

Nittany Mineralogical Society Bulletin

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

Editor (see page 8):

David C. Glick

December, 2015

Visit our web site: www.nittanymineral.org

December 16th meeting:

**Annual Holiday Dinner at
Hoss's Steak & Sea
House Restaurant
6:00 p.m. Wed. Dec. 16**

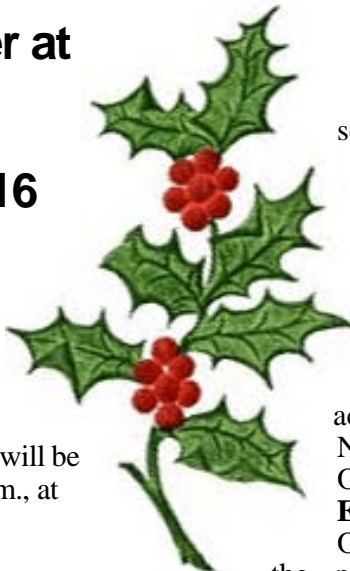
**Please sign up by
Dec. 7
if you can**

Our annual December dinner meeting will be held Wednesday, December 16th, 6:00 p.m., at Hoss's Steak & Sea House restaurant 1450 North Atherton St. State College PA 16803

If you plan to attend, **please RSVP** to NMS Secretary Ellen Bingham, stating the number of people in your group, at 814-234-4532 (leave a message with your name and phone number and the number in your group, then repeat it so that we're sure to get it right) or e-mail nittanymineral.org@gmail.com - by 6 p.m. Monday December 7 if at all possible (but if it's later or you need to make a change, contact Ellen anyway). Guests, junior members and their families, non-members and prospective members are welcome; just sign up with Ellen.

NMS will pay for some appetizers for the group. Individuals will then order their dinners from the menu and will have separate checks. Hoss's no longer adds a gratuity to the checks, even for groups, so please remember to tip your server. The menu should be as shown at <http://www.hosss.com/menu/> (choose the various sections on the right side). Almost all dinner entrees include Hoss's salad bar. (There's also a full reproduction of the menu at the independent web site <https://www.statecollege.com/dining/613/hosss-steak--sea-house/> but the prices are out-of-date.)

We'll have time before and after dinner to socialize. We won't have a formal meeting or program, but we'll have some door prizes. As always, feel free to bring a mineral specimen, lapidary project, etc. to show to everyone. Please come and join us for an enjoyable evening!



Thank You for Another Year from David Glick, NMS President

Looking back on 2015, I can say that my schedule has been totally crazy. The support and cooperation of everyone involved with NMS allowed me to keep the Bulletin coming to you and keep NMS activities organized; I'm very grateful. The **Board of Directors** is a wonderful group to work with. Members and colleagues who have presented our **monthly programs** and contributed articles and photographs for the **Bulletin** are supporting the heart of our activities. Good material came from the EFMLS Newsletter and club bulletin exchanges as well. Our big annual event is **Minerals Junior Education Day**, and we had lots of help with that. Other people took the initiative with **outreach** to the public. Finally, the members provide an appreciative audience and make it all worthwhile. Thank you!

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 December dinner, 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>

Tax-deductible Donations Welcomed

by David Glick, NMS President

NMS is a 501(c)(3) nonprofit corporation (registered in Pennsylvania), so your donations are tax-deductible as permitted on your Federal income tax return. The Society welcomes donations which we will use for our various programs, including Minerals Junior Education Day. To donate, make your check out to NMS, note that it is a donation, and send it to the NMS Treasurer: Stuart Bingham, 145 Goddard Circle, Penna. Furnace PA 16865 (before the end of the year if you plan to deduct it on your 2015 tax return). NMS will provide a letter documenting your donation. Thank you!

TWO AMAZING WEEKS IN THE MOUNTAINS AWAIT YOU

by Steve Weinberger,
Wildacres Committee Chair
from December 2015
EFMLS Newsletter 53:2

Registration opens January 1

Imagine yourself spending a week away from the pressures of life, the noise of car and truck horns, blaring radios, stories of crime blaring at you from the local news, and, if you're not retired, the pressures of "the boss" who expects you to "work" to earn that paycheck.

