

Nittany Mineralogical Society Bulletin

Nittany Mineralogical Society, Inc., meeting in State College, Pennsylvania
Contact information on back page

Editor (see page 8):

November, 2015

Visit our web site: www.nittanymineral.org

David C. Glick

November 18th meeting:

Prevention of acid drainage at coal surface mines and highway construction projects through alkaline addition: Lessons learned from Central Pennsylvania

by

Michael Smith, P.G.

PA DEP, Moshannon District Mining Operations

Our November meeting will be held Wednesday the 18th in room 116 (smaller auditorium) of Earth & Engineering Sciences Building on the west side of the Penn State campus in State College, PA. Maps are available on our web site.

6:45 to 7:45p.m.: Social hour, refreshments in the lobby

7:45 to 8:00 p.m.: announcements, questions, answers

about 8:00 p.m.: featured program

*The event has free admission, free parking, and free refreshments, and is open to all; **parents/guardians must provide supervision of minors.** Bring your friends and share an interesting evening!*

Coal mines are well known to produce acid mine drainage (AMD). The severity of AMD varies depending on the mineralogic characteristics of the overburden and coal being mined. Contrary to popular opinion, most surface mines actually produce alkaline drainage. But unfortunately, Central Pennsylvania coal seams produce some of the most acidic drainage in the country.

See pages 2 - 3 for the complete story with photographs.

ATTENDING THE NOVEMBER MEETING?

Donations of **a few high quality, labeled door prize specimens** are invited.

Your donated snacks and drinks will be welcomed.

Bring a friend!

Social Hour Schedule Shift

by David Glick, NMS President

We don't seem to have many people at the start of our pre-meeting social hour, and we aren't filling a half-hour with business and announcements. Therefore we're going to shift the schedule by 15 minutes, as shown above: Social hour at 6:45, business meeting at 7:45. We'll continue to start the program at 8:00 p.m.

Officers Re-elected

by David Glick, NMS President

The Annual Meeting of the Corporation was held October 18, with brief reports on the status of the club. The treasury is doing well, up slightly from one year ago. The slate of officers was elected by acclamation: President David Glick, Vice-President Robert Altamura, Treasurer Stuart Bingham, and Secretary Ellen Bingham.

It was also noted that **programs for 2016 meetings** are desired. Please contact Program Chair Duff Gold (see p. 8) or the president if you might be able to present a program on minerals, lapidary, jewelry, geology, etc.

The Board truly needs **additional volunteers** to get involved with running the Society, providing **new energy and fresh thinking** and some new names on the ballot next year. **All members: please consider volunteering!**

NMS T-shirts Available

NMS continues to have t-shirts in stock in a variety of sizes and colors. Please check with Bob Altamura (at the November meeting, or see page 8 for contact information) if you are interested in purchasing. The price is \$9 per shirt. Some of the colors are shown on our web site, <http://www.nittanymineral.org/merchandise.htm>

Door Prizes & Giveaways

by David Glick, NMS President

A few years ago we had a project to provide one or two good quality specimens for each meeting's door prizes, principally by purchasing them for around \$20-\$25 each. The Board has decided to renew that program and a few fossil and mineral specimens were purchased at the Harrisburg Show to get it started. If you have a few attractive, identified, labeled specimens to donate for this program, they would be welcomed. We would like to limit each month's drawings to just a few specimens to keep the time down and the impact up.

We do want to continue the tradition of providing a way for extra, useful but perhaps less impressive specimens to find their way to new owners who would appreciate them. To do this, we will set aside a space in the lobby for a giveaway section. Specimens (preferably identified with at least one label) can be placed there during the social hour for anyone to pick up. Leftovers can be picked up by the donor or given to NMS for future use.

December Program - Holiday Dinner

Dinner at Hoss's is planned for 6:00 p.m. Wednesday, December 16. Watch for any updates in the December issue.

Prevention of acid drainage at coal surface mines and highway construction projects through alkaline addition: Lessons learned from Central Pennsylvania

by

Michael Smith, P.G.

