Nittany Mineralogical Society
State College, Pennsylvania
www.nittanymineral.org
2011

January 19th meeting:

A Photo Tour of the National Mining Museum

by David Glick

Our January meeting will be held Wednesday the 19th in the room 114 auditorium of Earth & Engineering Sciences Building on the west side of the Penn State campus in State College, PA. Maps may be found on our web site.
6:30 to 7:30 p.m.: Social hour, refreshments in the lobby
7:30 to 8:00 p.m.: announcements, questions, answers; door prize drawings
about 8:00 p.m.: featured program
The event has free admission, free parking, and free refreshments, and is open to all – ***Bring your friends and enjoy the evening.*** *-Editor*

A few months ago, Dave Glick visited the National Mining Hall of Fame and Museum in Leadville, Colorado. It is a large facility and he took quite a few photographs of his tour, which he will share with us at our January meeting. The museum includes multiple mineral collections, modern and historical works of art, walk-through replicas of both coal and hard rock mines, dioramas, working models, and a wide variety of other interesting artifacts. More can be found on the web at http://66.36.119.45/miningmuseum/

A mineral display at the museum. *D. Glick photo*

Why is this car in a mining museum? This 1923 model was the first to use molybdenum steel. The Climax mine just down the road from the museum was the world's largest producer of molybdenum. *D. Glick photo*

The Hall of Fame is located on the top floor, and includes over 200 plaques showing portraits, biographies and contributions of the inductees. Some interesting ones will be discussed. The late Allen Heyl, geologist from Pennsylvania and NMS member and supporter, had just been inducted into the Hall of Fame a few weeks before Dave's visit. Allen's plaque, so new that it wasn't yet mounted on the wall, will be shown. Information on all of the inductees can be found on the web site mentioned above.

The program will also include a few photographs around Leadville and elsewhere on Dave's trip. As a bonus we will see a brief overview of the National Rockhound & Lapidary Hall of Fame in Murdo, South Dakota, which Dave visited in 2007. It was founded by the late June Culp Zeitner, whose writing of many mineral and gem collecting guidebooks and articles helped popularize our hobby for more than 50 years. See <www.rockhoundhalloffame.org>.

Bob (center) speaks to the class at the main ore pit.
J. Passaneau photo

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Junior Rockhounds Meet January 19th, 6:30 p.m.

Junior Rockhounds meetings are scheduled for the third Wednesday of the month this January through May, in room 116 Earth & Engineering Sciences Building. That's during the social hour for the regular NMS meeting, so juniors and their parents can choose to come to the main meeting afterwards as well.

Each month's meeting has a new topic or topics with fun, hands-on learning for the kids. We encourage those who attend to become NMS members, but it's not required. Just $7.00 covers a whole year (through October 2011) of student membership. Parents may get a lot out of the meetings, too! Check the web site for news, or contact Dr. Andrew Sicree (see page 8). - *Editor*

ATTENDING THE JANUARY MEETING?
Donations of door prize specimens are invited.
NMS will provide ice, soft drinks, and water;
your donated snacks will be welcomed.
Bring a friend!

Limonite and goethite in a vug in freshly broken lump ore from the Scotia pit. Field of view approx. 1 inch across.
J. Passaneau photo

Goethite (based on color and brown streak) rod forms in a vug in freshly broken lump ore from the Scotia pit. Minor tan minerals appear to be alteration products. Field of view approx. 1 inch across. *J. Passaneau photo*

Pipe ore (left) from the Pennington iron ore bank located west of Pennsylvania Furnace, PA, and (right) iron ore speleothem from Connecticut (see text). Coins are 1.1 inch across. *R. Altamura photos*

NMS Carnegie Museum Tour Bus Trip March 5

NMS is pleased to accept the invitation for a private tour of Carnegie Museum's recently renovated Hillman Hall of Minerals and Gems (including the new Wertz Gallery of Gems and Jewelry) guided by Marc Wilson, Head of Section of Minerals. For the die-hard mineral collectors he will also provide a behind-the scenes tour which may include recently cleaned and stabilized specimens received from the Philadelphia Academy of Natural Sciences.