We have a terrific solution for you – an opportunity to get away from all of the above and immerse yourself in relaxing, learning a new skill or two, and learning new things from a guest speaker. **That solution is attending one or both of the 2016 EFMLS Workshops at Wildacres in North Carolina.**

Wildacres is a fantastic retreat located on Pompeys Knob just off the Blue Ridge Parkway about an hour north of Asheville. The property consists of over 1,000 acres, much of which is truly kept "wild". The facility features two large lodges with private, motel style bedrooms (each with private bath), well equipped lapidary and jewelry studios and other classroom spaces, an auditorium, hiking trails, dining room and fantastic views of Mt. Mitchell and the surrounding Blue Ridge range.

Owned by a private foundation that allows non-profit groups such as ours to come for a few days for workshops that encourage the betterment of mankind, we've been privileged to be allowed to use the facility for the past 43 years.

Each session consists of time for participants to take one or two classes, hear excellent talks from our guest speaker, join a field trip, explore the area, and participate in a variety of other activities. Our instructors, all volunteers are outstanding and bring with them a wealth of knowledge about their subject, lots of teaching experience and above all, patience!

Dates for 2016 are May 9 – 15 and September 5 – 11. Descriptions for our spring classes are on page 8. We're still working on the fall list, but will include faceting, fused glass, silversmithing and wirewrap for sure. Descriptions for all fall classes will be in the next EFMLS News and on our website <efmls-wildacres.org>.



Tuition for each session this year will be \$400 per person which includes your room and board for the week and gratuity for the Wildacres Retreat staff. You will be asked to pay your instructor(s) a materials fee, but that depends on what class or classes you select. Materials fees will be announced closer to the workshop session since costs, especially that of metals, do tend to change.

We've included a registration form for your use [in December newsletter linked from NMS web site]. Feel free to make copies for your club members! Since some classes fill quickly, we ask that you include 4 options per "semester". More information about the EFMLS Workshops at Wildacres can be found on our website <efmls-wildacres.org>. Do register, but not before January 1, 2016.

In a nutshell, an EFMLS Workshop at Wildacres should be on your bucket list of places to experience. We hope to see you there in 2016.

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 Bulletin issues.

Carbonate tidal-flat deposits in Rupp Quarry

By Charles E. Miller, Jr
State College, PA 16803

Introduction

For decades, an abandoned, one-half acre quarry (Figures 1 and 2) in State College (PA) has been a field stop for Penn State geology students. Rupp Quarry exposes tidal-flat deposits in the Half-Moon Hill Member of the Axemann Limestone of the Lower Ordovician Beekmantown Group (Table 1). Included among the many sedimentary features are the largest stromatolites in the local area. Despite partial backfilling and urban encroachment, this quarry still provides one of the best exposures of the Half-Moon Hill Member.

Location and history

Rupp Quarry, previously the O'Bryan (or William O'Bryan) Quarry (Rich Francke, personal communication, 12-12-14), is located behind Hamilton Square Shopping Center on Hamilton Avenue (Figures 1 and 2b). The quarry was active by 1911-1912 (Frear, 1912), and was eventually excavated to approximately 70 feet (Figure 2a). Mining is thought to have ceased in the 1930s. By 1959, the quarry was backfilled to approximately 50 percent of its former depth. In that year, the shopping center was built, and the backfilled area became a parking lot. From 1994 to 1997 Championship Mini-Golf occupied part of the quarry. Since about 1999, Walk's Towing uses the same area for towed vehicles (Figure 2b). This section of the quarry is now fenced-in and permission to enter must be obtained from Walk's. In 2013, Cliffside Apartments was built above one abandoned highwall, covering surface exposures.

