Nittany Mineralogical Society Bulletin

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

May, 2020 **Visit our web site: www.nittanymineral.org** *Editor (see back page): David C. Glick*

May Online Presentation:

Fluorite, the Fourth Mineral

by Dr. Andrew Sicree

Thanks go to Dr Sicree for creating this video presentation and making it available online. To view it, go to the main page of our web site and use the links in the central announcement.

Cubic crystals of purple fluorite, Cave-in-Rock, Illinois. *J. Passaneau photo*

Fluorite is much-collected because it is a relatively common mineral (common enough for Friedrich Mohs to give it the 4th place on his scale of hardness), common enough that most collectors will encounter it in the field. This talk uses fluorite as an example to introduce the beginning collector to some basic principles of mineralogy.

With no gatherings of groups of people due to COVID-19, and the Penn State campus closed, we won't have a May meeting in person. As usual, no meetings are planned for June or July. All of us at NMS sincerely hope that everyone is in good health and will continue to be well. We look forward to being together again.

Geo-Sudoku

by David Glick

This puzzle contains the letters ABCEILSTU; one row or column spells an interesting fossil. As usual, if you've read this issue, you've seen it. 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.

	I		C		E			U
C		U		I		E	S	
	E		S	B				
		C			I			S
		S	T	E				
	L	E	B		C			
	C	B		U	L		I	
	S	A						E
			E			B		

FEDERATION NEWS

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. The **Federation leaders and our Society strongly encourage all members to read the monthly Federation Newsletters, available on their web sites**, which are linked from our web site, www.nittanymineral.org . We present brief summaries here in order to encourage readers to see the entire newsletters. There's a lot there!

The May **EFMLS News** notes that the Wildacres Spring Workshop has been cancelled; at this time, the August session is still scheduled to be held. Many events have been cancelled so it is essential to check on their status before traveling. The safety article concerns masks - not only for the coronavirus, but dust masks for various aspects of our hobby. They should be the right size and should provide a good seal in order to be effective.

The **AFMS Newsletter** May issue <http://www.amfed.org/news/> safety article summarizes COVID-19 safety. Dinosaur costumes are covered in the Juniors article. The AFMS Scholarship Foundation's operation is described. Some virtual field trips are listed; see the NMS web site for links. *-Editor*

While We Can't Travel:

Virtual Geo-Resources

While many of us are stuck at home, museums and professional organizations may be offering new material to view on the internet. **Penn State's Earth & Mineral Sciences Museum and Art Gallery** has added more "virtual museum" postings since last month on <https://www.facebook.com/EMSMAAG/>. The AFMS Newsletter, Rock & Gem magazine, and others have links to virtual field trips; see the NMS web site for some links. *-Editor*

From the collections

Dr. Charles E. Miller, Jr.

This is Part 1 in a series of articles showcasing images and specimens in the writer's collection.

Part 1: Ammonites

Ammonites

Ammonites are extinct marine fossils belonging to the large Phylum Mollusca. Although best known in coiled forms, they can have shells of various shapes (Figure 1). Externally, coiled forms may superficially resemble some gastropods (snails; Figure 2a) - another group of mollusks. However, ammonites have internal partitions (septa) (Figure 2b), distinguishing them from gastropods. Folding of the septa produces suture patterns - similar to sutures of a human skull. (Figure 3).

Figure 1: Carnegie Museum of Natural History display showing ammonite shell morphologies. Image by the author.

Ammonites are cephalopods, a class of mollusks. Two major subdivisions of the cephalopods are the nautiloids and ammonoids (Figure 4). Distinction between the two is largely based on suture patterns. Nautiloids have simple septa that are not convoluted. Within the ammonoids, subdivisions are based on the complexity of the sutures. Ammonites are ammonoids having the most complex suture patterns - ammonitic sutures.

Ammonites were carnivores. In gross external appearance, they resemble today's *Nautilus*, both of which had/have tentacles for grasping prey. They were free-swimming, free-floating animals, using self-generated jet propulsion for movement. The aforementioned internal septa partitioned part of the inner shell into chambers, each of which was filled with gas to provide buoyancy.