PA DEP, Moshannon District Mining Operations

Coal mines are well known to produce acid mine drainage (AMD). The severity of AMD varies depending on the mineralogic characteristics of the overburden and coal being mined. Contrary to popular opinion, most surface mines actually produce alkaline drainage. But unfortunately, Central Pennsylvania coal seams produce some of the most acidic drainage in the country. In the early 1980s, following passage of the federal Surface Mine Control and Reclamation Act (SMCRA), considerable effort was directed at predicting and preventing AMD. One of the earliest approaches was to add lime or limestone to mine backfills. The application of limestone to prevent or reduce acidic drainage from surface mines and constructed fills was first used in the late 1970s. Early measures had very limited success because application rates were too low or the application methods were ineffective. By the early 1990s, the technology to predict which sites would produce AMD got quite good, but the problem persisted of what to do about AMD-producing mines. One approach is to prohibit mining of acid-producing coal seams, "sterilizing" millions of tons of otherwise mineable coal reserves and also missing the opportunity to remine and clean up thousands of acres of abandoned mine lands with remaining coal reserves. Pennsylvania has an abundance of abandoned mine lands, unreclaimed or poorly reclaimed and still generating acid drainage. Alkaline addition was revisited as a way to mine potentially AMD-producing sites without causing more bad drainage and potentially cleaning up abandoned AMD-producing mines. Subsequent alkaline addition projects on surface coal mines greatly improved the success rate, as measured by the incidence of post-reclamation alkaline drainage. It also played a major role in the restoration of the West Branch



Logging core for overburden analysis



Alkaline material added to backfill



Reclaimed surface mine, State Game Lands 100

Susquehanna River, most of which was AMD-impaired in the early 1980s and contained few fish. While some reaches of the West Branch are still impaired, most of it now boasts a thriving fishery. The successful use of alkaline addition on both new mines and the restoration of abandoned mines was done by: 1) achieving backfill net calcium carbonate equivalence of 1.2%; and 2) by thoroughly mixing alkaline material to replicate naturally alkaline rock.

Of course, any large excavation that disturbs sulfur minerals has the potential to produce acid drainage. Highway projects are no exception. In the early 2000s, the use of alkaline addition on coal surface mines was extended to highway projects and other large-scale excavations with the potential to produce acid "rock" drainage, or ARD. Two noteworthy examples of this are the use of alkaline addition to abate acidic drainage for Interstate 99 near State College PA and US 522 at Lewistown, PA. The backfill and exposed cut faces produced severe acid drainage, with acidity ranging to over 20,000 mg/l, and very high concentrations of sulfates and metals. PennDOT placed the acidic rock in an engineered fill, mixing it with lime waste. In both cases, 300 pounds of lime was applied to each cubic yard of rock, achieving a net neutralization potential of 12 ppt, the equivalent CaCO_3 content of 1.2%. Remediation at both sites successfully resulted in alkaline drainage and relatively low metals.



Interstate 99 roadcut at Skytop, west of State College, PA.



Rt 522 bypass road cut into the Marcellus Shale, near Lewistown.



Construction of I-99 Engineered Rock Placement Area (ERPA)

Rare fossils discovered on Tussey Mountain

Dr. Charles E. Miller, Jr.
Geologist

Rare fossils dating back to the Ordovician Period 450 million years ago have recently been found in a shale borrow pit on Tussey Mountain. In June, Anna Whitaker, a local geoscience honors student at The Pennsylvania State University, found starfish (Figure 1) and a conularid (Figure 2) at the site. These fossils have not been reported in Centre County and are uncommon within the state. The latter fossil is unusual enough that some geologists are unfamiliar with it.



Figure 2: A conularid in shale at the Tussey Mountain borrow pit. The specimen is 13 cm (5.1 inches) long. Image by the author.

shale and sandstone of the Reedsville Formation, a geologic unit found in central Pennsylvania and attaining an average thickness of 1000-1200 feet. However, at this pit, only about 30-40 feet of the formation are exposed. Much of the pit is covered with rock debris from higher up on the ridge. Despite limited exposure, this pit has some interesting fossils.

The shale and sandstone were originally mud and sand, respectively, eroded from the ancestral Taconic Mountains. Those mountains were the first of two in the eastern United States predating the Appalachian Mountains. The Reedsville is the first of several formations formed of eroded material from the Taconic Mountains. Total thickness of these formations suggests that the Taconic Mountains may have been more than 4000 m (13,100 ft.) high. The mountains have long since eroded away. Reedsville sediments mark a milestone in local geologic history. They terminated approximately 100 million years of continuous carbonate (limestone) deposition in central Pennsylvania. Local limestone was deposited when there were no nearby mountain-building episodes (orogenies). Mountain building produces eroded material that shuts down carbonate deposition.