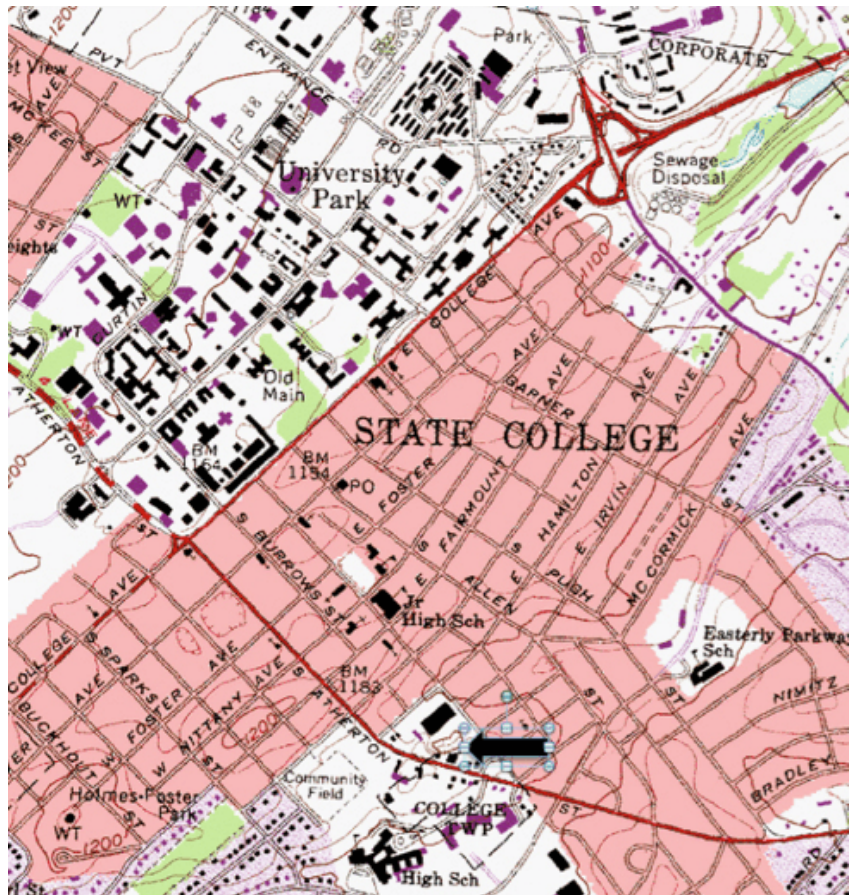


Figure 1: Location map for Rupp Quarry (black arrow). (Base from State College, PA., 7.5-minute quadrangle, U.S. Geological Survey).

Geologic setting

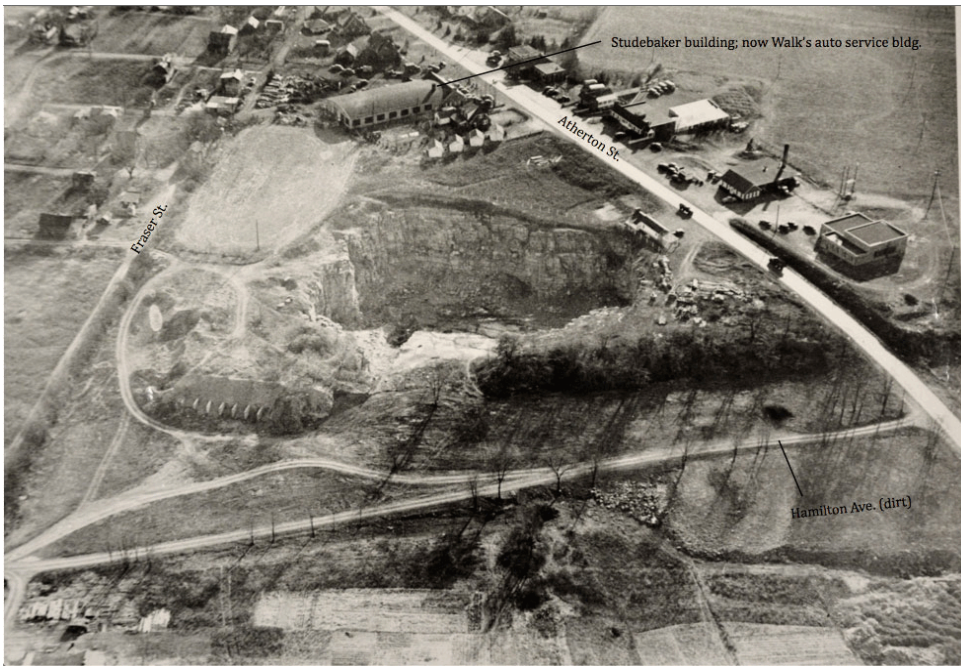
The quarry is located in Nittany Valley, an anticlinal valley largely underlain with Cambro-Ordovician carbonates. The Axemann is part of a local 7000-foot carbonate sequence (Table 1) deposited on an early Paleozoic platform that fringed Eastern North America. This Great American Carbonate Bank represents 100+ million years of nearly continuous carbonate deposition (Demmico and Mitchell, 1982).

