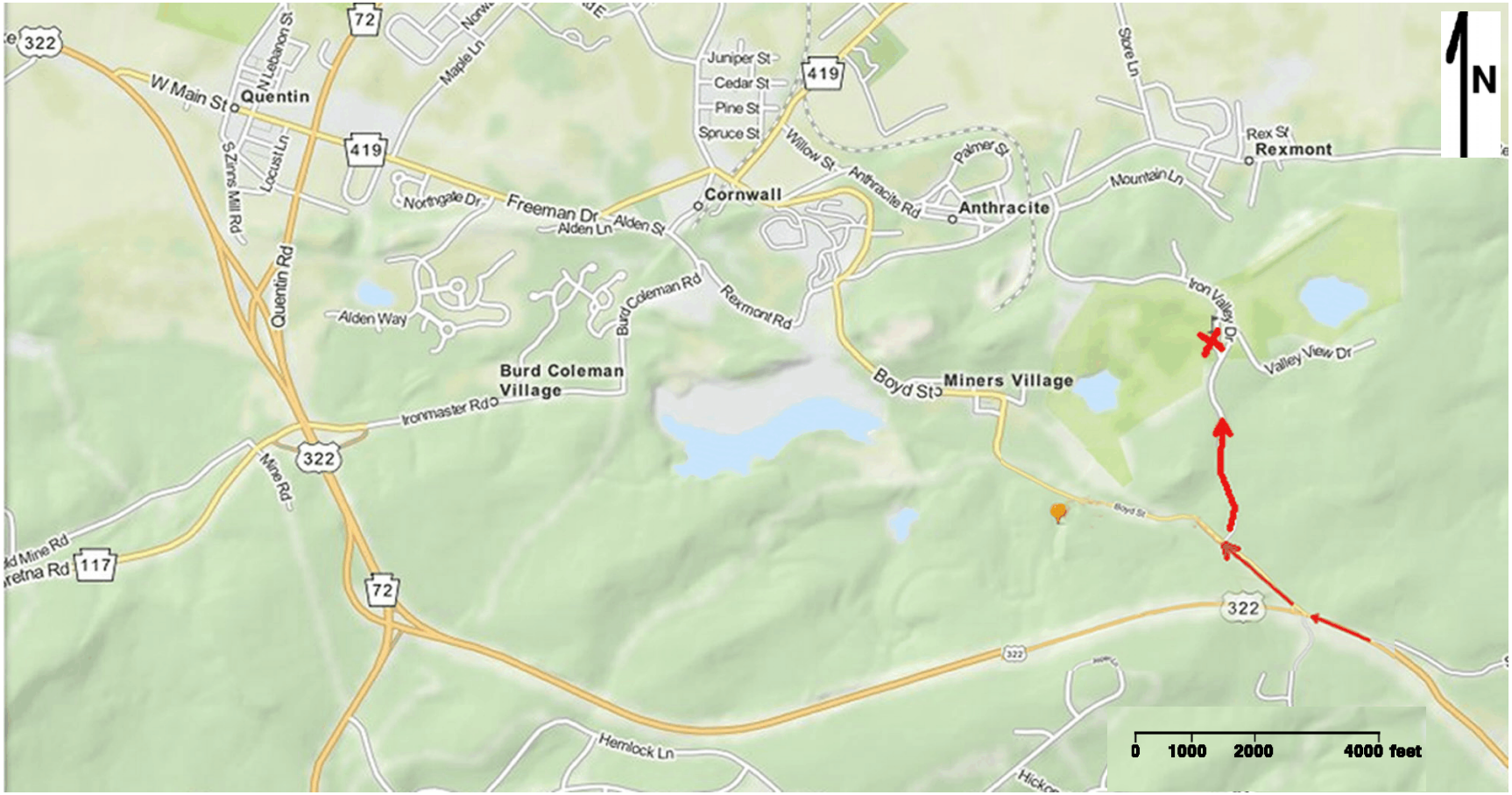
For the past twelve years, I have been working to better understand the volcanic history and evolution of Central America. Most of my fieldwork has been focused on western Nicaragua along a string of active volcanoes within the Nicaraguan Depression. Initially, our research group was interested in using 40Ar/39Ar geochronology to establish the ages of each volcano and calculate the eruption rates as well as specific trace elements. Despite the wealth of available geochemical data, no argon ages had ever been published for this region. These growth rates were then compared to those in Costa Rica, which were also based on my argon work. The other goal of this fieldwork was to fill in an apparent gap in volcanism from 7 Ma to the onset of the modern volcanic front only a few hundred thousand years ago. This effort ultimately reduced the length of the gap roughly by half and yielded great insight into why the volcanic front had shifted through time and why it had reestablished itself in its current location.