Of macro fossils, ammonites are prized for their large size and use in stratigraphy. The largest North American ammonite measures 4.5 feet in diameter. Ammonites are useful as index fossils to identify and date strata. To

Figure 2: **(a)** Cross-sectional view of Ordovician gastropod (snail), Chambersburg, PA. Note absence of internal septa. **(b)** Cretaceous ammonites from the Pierre Shale; South Dakota; 1974. Top: lateral external view; bottom left: apertural view. Original shell is preserved; lower right: internal lateral view showing septa. Specimens collected and photographed by the author.

Figure 3: Portion of Baculites, a straight-shelled ammonite, showing very-well preserved ammonitic sutures. Compare to Figure 4. Pierre Shale of Wyoming; 1985. Collected and photographed by the author.

qualify as index fossils, they must be easily identified, widespread, abundant, and limited in geologic time. The reader is referred to the August, 2018 issue of the *Nittany Mineralogical Society Bulletin* (pp. 4-7) discussing using fossils to date rock strata. Some index fossils are especially useful because their stratigraphic range is so

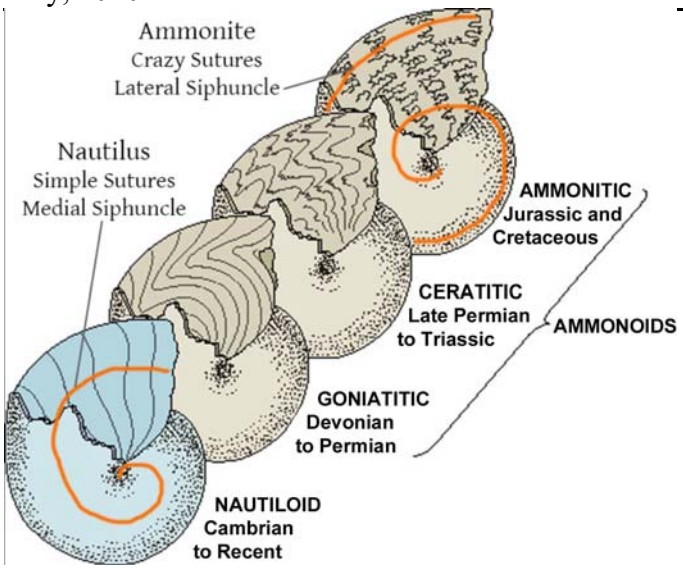

Figure 4: Comparison of nautiloid and ammonoid suture patterns. (After Harold Levin, *The Earth Through Time*)

limited they are associated with a particular formation. This association aids geologists trying to figure out stratigraphic sequences, especially in carbonates where strata may look similar.

Some ammonites provide paleoecological information. For example, some are found with holes in them (Figure 5). The holes are aligned so they match teeth of a mosasaur (Figure 6), the top marine reptile predator during the Cretaceous. These examples provide insight into part of the marine food chain during that time period.

Figure 5: Ammonite showing puncture holes, probably from a mosasaur attack. Royal Tyrrell Museum of Palaeontology; Alberta, Canada. Image by the author.

Figure 6: Teeth of a mosasaur; Carnegie Museum of Natural History. Image by the author.

Ammonoids lived from the Devonian to the end of the Cretaceous - a span of about 300 million years, while ammonites lasted from the Late Triassic to the end of the Cretaceous - a span of about 135 million years. From a longevity perspective, they represent an evolutionary success. In the Cretaceous, they attained their greatest diversity in size and shape. Their size ranged from that of a small marble to 7+ feet in diameter. The great diversity may have partially resulted from ammonites adapting to changing environmental conditions as well as from minor random evolutionary changes. By the end of the Cretaceous, they were extinct.

The Western Interior Seaway

Ammonites in the writer's collection are from the Cretaceous of Texas, Colorado, Wyoming, and South Dakota. These are associated with the Western Interior Seaway (Figure 7), an epicontinental, shallow sea that existed mostly during the mid- to late-Cretaceous. At its greatest extent, it bisected North America, connecting the Gulf of Mexico to the Arctic Ocean (Figure 7). During its maximum extent, it was 600 miles wide, 2000+ miles long, and, generally, less than several hundred feet deep. Typical fauna of the seaway included plesiosaurs, mosasaurs, ammonites, fish, and invertebrates.