The bus trip (transportation only) will cost $25 per person, and will leave State College at 8:00 a.m. Saturday March 5 and return from Pittsburgh in the evening. Details of the schedule and the group rate for museum admission will be available very soon on the NMS web site.

Please sign up ASAP (definitely by Feb. 18) with Ellen Bingham, preferably by e-mail to <emb22@psu.edu>. Or phone Ellen at 814-234-4532; if leaving a voice message, please speak clearly and slowly, leave your name and phone number twice, and any other contact information. - *Editor*

Minerals Junior Education Day planned for April 2

Please keep the date open and plan to help present this important annual NMS event (our 15th) for grade-school age children. - *Editor*

Middle School Class Field Trip to Historical Scotia Iron Ore Deposits led by NMS Members

by Bob Altamura

On Friday November 17, NMS members Bob Altamura and John Passaneau led a middle school class from Centre Learning Community Charter School on a geology field trip to supplement class studies in earth science. Ms. Donna Fisher and Mr. Kelly Kennedy's class comprised approximately 30 students. The field party left the CLC parking lot and headed for Scotia, the abandoned mining town site and ore pits west of State College. The field trip leaders gave a presentation (photo below) on the geology and historical mining of the Scotia area, historical iron making in Centre County, and the mineralogy of Scotia iron ore.

The iron ore of Scotia overlies sandy dolostones of the Cambrian Gatesburg Formation which are exposed along the core of the Nittany anticline, a regional upward fold defining the structure of the bedrock. The iron ore is composed of the iron oxyhydroxide minerals limonite and goethite (photos below) with minor amounts of earthy hematite (iron oxide). Goethite has a dark-gray color and a brown streak (powdered sample). Limonite is yellow-brown to brown and has a yellowish streak, and the hematite is red and exhibits a reddish-brown streak. Approximately 1.7 million tons of iron ore are reported to have been extracted from Scotia (Rose, 1995 after Butts and Moore, 1936).

Three major types of ore have been described from Scotia and other iron ore deposits in Centre County: wash ore, lump ore, and pipe ore. "Wash ore" is composed of ore clasts (rock fragments) ranging from 1 to 10 cm in diameter mixed with a large amount of unconsolidated clay and sand. It forms the surface shown in the scenes at left and right. It gets its name from the considerable amount of washing needed to separate it from the non-iron-bearing material.

"Lump ore" occurs beneath the wash ore, with lumps ranging from 10 cm to 1 m and more, as shown in the photo above. Lumps at Scotia commonly show breccia textures made up of broken fragments of chert, sandstone, or clay in a matrix of limonite and goethite (photos, below left). According to Dr. Arthur Rose, an economic geologist at Penn State, lump ore near the base of the weathered zone (*i.e.*, wash ore zone) was a target of mining in Centre County, undoubtedly because of the high concentrations of iron.

Lump ore (the largest lump is approx. 1 meter across) sitting on wash ore in the main pit at Scotia. *R. Altamura photo*

"Pipe ore" from Centre County (photo below) occurs as steeply dipping veins to vertically plunging pipes up to several meters thick enclosed within bedrock (D'Invilliers, 1884). Observations by D'Invilliers (1884) from numerous Centre County iron ore deposits are consistent with a crude layering with wash ore nearest the surface, lump ore beneath, and, closest to the buried bedrock surface, the pipe ore. Rose (1995) refined this layered model to associate pipe ore with paleo-sinkholes which existed in the now-buried bedrock surface. The idea is that soluble and insoluble residues of iron minerals migrated by leaching and perhaps lateral creep toward bedrock lows and probably into voids associated with collapsed caves in the subsurface beneath unconsolidated deposits. Iron ore deposits from the historical 'Ore Hill Iron Mine' near Salisbury, Connecticut, have yielded specimens that are interpreted to be speleothems (cave minerals), shown to the right of the pipe ore in the photo. It is suspected that the pipe ore described by D'Invilliers (1884) also originated as gravity-oriented features more or less analogous to speleothems common in area limestone caves. Note the similarities of the two materials in the photo.

On the field trip, students enthusiastically collected abundant wash ore and lump ore samples. The leaders noticed that most students had full backpacks, but later

had to laugh when we noticed that during the hike back through the woods to the vehicles that students were unloading samples on the side of the trail to lighten their packs. Sound familiar?