Much of the Reedsville is barren of, or sparse in, fossils. However, some fossil layers are prolific in fossil types and actual numbers. At this site, brachiopods, pelecypods, trilobites (Figure 3), gastropods, bryozoans, cephalopods, crinoids, starfish, and conularids are found. All are marine animals. The reader is referred

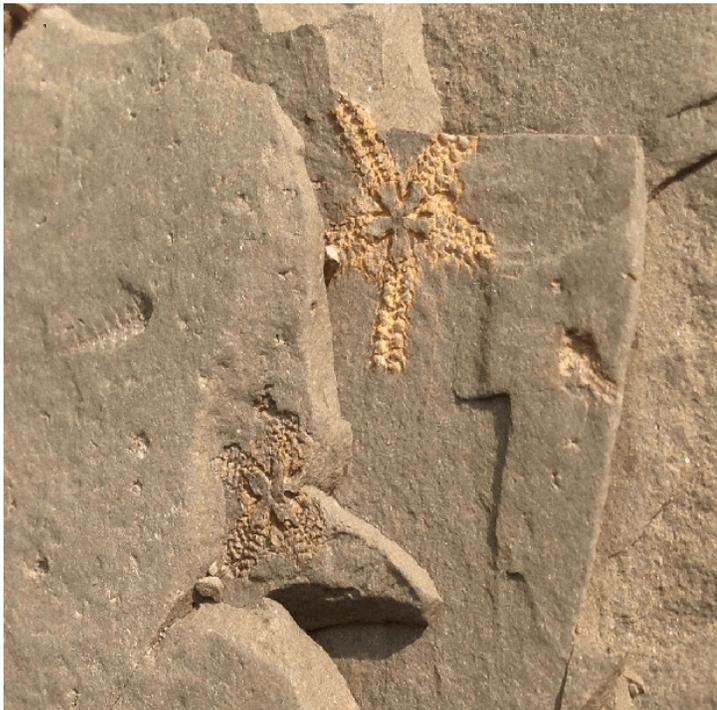


Figure 1: Two Ordovician starfish collected in borrow pit on Tussey Mountain. The upper specimen is 1.2 cm (0.5 in.) in length. Image by Anna Whitaker.

A borrow pit is an excavation from which material – commonly shale, sand, or gravel – is taken for use as fill. Such pits afford opportunities to study geology that might not be available elsewhere. This pit includes

to the Internet for images of the fossils not shown in this article. Brachiopods and pelecypods are marine animals with two valves (shells). These are different from each other, both in shell shape and internal structure. The latter includes clams and oysters. Trilobites (Figure 3) have an exoskeleton and segmented body divided into three longitudinal lobes. They have a passing resemblance to horseshoe crabs. Gastropods, here, are snails. Bryozoans are colonial animals resembling corals. Cephalopods are mollusks with segmented shells and tentacles for grabbing prey. A modern-day example is the Nautilus. They were the top predator in the Ordovician Sea. Crinoids, commonly called “sea lilies,” resemble underwater flowers but were filter-feeding animals.



Figure 3: A *Flexicalymene* trilobite from a borrow pit on Tussey Mountain. Image by the author.

Geologists study fossils and the rocks that contain them for clues about the geologic past. For example, disarticulated (fragmented) fossils infer high energy, as along a beach, where waves go back and forth. In contrast, whole fossils might suggest lower-energy (deeper water) below wave base. Fossil morphologies (shapes) provide similar clues. Delicate forms originate in low-energy settings whereas robust ones endure higher energy. Other factors considered might include fauna diversity, types, and orientations, as well as a host of clues from the rocks, themselves. In considering such clues, the depositional environment of the Reedsville at the Tussey Mountain borrow pit was one of turbid, warm water deposited as silt to produce a mud substrate (bottom). The sediment rate was not too great to prohibit fossil communities. Occasional severe storms punctuated this setting, depositing sand. The fossils,

here, reflect these changing conditions. Some fossil zones display largely intact specimens whereas fragmented fossils characterize others.

Of the fossils at this site, starfish and conularids are the rarest. These have not previously been identified in Centre County. Of the two fossils, most people are more familiar with starfish. The closest, other site yielding starfish is Swatara Gap in Lebanon County. There, starfish are in the Martinsburg Shale, a geologic unit correlative with the Reedsville. Starfish date back to the Ordovician (485-444 million years ago). Like other fossils in the Reedsville, starfish provide information on ecological conditions where they lived. In addition, some starfish species are index or guide fossils, useful in identifying specific geologic time periods. The two specimens from the borrow pit are tentatively thought to be brittle (ophiuroid) starfish. Identification of the species is pending.

Conularids are extinct marine animals having elongate pyramidal skeletons. Each side is made up of horizontal rods. Individuals attached to substrates at the narrow, pointed end. Tentacles protruded from the wider end of the pyramid. Conularids preferred muddier, poorly illuminated sea floors – an interpretation consistent with much of the Reedsville Shale. They are rare in the borrow pit and uncommon in Pennsylvania.