Figure 7: Map showing the Cretaceous Western Interior Seaway at the one point in time when at its maximum extent. Its areal extent was continually changing, as its exact shorelines fluctuated.

Texas ammonites

The writer collected Texas ammonites (Figure 8) in 1982 near Crowley, 15 miles south of Ft. Worth, from the Duck Creek Formation. The formation - a marly limestone - was exposed in a dry creek bed. Marl typically consists of calcium carbonate (lime) mixed with clay-mineral mud, collectively deposited as loose, earthy material. As a result, extrication of fossils - especially ammonites - from the matrix was relatively easy in comparison to most fossil collecting. The ammonites could literally be plucked out of the creek bed. Discovery of Specimen "f" was serendipitous. It was found lying on the creek bank. No digging was needed. Specimens in Figure 8 range from 9.5 to 16 inches in diameter. While these specimens are of large size, a 1928 publication in the *Journal of Paleontology* reports Texas ammonites ranging up to 40 inches across.

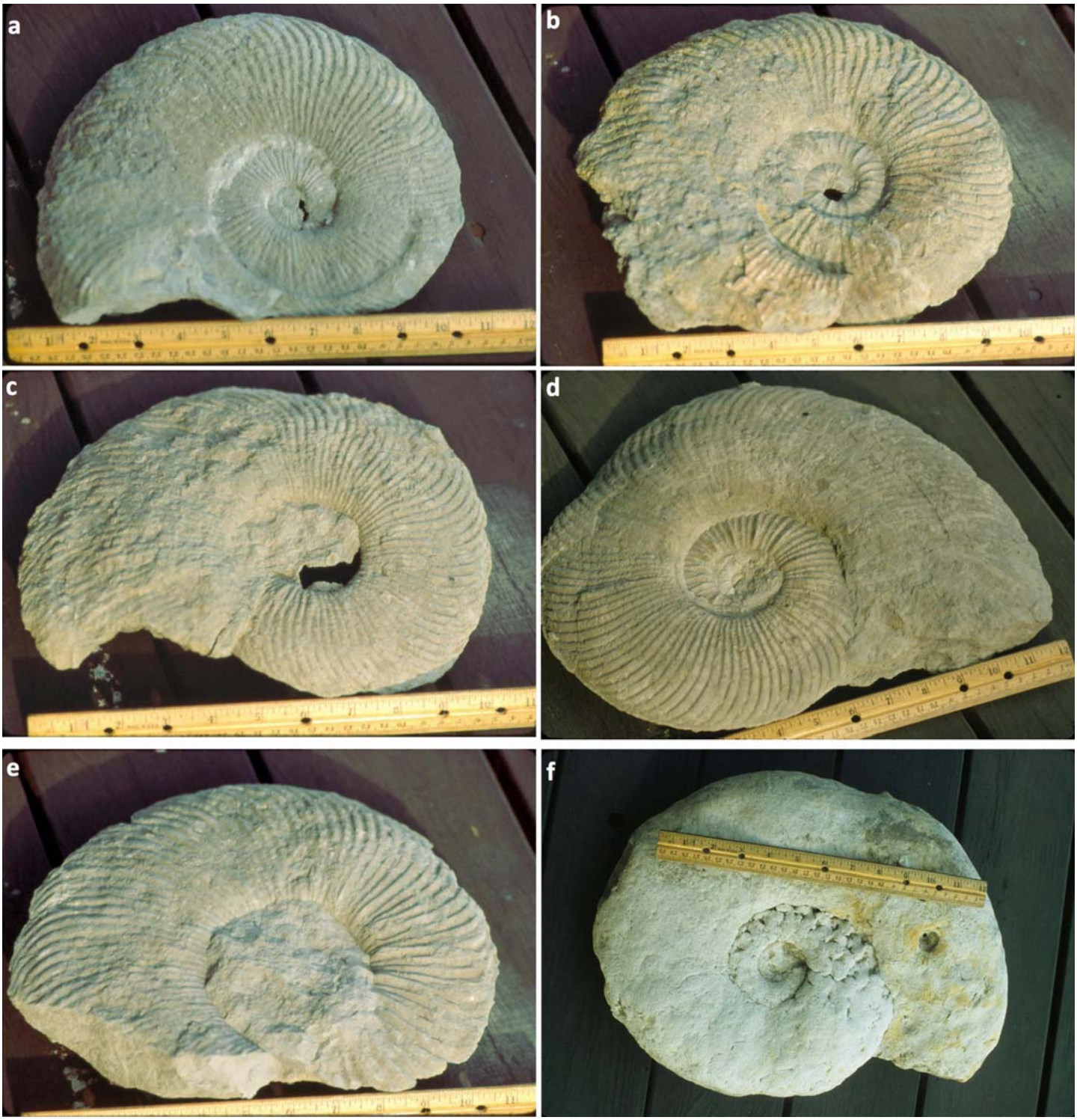

Figure 8: Ammonites from Crowley, Texas. Diameters range from 9.5 to 16 inches. All are internal molds. Collected and photographed by the author.

The Duck Creek Formation was deposited on a warm, shallow, open shelf. Abundance and variety of marine fauna suggest well oxygenated water of normal salinity. At the time of deposition, there was local tectonic quiescence - i.e., no significant, local uplift that would have resulted in much erosion and an influx of voluminous terrigenous sediment.

Kremmling, Colorado ammonites

Kremmling, Colorado is known for large ammonites, with some at least up to 22 inches in diameter (Figure 9). *The Washington Post* calls it the world's largest known giant ammonite graveyard. These are some of the largest ammonites in the 48 states. They occur in iron-stone and limestone concretions (Figures 10 and 12), some of which can be up to 15 feet in diameter. In addition to ammonites, the concretions also yield other mollusks such as gastropods (snails) and pelecypods (clams).