References Cited

Butts, C. and Moore, E.S., 1936, Geology and mineral resources of the Bellefonte Quadrangle, Pennsylvania: PA Geological Survey, Bulletin A96, 115 p.

D'Invilliers, E.V., 1884, The geology of Centre County: PA Geological Survey, Report T4, 464 p.

Rose, A.W., 1995, Genesis of the ores: *in* Geology and History of Iron Ore Production in Centre County, PA, R. Slingerland (Editor), Guidebook for the V.M. Goldschmidt Conference, May 24-26, 1995, pp. 27-38.

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Forest L. Benford, 1953 - 2010

by David Glick, NMS President

We are deeply saddened to report that long-time NMS member and volunteer Forest L. Benford Jr. of Pleasant Gap, PA, passed away on December 21 at age 57. An obituary from the December 23rd Centre Daily Times, available at www.legacy.com, notes his work at Woodring's Floral Gardens and his presidency of the first (1983) Bellefonte Victorian Christmas celebration. Suggestions for memorial contributions are listed there.

of Fame a few weeks before Dave's visit. Allen's plaque, so new that it wasn't yet mounted on the wall, will be shown. Information on all of the inductees can be found on the web site mentioned above.

The program will also include a few photographs around Leadville and elsewhere on Dave's trip. As a bonus we will see a brief overview of the National Rockhound & Lapidary Hall of Fame in Murdo, South Dakota, which Dave visited in 2007. It was founded by the late June Culp Zeitner, whose writing of many mineral and gem collecting guidebooks and articles helped popularize our hobby for more than 50 years. See <www.rockhoundhalloffame.org>.

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.ems.psu.edu/nms/** or remind Dave Glick to bring a printed copy to a meeting for you to see.

The January issue has the classes and sign-up information for the April 11-17 2011 Wildacres Workshop. The Speaker in Residence will be Gene LeBerge, award-winning University of Wisconsin professor of geology and mineralogy, consummate teacher, world traveler, and distinguished author. President Betsy Oberheim reminds us to recognize our fellow club members through nomination for the Each One Teach One and the American Rockhound of the Year Awards, and to support the ALAA. The safety article addresses junior members and the examples that adults do or don't set for them. The convention (July 7-10, Syracuse, NY) update includes descriptions of Herkimer "diamond" collecting sites.

The **AFMS Newsletter** is available by the same methods. The December/January issue was reported here last month.

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

More on Dave Snell, 1928-2010

An extended obituary for Dave Snell, who passed away last September, was published in the Centre Daily Times on December 26, 2010. It is available at www.legacy.com. The family requests that memorial contributions be made to the Sterling Hill Mining Museum or the Nittany Mineralogical Society, and the obituary includes descriptions of both organizations. The family reports that a public celebration of life service is planned for this coming spring.

POPULAR MINERALOGY

Fascinating mineralogy and earth science for the amateur mineralogist and serious collector - #38

Burning Rocks

by Andrew A. Sicree

Working flint and chert

Before ancient Man discovered metal, his weapons and tools were fashioned from wood, bone, or stone. Amorphous rocks like obsidian and cryptocrystalline rocks such as flint, chert, and chalcedony have the virtue of fracturing conchoidally producing razor-sharp edges, and thus they served as raw materials for tools and weapons. (Obsidian and other amorphous rocks have no crystalline components – they are natural glasses. Cryptocrystalline rocks are those in which the constituent minerals – typical quartz grains – occur as extremely fine individual crystals, so small that they cannot be differentiated with the naked eye.) Stone-Age peoples quarried and worked flint, chalcedony, and chert nodules, rendering them into spear points, knives, arrowheads, scrapers, drill points and other artifacts. Where these rocks were less abundant, rhyolite, felsite, or quartzite might have been pressed into service.