Stratigraphy

In central Pennsylvania, the Axemann ranges 200 to 700 feet thick. At Rupp Quarry, 80 feet of strata are exposed: 76 feet of Axemann and four feet of overlying Bellefonte Dolomite (Table 1). Lees (1967) provides detailed stratigraphic descriptions of this measured section. In the State College area, the Axemann can be divided into two members: a lower Rockview Member and an upper Half-Moon Hill Member. Only the latter is represented here. The best estimate for total thickness of the Half-Moon Hill Member is 150 feet (Lees, 1967).

System	Group	Formation	Member	Thickness, ft.
Ordovician	Beekmantown	Bellefonte Dolomite		1200
		Axemann Limestone	Half-Moon Hill	400
			Rock View	
		Nittany Dolomite		1200
Stonehenge		500		

Table 1: Generalized columnar section of the Lower Ordovician Beekmantown Group of Central Pennsylvania.



Stratigraphic description	Feet	
	Unit	Total
Dolomite	4	80
Calcarenite pelmatozoan. Fossils include straight-shelled cephalopods, <i>Ceratopea ankylosa</i> .	0.5	76
Dolomite	8.5	75.5
Calclutite somewhat calcarenitic; dolomite.	6	67
Dolomite.	4	61
Calclutite, calcarenite, dolomite.	6	57
Dolomite.	2	51
Calclutite, calcarenite.	4	49
Dolomite.	4	45
Pelmatozoan calcarenite, calclutite, dolomite.	11	41
Calclutite, calcarenite, calcirudite.	1	30
Dolomite.	2	29
Calclutite, dolomite.	1	27
Dolomite.	1	26
Calclutite, calcarenite.	2	25
Dolomite.	3	23
Calcarenite.	2	20
Dolomite.	6	18
Calclutite, dolomite, calcarenite.	12	12

Figure 2: (a) Oblique aerial view of Rupp Quarry (center) showing mining at an approximate maximum depth of 70 feet. (b) Oblique aerial view of the Hamilton Square Shopping Center (#1) and Rupp Quarry (#2). By 1959, the quarry was backfilled to approximately 50 percent of its original total depth.

Table 2: Generalized stratigraphic column at Rupp Quarry. Modified from Lees, 1967.

General stratigraphy is calcilutite interbedded with dolomite (Table 2). Closer inspection shows complex interbedding of different lithologies, including calcarenites and calcirudites, reflecting environmental changes. Small-scale interbedding of strata several inches thick or less indicates rapid environmental changes, such as from storms (Lees, 1967).

Rupp Quarry strata represent carbonate tidal-flats. These are divided (top-to-bottom) into supratidal, intertidal, and subtidal zones (Figure 3). Supratidal zones are subaerially exposed except during storm

surges and spring tides. Intertidal zones range from high to low tide. Subtidal zones are below wave base, permanently covered with water. Each zone produces lithologies, sedimentary features, and fossils distinctive enough to differentiate one from the other.

Supratidal deposits, here, include dolomite, algal mats (finely-laminated dolomites), mudcracks, evaporites, tepee structures, and very restricted or absence of fauna. Intertidal deposits include intraformational conglomerates (rip-up clasts), disarticulated fossils, and "cabbage-head" stromatolites. Subtidal deposits are predominantly calcilutites.

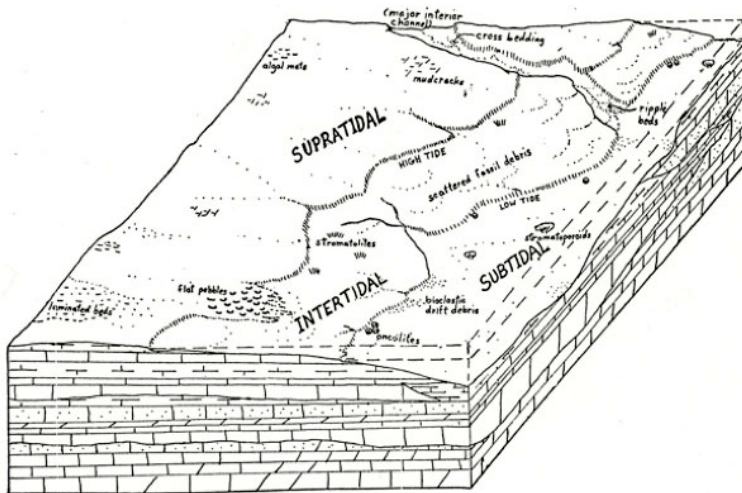


Figure 3: Block diagram showing the three zones of a carbonate tidal flat. (Miller, 1971).