Figure 9: Cretaceous ammonites from Kremmling, Colorado. Denver Museum of Nature and Science. The ammonite at center is 22 inches in diameter. The sunglasses are five inches across. Image by the author.

Fossils at Kremmling are from the Pierre Shale deposited in the Cretaceous Western Interior Seaway (Figure 7). Its geographic extent ranges from Canada to New Mexico, making it a major component of the seaway's stratigraphy. At the time of deposition, a shallow temperate sea covered Colorado. In most areas, water depth was less than 600 feet, in many places substantially less. At Kremmling, however, water depth was quite shallow because the calcareous sand, there, represents an ancient sand bar in the seaway.

Figure 10: Kremmling, Colorado. The author with a 15-inch *Placenticeras* ammonite.

Figure 11: ~4-inch ammonite (center).

Because of size and weight of larger concretions, considerable effort may be required for accessing ammonites at Kremmling. Initially, the concretion is dug out of the ground and oriented vertically. It is then split open using chisels and a sledge hammer. The larger ammonites are commonly of the genus Placenticeras (Figures 5, 9, and 10). The specimen of Figure 10 is a 15-inch Placenticeras collected in 1987 at this locality. Original diameter of this specimen was approximately 22 inches. Unfortunately, the outer whorl was broken off in extricating the fossil from a concretion.

Most ammonites at Kremmling are females. Presence of literally thousands of ammonites - mostly

Figure 12: Large concretions (center and lower right); Kremmling, CO. Image by the author.

females - in association with a sand bar in shallow water suggests the site may have been a spawning area. Normally, ammonites lived in deeper water. However, like many marine creatures in today's oceans, they may have congregated in near-shore areas to lay eggs. And, like many other marine creatures, they may have died off upon concluding the act. Their shells then became part of the rock record.

Because of over zealous collecting by commercial fossil hunters, the locality is now protected and is a Research Natural Area. The Denver Museum of Nature and Science has a collection of ammonites from Kremmling, some of which have 22-inch diameters (Figure 9).