The major problem confronting the Paleolithic flint-knapper was the brittleness of stone. Flint or chert readily fractures when struck, but the direction and extent of the break is hard to control. Many flint-knappers employed the age-old technique of pressure flaking. Rather than strike the flint with a crisp blow from another rock, the knapper used a punch carved from a branch or an antler. By pressing the tip of the punch firmly against the edge of a block of flint, the knapper spalled off a small flake flint leaving behind a dish-shaped conchoidal surface. By controlling the pressure and the orientation of the punch, the knapper chipped out arrowheads, scrapers, or other objects. The punch made possible fine details and a razor-sharp edge.

Even with the pressure flaking method, flint and chert are still difficult to work. But somewhere back in the misty past, an early flint-knapper discovered that fire could "soften" the stone, making his work easier.

Benefits of fire

Heat treatment of stone stretches back at least 72,000 years in the archaeological record, and extends to the present day. Until recently, the Kidja aborigines of northwestern Australia used fire to soften chalcedony in preparation for weapon-making, so their techniques are well-documented. First, they build a large fire in a one-to two-foot deep pit in sandy soil. After the fire is reduced to coals, they scrape out the coals and ash and set rough-worked blocks (blanks) of chalcedony in the hot sand. The blanks are covered with additional sand and the coals are shoveled back into the pit. When the fire cools after three or four days, the blanks are retrieved and used for pressure flaking.

Heat treatment dramatically reduces the fracture toughness of chert or flint. Treated stones fracture more consistently, more like untreated obsidian or other high-grade blade materials.

Color alteration can be another effect of heat treatment. For instance, after heating, some white or gray cherts may turn red. In some regions, much of the local "jasper" is really chert heat-treated by the paleo-Indians. The shift to red occurs as iron impurities in the chert form small crystallites of iron oxide minerals such as hematite scattered throughout the sample. Red is the streak color of hematite – the true color of the mineral, which is revealed when it is crushed. When hematite occurs as very small crystals, its color is that of the powder. Growth of these small iron oxide crystals weakens the bulk rock and makes it more amenable to working.

Ref: Webb, J,. and Domanski, M., 2009, "Fire and Stone," *Science*, v. 325, 14 Aug 2009, p 820-821.

=MARTIAN MINERALS=

We've been vicariously traipsing across the surface of Mars in robotic rovers since 1997, peeking under rocks via remote video cameras and scooping up soils, analyzing them with the rovers' on-board spectrometers. What have we learned so far about the mineralogy of Mars? Which minerals have been identified on her surface?

We obtain data on Martian minerals principally from two sources: rovers and orbiters. Satellites orbiting the Red Planet map the spectral signature of wide swaths of the planet. While satellites cannot tell us exactly which minerals are on the surface, analysis of the reflectance spectra of the planet gives us clues to Mars' surface mineralogy. Sunlight hits Mars and orbiting satellites "look" at the light reflected back into space. In particular, infrared light (light beyond the red end of the visible light spectrum – our eyes cannot see it, but spectrometers can record it) is mineralogically important because certain wavelengths of infrared light are absorbed by the chemical bonds within minerals. Absorbed or "missing" wavelengths give us clues to minerals on the planet surface.

Although satellite infrared data don't usually allow us to identify specific minerals on Mars, these data are useful because they indicate which chemical groups of minerals are present. For instance, on Mars, satellite data records infrared absorption bands that coincide with the energies of Al-OH, Fe-OH, and Mg-OH bonds in phyllosilicate minerals. The phyllosilicates, or sheet silicates, are silicate minerals in which the atoms are arranged in layers or sheets. Muscovite mica is the best-known member of this group. Other phyllosilicate minerals include montmorillonite, kaolinite, and prehnite.

The list of possible minerals on Mars includes the phyllosilicate minerals muscovite, kaolinite, dickite, nacrite, halloysite, lizardite, chrysotile, antigorite, and prehnite. Scientists are particularly interested in evidence that supports the existence of hydrated phyllosilicates such as montmorillonite, nontronite, saponite and beidellite because these minerals require water for their formation. Their presence indicates that at some point in the past, Mars had free water on its surface. There is also evidence to support the presence of pumpellyite, epidote, and analcime. Satellites have detected large amounts of opal on the Martian surface. Opal also requires water to form.