Of the intertidal features, large, three-foot tall “cabbage-head” stromatolites (Figure 4) are striking. These fossils are blue-green algae in association with cyanobacteria. Stromatolite morphologies reflect their distribution in modern tidal flats (Figure 5). Supratidal forms consist of laterally-linked hemispheroids with continuous laminae (LLH). They are commonly referred to as algal mats. Intertidal stromatolites develop larger, more distinct domes or hemispheroids forming columns or clublike “cabbage heads” (SH, LLH-SH). Subtidal forms, designated SS, are not present at Rupp Quarry.

Height of intertidal stromatolites (SH, LLH-SH) has been considered as a paleotidal indicator (Cloud, 1968). This would be a valuable tool for determining tidal amplitudes in the geological past. However, there are several caveats. The principal problem is misinterpretation of the preserved fossils as if they were large, tree-like structures during life, standing free high above the bottom. Instead, by carefully tracing individual laminations from the stromatolite interior, out into the layers in the surrounding sediment, it was shown that the stromatolite top projected above the surrounding sediment surface by only centimeters/inches, not meters/feet. Thus, the initial inference of very great tidal ranges was seriously in error. Additionally, shoreline configuration, water depth, and storms are some of the factors influencing height and timing of tides at a locality. The Bay of Fundy at Nova Scotia has the highest tidal range in the world. These exceptionally high tides are largely due to a funnel-shaped coastline that shallows toward the upper part of the bay. This combination forces incoming tides higher up onto the shores. If such a coastal setting is preserved in the ancient rock record, it is misleading to assume the tidal range there was totally due to lunar influence. In addition, assuming these exceptionally high tides to be an average for that geologic time period is equally erroneous. The caveats associated with intertidal stromatolites led to no longer using them as paleotidal indicators.



Figure 4: Three-foot tall intertidal “cabbage-head” (SH) stromatolites at Rupp Quarry. The folding knife is four inches in length.

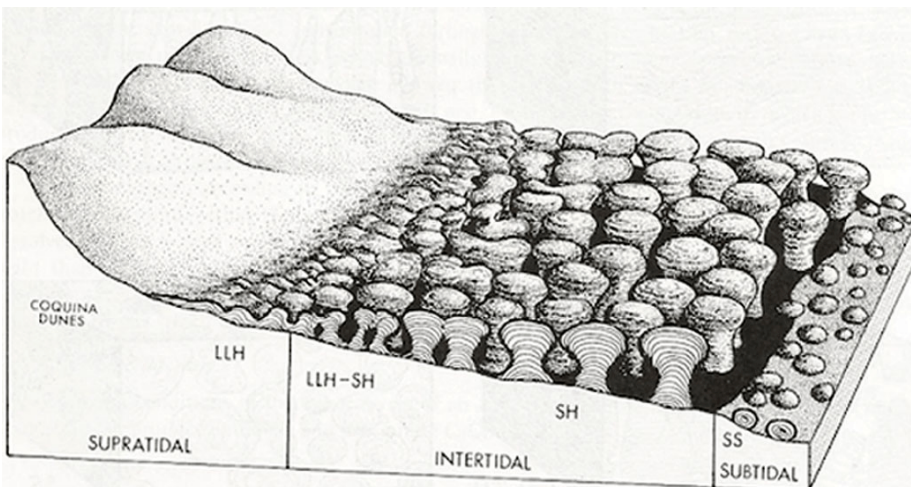


Figure 5: A generalized distribution of stromatolites in tidal flat environments. (Anstey and Chase, 1974; used with permission.)

Additional fossils include pelmatozoans, gastropods, and cephalopods. Of these, the gastropod *Maclurites affinis* is an index fossil to the Axemann. The fossil ranges vertically through the formation and is not found in other local carbonates (Lees, 1967). As such, it is useful in identifying the

Axemann. Other high-spired gastropods of the genus *Hormotoma* are also found throughout most of the formation.