Reedsville Shale fossils from Tussey Mountain provide a “window” into sea-bottom life 450 million years ago in the State College area. The fossils represent one or more communities of marine animals inhabiting a relatively shallow, warm, near-shore, muddy sea bottom. At that time, State College was located at approximately 20 degrees below the equator. This places it within the tropics. A reconstruction of this sea-bottom setting would show crinoids attached to the muddy bottom and extending upward. Some would be at least 12 inches tall. They would sway in currents. Also attached to the bottom were conularids along with brachiopods and pelecypods. This fossil community also included straight-shelled cephalopods swimming or resting on the sea bottom. The community also had gastropods (snails), trilobites, bryozoans, and starfish. Just as in modern oceans, sea life was not evenly distributed. Some sea-bottom locations were suitable habitats and others were not. ✱

Oak Hall Quarry Open House

by David Glick

The Hanson Aggregates Oak Hall Quarry near State College held an Open House on Saturday, Oct. 17, to show the public what they do. They presented displays related to the quarry, and personnel to answer questions. There were van tours through the quarry and the crushed stone processing facilities, but no mineral collecting. Lots of catered picnic food and snacks, cakes and cookies were provided. The October weather put on its own display, with sun, wind, rain, and accumulating sleet during the four-hour event, so the visitors were very grateful for the protection of the big tent.

Nittany Mineralogical Society members David Glick and Drs. Duff Gold, Bob Altamura and Andrew Sicree provided geological and mineralogical



Hanson Aggregates' Oak Hall Quarry offices on Boalsburg Road, between Lemont and Oak Hall, at right; Open House tent at left. *D. Glick photos.*



Left: Inside the tent. At left, Duff Gold discusses geology and mining with a visitor. In the center, the mini-mine provides small specimens for children to keep, as Bob Altamura (seated) identifies them. At right, Andrew Sicree shows specimens for the visitors to touch, and information on the many uses of limestone and the importance of quarries and mines. "If you can't grow it, you have to mine it."

information and various levels of activities for the visitors, especially children. Free publications provided by the Pennsylvania Geological Survey were very popular. Rock, mineral and fossil specimens, including some found in this quarry, were on display and could be handled by the visitors. Children could dig in the mini-mine to find and keep a wide variety of minerals and gemstones, which the mineral club members then identified for them.

The quarry produces dolomitic limestone of Ordovician age. It sometimes exposes specimens of crystalline calcite, dolomite, quartz, and strontianite, with lesser amounts of fluorite, barite, sulfur, and pyrite. ❄️

Below: Quarry equipment was parked in the parking lot so that visitors could get close and comprehend its size. The edges of the quarry pit can be seen in the background.



NEWS FROM THE FEDERATIONS

Nittany Mineralogical Society, Inc., is a member of EFMLS, the Eastern Federation of Mineralogical and Lapidary Societies, and therefore an affiliate of AFMS, the American Federation of Mineralogical Societies. We present brief summaries here in order to encourage readers to see the entire newsletters.

The **EFMLS Newsletter** is available through the link on our web site www.nittanymineral.org, or remind Dave Glick to bring a printed copy to a meeting for you to see. In the November issue, Club Rockhound of the Year selections are solicited. Other Federation programs such as Each One Teach One and All American Club Award are discussed. President Larry Heath takes over upon the resignation of Merrill Dickinson and introduces himself.

The **AFMS Newsletter** is available by the same methods. The November issue includes photos of the final donations to the 2015 Endowment Fund Drawing, and the first for 2016, with a kickoff article on the 2016 drawing and the Fund. New President Matt Charsky introduces himself and his history as a geologist, mineral and crystal collector, and holder of many offices in AFMS and EFMLS. The Rockhound Sticker™, “developed to promote rockhounding and help rockhounds identify one another,” is discussed. The safety article discusses how the field trip leader may have to be the “tough guy” in enforcing safety rules, sometimes even more stringent than, for example, a mine operator.

Please see the web sites for the complete Newsletters. There’s a lot there!
-Editor

Dues are Overdue!

by David Glick, NMS President

Our membership year ended on October 31. If you haven’t renewed your membership, Please do! The rate remains at \$20 for an individual member, with other options available. Forms may be downloaded from our web site.

The dues form includes a line for “don’t send a printed Bulletin;” you can help reduce our expenses by checking this line. You can go back to the printed version, or request individual printed issues, at any time.



Geo-Sudoku

by David Glick

This puzzle contains the letters ACDILMPRY. One row or column includes the general shape of a conularid. Each block of 9 squares, each row, and each column must contain each of the nine letters exactly once. The solution is on page 8.