Analyses of satellite spectral data have revealed that carbonate group minerals (possibly calcite) and chloride group minerals (salts) occur on the Martian surface. These minerals also probably require water from which to precipitate. Similar analyses indicate the presence of sulfate and sulfide group minerals.

Robotic rovers moving across the surface of Mars have also identified minerals, many of which contain iron. For instance, NASA's Spirit and Opportunity rovers were equipped with Mossbauer spectroscopes, which enabled them to identify hematite and olivine in rock and soil samples. The Opportunity Rover also found the iron mineral jarosite, which requires water to form.

As we continue to explore Mars, the list of Martian minerals will grow. Someday in the future, we may even discover a mineral species on Mars that has never been found on Earth.

Ref: Poulet, F., and Beaty, D. W., et al., 2009, "Key Scientific Questions and Key Investigations from the First International Conference on the Martian Phyllosilicates," *Astrobiology*, v. 9, no. 3, p 257-267.

Dr. Andrew A. Sicree is a professional mineralogist and geochemist residing in Boalsburg, PA.

ANCIENT HERMITS

How long have hermit crabs walked the seafloors? While the origins of modern-day hermit crabs may be obscure, paleontologists have found early Holocene (about 10,000 years ago) trace fossil trackways of hermit crabs preserved in the Bahamas.

But "hermit" behavior pre-dates the hermit crab. Hermit crabs find the hollow shell of a dead snail or bivalve, and carry it around. When danger threatens, they withdraw backward into the shell. As it grows, the hermit crab will discard its borrowed seashell for another, larger shell. Apparently, throughout the fossil record, there were other arthropods, before the hermit crab, that carried around brachiopod or gastropod shells for protection. Researchers recently identified the trackways of hermit arthropods in Late Cambrian (about 500 million years old) rocks in Wisconsin. Trackways occur in sandstone that once was sand laid down

between the high- and low-tide marks along an ancient ocean shore. Even though they have not yet found any fossils of the track-making arthropod, scientists deduced that these arthropods behaved like hermit crabs because their tracks were asymmetrical – as might be expected from an animal partially inside a shell. During the Cambrian, very few animals lived on land. Paleontologists speculate that hermit behavior may have helped ocean-dwelling arthropods safely make excursions up onto the beach.

Ref: Hagadorn, J. W., and Seilacher, A., 2009, "Hermit arthropods 500 million years ago?" *Geology*, v. 37, no. 4, p 295-298.

Ye Olde Englishe Rocke

The English language is replete with obsolete words and terms. Here are some that once applied to rocks and minerals:

Bonksman: The man who works at the mouth of a coal mine.
Comet-wine: Grapes growing during a year in which a comet appeared were thought to be better in flavor than those of other years, thus wine made during those years is thought to be superior in quality. Why? It was thought that comets could influence the weather, yielding a warmer growing season and better grapes.
Eagle-stone: Generally, an eagle-stone was a piece of iron ore. Eagles were believed to carry these stones up to their nests because the stones would prevent their eggs from rotting. Alternatively, an eagle-stone was a fossil that rattled when shaken because of a small loose fragment inside it. The eagle-stone was necessary for the eagle to raise healthy young. Eagle-stones also found use by pregnant women who wore them as a charm to prevent miscarriages.
Old-man: If underground miners broke into older, forgotten mine workings, they'd say that "the old-man has been here" or that they "got into an old-man."
Puttingstone: It was the custom among great houses in Scotland to keep a huge stone by their gates. Thrown from the shoulder, the stone was used for trials of strength. It was perhaps an ancestor to the shot put.
Sand-knocker: Sandstone was ground into grit, and the sand-knocker made it and sold it door-to-door for use in sanding down floors.
Sea-dog: Sailors viewed the sea-dog, a meteor seen on the horizon shortly before or after sunset, as a sign or portent of bad weather to come.
Slocking-stone: To promote a mining scheme, investors might be shown a slocking-stone, which was a very rich specimen of ore from the mine, as an inducement to buy.
Surface-coal: Another term for cow "chips" or cattle dung, which was widely used for burning.
Thunderstone: The thunderstone was a rock supposedly created by thunder. The belief in thunderstones might have its origin in the fulgerite, which is a fused rock created when lightning strikes sand or soil. Fulgerites may have a forked or branching structure; thus they were thought to be thunderbolts, or thunderstones.
Verter-water: Rainwater that collected in small hollows in rocks and tombstones was thought to work as a cure for warts.
Warming-stone: Warming-stones were pebbles used by bakers to indicate that their ovens were hot enough for baking. When the stone turned white, the oven was ready.