In general, fossils are sparse. Paucity of fossils reflects paleoenvironmental and diagenetic factors. Unfavorable environmental conditions might include reduced dissolved oxygen, increased salinity, subaerial exposure, and turbulence. The calcilutite-dominated stratigraphy may have been unfavorable to some marine macro organisms. Very fine-grained lime mud may have been suffocating to the organisms (Lees, 1967). In contrast, pelmatozoan calcarenites reflect environmental conditions favorable to those animals. Dolomitization, a diagenetic process, destroyed fossils in preexisting limestone. The supratidal environment in which dolomitization occurs is not conducive to prolific fossils due to subaerial exposure. LLH stromatolites are an exception. Fossil distribution in the Axemann, here, mimics present-day observations in carbonate depositional environments. Marine life in these settings is not ubiquitous, but exists where conditions are favorable.

The various carbonate lithologies – calcilutite, calcarenite, calcirudite, and dolomite (Table 1) – reflect different paleodepositional environments. Calcilutites are aphanitic limestone representing quiet water (low energy) settings, either below wave base (subtidal) or in shallower, restricted areas (subtidal lagoons behind barrier shoals, organic buildups, or exposed highs). Fossils are scarce in calcilutites. Calcarenites are carbonate sands deposited in shallow, higher-energy settings such as coastal sand dunes, beaches, and offshore bars and shoals. Some calcarenites are oolitic and others contain disarticulated pelmatozoans, both reflecting a higher-energy environment. Calcirudites are coarse-grained or pebbly carbonates, also reflecting shallow, higher-energy deposition. Examples include a wide variety of subtidal, coastal settings where debris from the intertidal zone can accumulate. Dolomite - in association with mudcracks, algal mats (LLH), scarcity of other fossils, and possible teepee structures - suggests a sabkha environment.

A conspicuous feature at Rupp Quarry is the repetitious pattern of limestone alternating with dolomite (Table 1). This pattern represents carbonate parasequences (cycles). Each cycle is a shallowing-upward sequence, beginning with limestone deposited below wave base in the lower-energy subtidal zone. This is the transgressive part of the cycle. The cycle ends with limestone penecontemporaneously altered to dolomite in the supratidal zone. This is the regressive part of the cycle. The shallowing-upward cycle is the most common type of carbonate cycle (Engelder, 2006).

The cyclicity is due to sea-level fluctuations relative to vertical land movements over thousands of years. These cycles occurred in a sabkha setting analogous to the Abu Dhabi sabkha in the Arabian Gulf today. Dolomite deposition within the cycles reflects more restricted conditions of greater-than-normal marine salinity. These more restricted conditions must have persisted for longer periods of time as younger and younger cycles developed. This can be seen in the increasing ratio of dolomite to other lithologies, going from lower to higher strata (Table 1). Dolomite represents 31 percent of lithologies in lower strata, increasing to 50 percent in higher ones (Table 1). The observation that dolomite dominates in upper Axemann strata contrasts with observations elsewhere in the same formation. Doden, et al (unpublished) reports that, elsewhere in the State College area, limestone predominates near the top of the Axemann. The difference suggests the Rupp Quarry location was more restrictive than at the other Axemann locations.

Paleogeography

During Axemann time, State College was located at 25° south latitude (Laughery, et al, 2004), placing it in the tropics. This is consistent with most modern marine limestone being deposited in the tropics or subtropics. A shallow, warm, epeiric sea covered Nittany Valley. Except for restricted areas, oceanic connections to the northeast and southwest maintained normal marine salinities (Schuchert, 1955). These marine waters were super saturated with calcium carbonate. Carbonate deposition implies a low or distant source land. Absence or paucity of allochthonous clastic sediment indicates no local orogeny occurred for duration of the Axemann. Water depth was probably less than 30 feet (< 10 m) (Demico and Mitchell, 1982). At times, substrates were subaerially exposed to desiccation, as indicated from mudcracks, evaporite vugs, and algal mats. Intraformational conglomerates (rip-up clasts) imply storms occasionally affected the tidal flats. In places, tides, waves, and/or currents were strong enough to winnow sediment and cause disarticulation of fossils.