San Cristobal volcano, Nicaragua

Biography

Ian Saginor is a volcanologist with a Ph.D. in Geochemistry and Geochronology from Rutgers University. Most of his research has focused on understanding the evolution of subduction zone volcanic systems in Central America and the Caribbean. Recently, he started an organization called the Volcano Terrain Project that distributes 3D printed volcano models for use in hazard outreach and education.

NOTES



CORNWALL, PENNSYLVANIA, AREA Mapquest Map Builder Beta and Mapquest.com

DIRECTIONS TO FIELD TRIP SIGN-IN, IRON VALLEY GOLF CLUB PARKING LOT, CORNWALL, PA

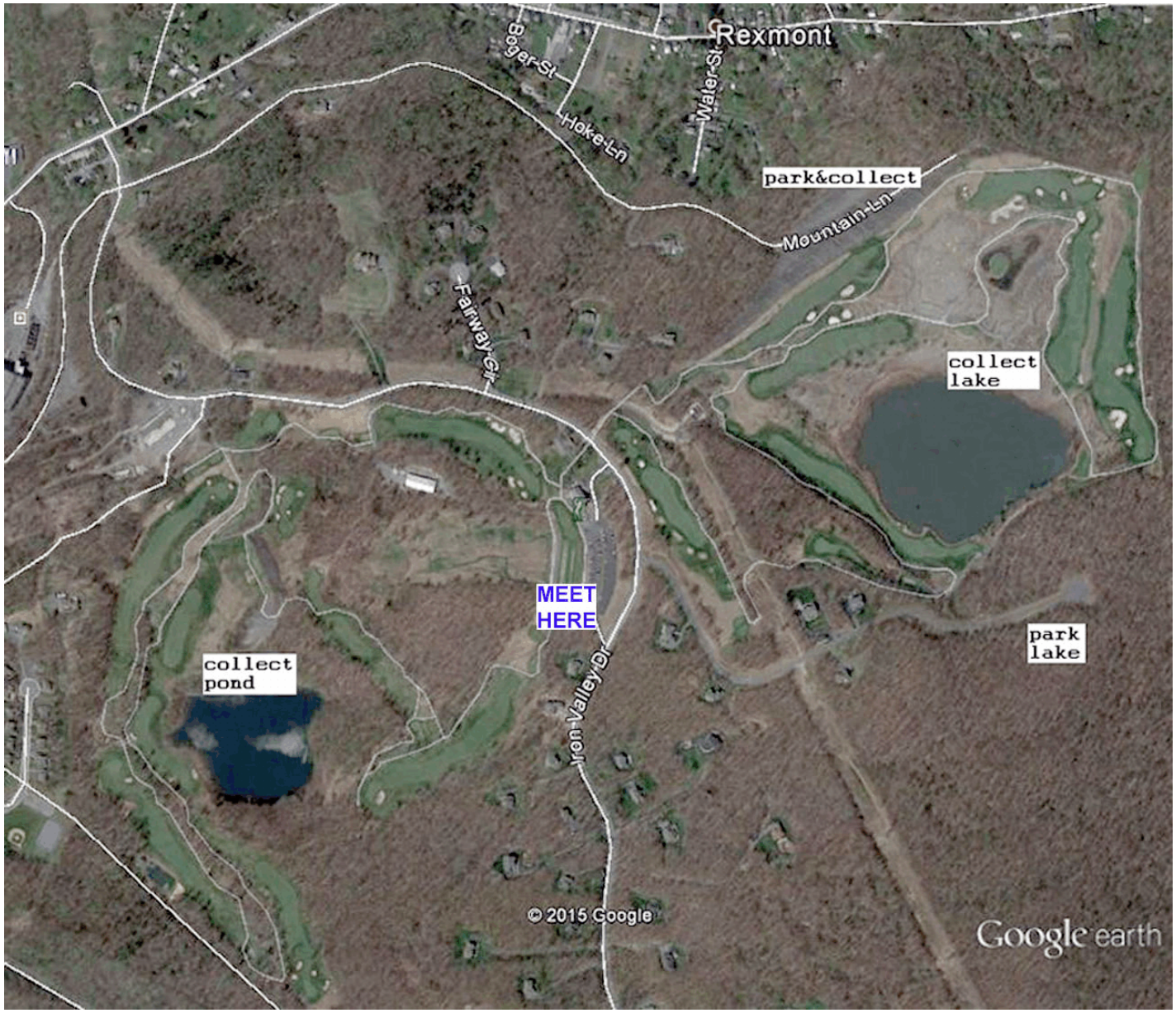
From the Lancaster area, go north on PA 501 (Lititz Pike, straight through Lititz, PA) approximately 12 miles.