Ref: Kacirk, J., 2000, *The Word Museum*, Touchstone, Simon & Shuster, New York, NY.

Geo-Sudoku

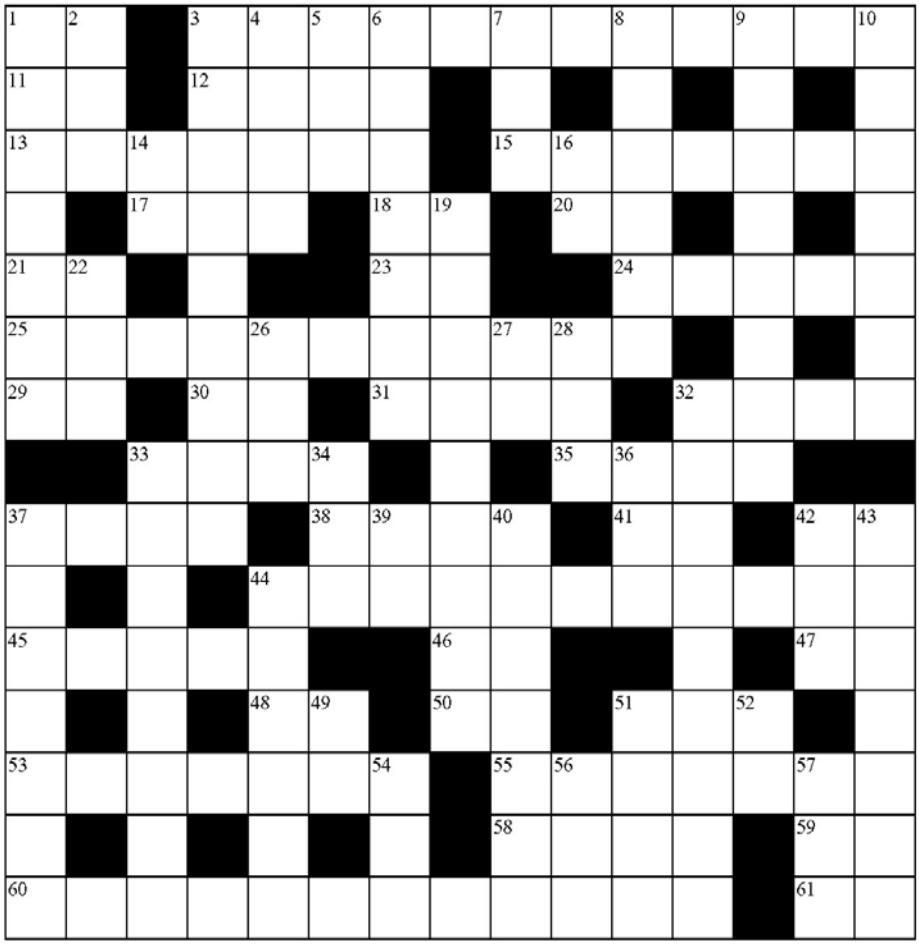
by David Glick

This puzzle contains the letters CEIMOSTUV, and one row or column spells out one of the possible phyllosilicate minerals on Mars. 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.

T						V	U	I
	C	V		M				
		E		S		C		O
						U	V	C
	U			O	V	I	T	
	T	C	I					
						O		
S	V	O			C			
			O			M	C	U

Crystal Matrix Crossword

Famous Mines



ACROSS

1 found in calcite, aragonite
3 famous zinc mine
11 ruthenium
12 how you cross a stream
13 rock name from fire
15 to add a little sugar
17 opposite of no
18 higher than elementary (ab)
20 not male or female
21 used by old-time plumber
23 not direct in electricity
24 stone tablet mountain
25 crust and rigid upper mantle
29 name of a TV horse
30 hydroxyl group
31 long skinny fish
32 noble gas with 10 protons
33 novel by Jane Austen
35 copied
37 where St. Peter is
38 South Pacific island
41 where famous Cu mines are
42 not alternating in current
44 laid down in layers
45 mass x acceleration
46 toilet paper (ab)
47 a short yes
48 chops trees
50 electrical engineering
51 a Spanish one
53 what halite is
55 from first principles
58 mi ___ es su ____
59 after BC
60 famous lost gold mine
61 combines with gold to form minerals