			L			D		
P	A		D					L
I					R		C	
	R	A			C	L		
			R			I		
C	I			L				M
			P	I	L		A	D
	M					P	L	
D	L	P		M				

Classifieds

Ads may be submitted to the Editor (see p. 8)

FOR SALE: 2 Homemade Lapidary saws for sale - 14" and 18". Both come with working motors, arbor, belt, pulley, rock clamp/carriage, and a blade. Both are mucked-out and ready to move. Both could use a little TLC. For more info contact Mike Zelazny at fabricatefilm@yahoo.com

FOR SALE: Microscope & Accessories, Mineral Specimens, Crystal Models.

Avid collector wants these to be purchased by someone who would appreciate them. Contact Frank & Gail Beall, 724-789-7290. See much more complete listing at www.nittanymineral.org/beall.pdf and in earlier NMS Bulletin issues.

Some Upcoming Shows and Meetings

Our web site <http://www.nittanymineral.org> has links to more complete lists and details on mineral shows and meetings around the country.

See www.mineralevents.com for more.

Nov. 21-22, 2015: Gem, Mineral, and Fossil Show, by Northern Virginia Mineral Club & George Mason University's Department of Atmospheric, Oceanic, and Earth Sciences. George Mason University, The Hub Ballroom, Rte 123 & Braddock Rd, Fairfax, VA; Sat. 10-6, Sun 10-4. Adults \$6, seniors \$4, teens (13-17) \$3, 12 and under free, Scouts in uniform & students w/ID free.
info: <http://www.novamineralclub.org/events/2015-show>.

March 5-6, 2016: Gem, Mineral & Fossil Show, "Where in the World," by Delaware Mineralogical Society.
<http://delminsociety.net/marchshow/marchshow.htm>

April 8-10, 2016: *NY/NJ Mineral, Fossil & Gem Show.*
Special deal for dealers: The offer is simple: if a dealer agrees to offer exclusively "local" mineral, fossil & gem material (defined as items from NY, NJ, PA, DE, MD or CT) then they may obtain a 10'x10' booth for only \$500 at the 2016 *NY/NJ Mineral, Fossil & Gem Show*. That is about 1/3 the regular price of a booth at this popular show, with 14,000 visitors expected in 2016. Each year, the NY/NJ Show spends \$80,000+ on billboards and front-page newspaper ads, which drives the aggressive growth in both attendance and dealer participation. The 2016 show will be our 5th annual show, but the displays and exhibits will be second only to the 70-year old Tucson "Main Show." However, we must have their **application by November 30th**. No applications will be accepted for \$500 booths after this date. See www.ny-nj-gemshow.com/ or contact D Glick for the specialty booth application.

Geo-Sudoku Solution

R	Y	M	L	C	A	D	P	I
P	A	C	D	Y	I	R	M	L
I	D	L	M	P	R	Y	C	A
M	R	A	I	D	C	L	Y	P
L	P	Y	R	A	M	I	D	C
C	I	D	Y	L	P	A	R	M
Y	C	R	P	I	L	M	A	D
A	M	I	C	R	D	P	L	Y
D	L	P	A	M	Y	C	I	R

INVITE A FRIEND TO JOIN THE SOCIETY

The Nittany Mineralogical Society prides itself on having among the finest line-up of speakers of any earth sciences club in the nation. Everyone is welcome at our meetings. If you'd like to be part of our Society, dues are \$20 (regular member), \$7 (student rate), \$15 (seniors), \$30 (family of two or more members, names listed). Those joining in March or later may request pro-rated dues. Your dues are used for programs and speakers, refreshments, educational activities, Bulletins, and mailing expenses. Please fill out a membership form (available at www.nittanymineral.org), make checks payable to "Nittany Mineralogical Society, Inc." and send them in as directed, or bring your dues to the next meeting.

We want to welcome you!

CONTACT INFORMATION

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Door Prizes: Dr. Bob Altamura (see above)
Facebook & Publicity: John Dziak: jjd264@psu.edu

The **Bulletin Editor** will welcome your submissions of articles, photos, drawings, cartoons, etc., on minerals, fossils, collecting, lapidary, and club activity topics of interest to the members. Please contact:

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State College, PA 16801-7226

Newsletter submissions are appreciated by the first Wednesday of the month. Photographs or graphics are encouraged, but please do not embed them in word processor files; send them as separate graphics files (TIF, or good to highest quality JPEG files, about 1050 pixels wide, are preferred). Please provide captions and name of photographer or artist.

Visit us at www.nittanymineral.org