Canadian ammonites

At the Royal Tyrrell Museum in Drumheller, Alberta, Canada is a spectacular *Placenticeras* ammonite measuring 24 inches in diameter (Figure 13). The ammonite has an iridescent appearance with brilliant colors. This appearance is due to the original aragonite still being preserved as very thin sheets, which reflect light to produce these colors; the iridescent material is sometimes called "ammolite," broken fragments of which are regarded as semi-precious gemstones. Ammolite is mostly associated with *Placenticeras* ammonites (Figures 9,10, and 13), and commonly those from the Bear Paw Formation of Alberta, Canada. The Bear Paw is correlative with the Pierre Shale, both of which were deposited in the Western Interior Seaway (Figure 7).

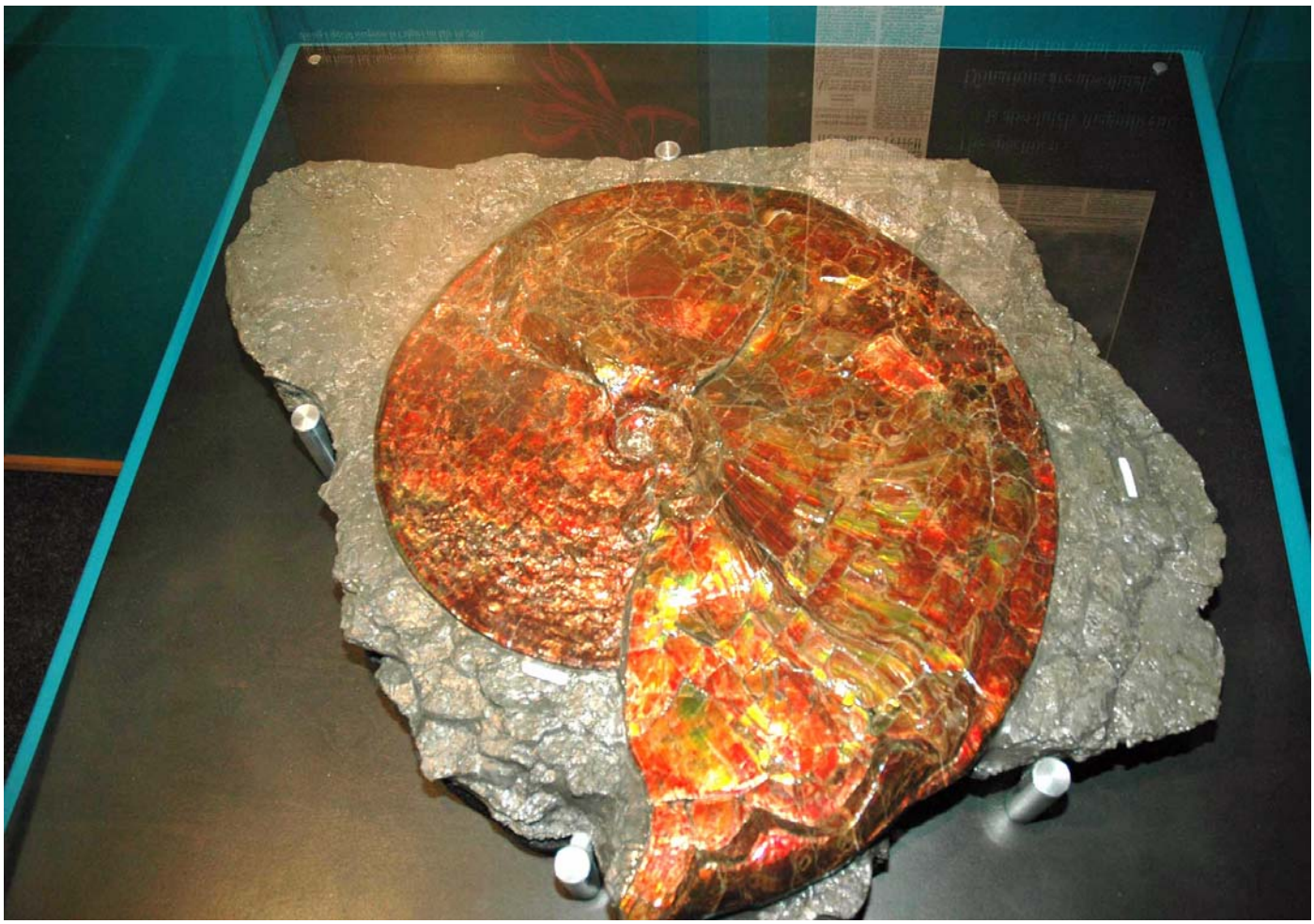

Figure 13: 24-inch ammonite exhibiting preservation as ammolite. Royal Tyrrell Museum, Drumheller, Alberta, Canada. Image by the author.

Wyoming ammonites

Figure 14 shows an internal mold of two segments of the straight-shelled Cretaceous ammonite *Baculites* from the Pierre Shale in Wyoming. Compare to Figure 3, that shows original shell preserved. Close inspection of Figure 14 reveals evidence of ichnofossils (trace fossils), probably due to worms that burrowed through mud in which the fossil rested.

Figure 14: Internal mold of *Baculites* from Wyoming. Image by the author.

Figure 15 is another *Baculites* specimen, also from the Pierre Shale of Wyoming. Note the minerals precipitated inside the ammonite shell. Minerals commonly precipitate in the hollow, partitioned chambers of ammonites.

Figure 16 shows excellent preservation of the smaller ammonite *Scaphites* from the Pierre Shale of Wyoming.

Acknowledgments

The author gratefully acknowledges Roger J. Cuffey for editing the manuscript. Any errors are those of the author.

Figure 15: Minerals precipitated in hollow chambers of *Baculites* ammonite from the Pierre Shale of Wyoming. Collected and photographed by the author.