At traffic light in Brickerville, turn left on US 322 West and go 5.0 miles.

In the middle of the woods in a valley, bear right onto Boyd Street and go 0.3 miles. Turn right on Iron Valley Drive.

Go 0.6 miles, turn in to the parking lot on left, meet the group by 9:00 a.m. EST.

GPS from Golf Club's web site: 201 Iron Valley Dr, Lebanon, PA 17042



Field trip: Meet by 9:00 a.m. at the southern end of the Iron Valley Golf Club parking lot to sign in.

1 Lisa Bonchek Adams Auditorium in Kaufman Hall
2 Admission, Wohlsen House, *637 College Avenue*
3 Alumni Sports & Fitness Center, *929 Harrisburg Avenue*
4 Appel Infirmary
→ Asian Cultural Center, *see Multicultural Affairs*
5 Arts House, *602 West James Street*
6 Baker Campus, *1300 block of Harrisburg Pike*
7 Ann & Richard Barshinger Center for Musical Arts in Hensel Hal l
8 Ann & Richard Barshinger Life Sciences & Philosophy Building
9 Black Cultural Center, *615 College Avenue*
10 Bonchek College House
→ Bookstore, *see Distler House*
11 Brooks College House
12 Brooks Tennis Center
13 Buchanan House
14 Business Office, *644–646 Race Avenue*
15 Career Services, *619 College Avenue*
16 Centennial Conference Office, *HEDS Consortium, Frederick Street entrance of Lancaster Theological Seminary*
→ College Guest House, *see Huegel Alumni House Annex*
17 College Row
18 College Square
→ Counseling Center, *see Appel Infirmary*
19 Diagnothian Hall
20 Dietz Hall
21 Distler House/Campus Bookstore
22 Facilities Services, *415 Harrisburg Avenue*
23 Faculty, Emeriti Faculty & Foreign Language Tutor Offices, *711 College Avenue*
24 Financial Aid, *617 College Avenue*
25 Franklin-Meyran Hall
26 French House, *548 West James Street*
27 Gerhart House
28 Goethean Hall
29 Green Room Theatre
30 Hackman Physical Sciences Laboratories
31 Patricia E. Harris Center for Business, Government & Public Policy
32 Hartman Green
33 Dr. Leon Herman Arts Center
34 Huegel Alumni House
35 Huegel Alumni House Annex,
→ College Guest House *445 College Avenue*
36 International House, *446–448 West James Street*
37 James Street Apartments, *534 West James Street*
38 Jazzman's Cafe & Bakery
39 Joseph International Center, *701 College Avenue*
→ Kaufman Hall, *see Lisa Bonchek Adams Auditorium in Kaufman Hall*
40 Keiper Liberal Arts
41 Klehr Center for Jewish Life, *645 College Avenue*
42 Kunkel Aquatic Center, *929 Harrisburg Avenue*
43 Marketplace Dining Hall
44 Martin Library of the Sciences
45 Mayser Physical Education Center
→ Meyran Hall, *see Franklin-Meyran Hall*
46 Multicultural Affairs, *625 College Avenue*
47 The President's House, *508 North School Lane*
48 New College House
49 New Street Studio
50 North Museum
51 Office of Student Academic Affairs, *623 College Avenue*
52 Old Main
53 Other Room Theatre
54 Philadelphia Alumni Writers House, *633 College Avenue*
55 Phillips Museum of Art
56 POGIL, *713 College Avenue*
57 Public Safety
58 Roschel Performing Arts Center
59 Schnader Residence Hall
60 Shadek-Fackenthal Library
61 Sponaugle-Williamson Field
62 Stager Hall
63 Stahr Auditorium
64 Steinman College Center
65 Sustainability House, *550–52 West James Street*
66 Thomas Residence Hall
67 Tylus Field: *Ken Gramas Pavilion*
68 Ware College House
→ Warehouse, *see Facilities Services*
69 Weis College House
70 Carolyn W. & Robert S. Wohlsen Center for the Sustainable Environment
→ Writers House, *see Philadelphia Alumni Writers House*