Conclusion

Rupp Quarry is one of the best exposures of Axemann Limestone in the State College area. Upper strata of the Half-Moon Hill Member are exposed. The strata were deposited during the early Ordovician in a warm, shallow epeiric sea super saturated with calcium carbonate. A calcilutite-interbedded-with-dolomite sequence also includes calcarenites and calcirudites. Varying lithologies, fossils, and sedimentary features suggest a shallowing-upward sequence of tidal-flat deposits in a sabkha setting. Higher-energy, normal-marine conditions occasionally interrupt calcilutite

deposits in shallow, restricted, quiet water. Stratigraphy, here, displays parasequences of limestone alternating with dolomite. These cycles reflect repetitive changes in eustatic sea level.

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that goes to AFMS). Club Rockhound of the Year selections are solicited. Other Federation programs such as Each One Teach One and All American Club Award are discussed. The Juniors article considers that “there is still hope” as kids continue to be interested in real mineral and fossil specimens in a world of video games and social media; we need to do our part to reach out to them “in creative and innovative ways.” The safety article discusses how safety talks are an opportunity to teach, educate, and inform.

The **AFMS Newsletter** is available by the same methods. The December issue includes President Matt Charsky’s “Initial View” and a proposal to reward the regional federation that has the greatest increase in membership from one year to the next. The AFMS Recognition Award goes to B. Jay Bowman for his efforts in promoting competitive exhibits and training judges. The AFMS Convention is recapped, with minutes and award winners listed, and Club Rockhounds of the Year are introduced. The Future Rockhounds of America program passes a milestone, with over 10,000 badges awarded to kids. The first donations to the 2016 Endowment Fund Drawing are illustrated, and 2015 winners are listed. Tax-deductible Scholarship Foundation contributions are invited.

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

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 December issue, 2016 workshops at the Wildacres retreat in North Carolina are described. President Larry Heath reviews the year, and reports that membership has increased for both adults and juniors. Treasurer Jean Charsky reviews the \$1.75 per member dues that each club pays to the Federation (75 cents of

Geo-Sudoku

by David Glick

This puzzle contains the letters ABDFILSTU. One row or column includes a low-energy setting for limestone deposition. 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.

U					L		A	
			F	U			S	
			B	A	S	I		
		L		B	A			
F	A	T	L		U		I	S
B						L		
				I	D			
L						U		
A		I	U	L	F	S	B	

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.

Jan. 23, 2016: Philadelphia Interclub Mineral and Fossil Swap and Sell, presented by The Philadelphia Mineralogical Society. Cathedral Village, 600 E. Cathedral Rd., Phila., PA 19128. Sat. Only, 9-1. Free admission to the public.

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

April 2-3, 2016: Philadelphia Mineral Treasures and Fossils Fair, Plymouth Meeting, PA

April 8-10, 2016: NY / NJ Mineral, Fossil & Gem Show.

April 14-17, 2016: Rochester Mineralogical Symposium <http://www.rasny.org/minsymp/>

May 14-15, 2016: World of Gems and Minerals, by Berks Min. Soc., Leesport PA

June 4, 2016: Spring Mineraldust by PESA, Macungie, PA. Sat only, 8:30 -3:00. <http://www.mineraldust.com/>

July 27- Aug. 1, 2016: AFMS Convention, Albany, Oregon

October 21-23, 2016: EFMLS Convention, Rochester NY

Geo-Sudoku Solution

U	I	S	D	T	L	F	A	B
T	B	A	F	U	I	D	S	L
D	L	F	B	A	S	I	U	T
I	D	L	S	B	A	T	F	U
F	A	T	L	D	U	B	I	S
B	S	U	I	F	T	I	D	A
S	U	B	T	I	D	A	L	F
L	F	D	A	S	B	U	T	I
A	T	I	U	I	F	S	B	D

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

mailing address:

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c/o S. Bingham, Treasurer
145 Goddard Cir.
Penna. Furnace PA 16865

SOCIETY OFFICERS

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 e-mail: emb22@psu.edu
 Stuart Bingham (Treasurer)
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 e-mail preferred: eechler@comcast.net
 Junior Rockhounds: Dr. Andrew Sicree
 814-867-6263 (h) e-mail: sicree@verizon.net
 Membership Chair: David Glick (see above)
 Programs: Dr. Duff Gold 865-7261(o), 238-3377(h)
 e-mail: gold@ems.psu.edu
 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:

David Glick E-mail: xidg@verizon.net
 209 Spring Lea Dr. phone: (814) 237-1094 (h)
 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