Figure 16: Pierre Shale; Wyoming. *Scaphites* ammonite. Collected and photographed by the author.

NMS BOARD MEETING NOTICE

NMS members are invited to attend Board of Directors meetings, which are generally held at 7:00 p.m. about two weeks prior to the general monthly meeting, although we do not meet every month. **The next date has not been set due to the coronavirus situation.** Members who would like to attend should contact president David Glick to verify time and place; those who would like to have their discussion item placed on the agenda should contact him at least one week in advance of the meeting.

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.

Most upcoming events have been canceled.
Verify show schedule before traveling!

EFMLS Convention rescheduled to October - see page 1 of the April Bulletin.

CLASSIFIEDS

Sphere Machine For Sale

Homemade but durable sphere making machine has two opposing gear motors with two spindles, all on a wheeled cart. Makes rock spheres 2-6 inches in diameter. Includes numerous diamond, cast iron and PVC grinding cups, a wide array of abrasive grits & several polishes. $500. Contact Jim Garthe 814.667.2409 or jwgarthe10@gmail.com

Geo-Sudoku Solution

S	I	T	C	A	E	L	B	U
C	B	U	L	I	T	E	S	A
A	E	L	S	B	U	I	T	C
B	**A**	**C**	**U**	**L**	**I**	**T**	**E**	**S**
I	U	S	T	E	A	C	L	B
T	L	E	B	S	C	A	U	I
E	C	B	A	U	L	S	I	T
L	S	A	I	T	B	U	C	E
U	T	I	E	C	S	B	A	L

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:
Nittany Mineralogical Society, Inc.
c/o S. Bingham, Treasurer
145 Goddard Cir.
Penna. Furnace PA 16865

SOCIETY OFFICERS

David Glick (President) 814-237-1094 (h)
e-mail: xidg@verizon.net
Dr. Bob Altamura (Vice-President) 814-234-5011 (h)
e-mail: raltamura@comcast.net
John Dziak (Secretary) e-mail: jjd264@psu.edu
Stuart Bingham (Treasurer)
e-mail: sebing145@comcast.net

OTHER CONTACTS

Field Trips: Dale Kephart
e-mail: beckdale2@comcast.net
Junior Rockhounds: Dr. Andrew Sicree
814-867-6263 (h) e-mail: aas132@psu.edu
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.

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