DOWN

1 famous Au creek / district
2 comes after July
3 produces Mn carbonates
4 old pueblo in NM
5 educational extension
6 what a lapidary does
7 island in Greece
8 goethite named for him
9 put into the ground
10 Swedish Mn-Fe deposit
14 where Herkimer is
16 home of Flambeau Mine
19 ore of tungsten
22 what collector does at a mineral auction
26 unit of resistance
27 Spanish article, pronoun
28 Republic of South Africa
32 rocks formed under water
33 mined in Muzo, Columbia
34 on Mount Rushmore
36 sounds like a joke
37 giving no for an answer
39 placed in magazine to sell gems and minerals
40 an indictment
42 where miners change clothes
43 used in gold mining
44 Mn nodules found here
49 abbreviated crystal
51 Latin bear
52 medium steel wool
54 done at a restaurant
56 girl's name
57 rodent bigger than a mouse

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.

January 29, 2011: Rutgers Geology Museum Open House. Presentations, mineral sale, identifications, hands-on activity sessions for kids. 9:00 a.m. to 4:00 p.m. http://geologymuseum.rutgers.edu/downloads/open_house.pdf

March 26-27, 2011: 42nd Annual Gem & Mineral Show sponsored by the Che-Hanna Rock & Mineral Club, Athens Township Volunteer Fire Hall, Sayre, PA www.chehannarocks.com/show.html

March 26-27, 2011: 33rd Annual Gem-Mineral & Jewelry Show sponsored by the Franklin County Rock & Mineral Club. Shalom Christian Academy, Chambersburg, PA.

April 2-3, 2011: Annual Mineral Treasures and Fossil Fair sponsored by the Philadelphia Mineral Society & Delaware Paleontological Society. LuLu Temple, Plymouth Meeting, PA.

April 30- May 1, 2011: 39th Annual NJESA Show sponsored by the Franklin-Ogdensburg Mineralogical Society in conjunction with the NJ Earth Sciences Assoc. and Sterling Hill Mining Museum. Franklin School, Franklin, NJ

July 6-10, 2011: EFMLS & AFMS Conventions, Syracuse, NY. Conventions July 6-10, show July 9-10.

2012: EFMLS Sept.15-16, Harrisburg, PA

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For sale / trade: Equipment & Materials

For sale: Large mineral collection; will sell all or part. Tumble polisher with three 12-lb. and one 6-lb. drum plus grits, polishes and pellets. My phone number is (570) 672-2325. Leave a message if I'm not in.

For sale: Jade in various types & colors; mostly rough, plus some slabs; some fine Coober Pedy opal. Also equipment and jewelry making supplies from jewelry studio and production shop. Contact Daniel G. Reinhold in Mill Hall, PA; phone 570 726-8091 after lunch every day, or e-mail: dreinhold1@comcast.net

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G e o S u d o k u Solution from page 6

T	S	M	E	C	O	V	U	I
O	C	V	U	M	I	T	E	S
U	I	E	V	S	T	C	M	O
E	O	I	S	T	M	U	V	C
M	**U**	**S**	**C**	**O**	**V**	**I**	**T**	**E**
V	T	C	I	E	U	S	O	M
C	M	U	T	I	E	O	S	V
S	V	O	M	U	C	E	I	T
I	E	T	O	V	S	M	C	U

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). Your dues are used for programs and speakers, refreshments, educational activities, Bulletins, and mailing expenses. Please fill out a membership form (available on the web site), make checks payable to "Nittany Mineralogical Society, Inc." and send them to

Nittany Mineralogical Society, Inc.
P.O. Box 10664
State College, PA 16805

or bring your dues to the next meeting.

We want to welcome you!

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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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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. If you include photographs or graphics, 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.