

Nittany Mineralogical Society Bulletin

Nittany Mineralogical Society, Inc.

P.O. Box 10664

State College PA 16805

www.ems.psu.edu/nms/

Editor: David C. Glick (see p. 4)

August, 2007

August 15th meeting:

Show and Tell

by the Members

Our August meeting will be held Wednesday the 15th at 7:30 p.m., in the room 114 auditorium of Earth & Engineering Sciences Building on the west side of the Penn State campus in State College, PA.

6:30 to 7:30 p.m.: Social hour with refreshments in the lobby

7:30 to about 8:00 p.m.: NMS Meeting, announcements and business including Bylaws discussion

about 8:00 p.m.: Show and Tell program

The event has free admission, free parking, free door prize drawings and free refreshments, and is open to all – please come and share an enjoyable evening!

In the business section of this meeting, our **bylaws** will be discussed (see article at right) and the members will be invited to suggest improvements as we work to get them in shape for our application for tax-exempt 501(c)(3) status. Because of this, the business meeting might run a little long. Elections are also coming up in October; nominations or volunteers for office are requested by the September meeting.

Our one-per-month grand **door prize** giveaways will resume at this meeting; several new ones acquired at our Show will be among the choices. Other door prize donations for this meeting are also welcomed.

The program topic will be **Show and Tell** by the Members, for the Members. This is a great chance to bring in lapidary work, new specimens, books, photos, equipment, projects in progress, interesting contrasts and comparisons, **anything** representing some area of interest in our hobby, and share it with others. You can speak about it as informally or formally as you'd like. Stories on their own are fine, too. We've had many fun and interesting reports in the past and look forward to more this month.

Our **September** meeting is scheduled for Wednesday, Sept. 19. Please watch for details. - - *Editor*

ATTENDING THE AUGUST MEETING?

This event is free and open to all - bring a friend!

Donations of door prize specimens are invited.

Your additional snacks will be welcomed.

JUNIOR ROCKHOUNDS PROGRAM TO BE OFFERED DURING SEPTEMBER

by Robert Altamura

Geologist and club member Robert Altamura will offer a presentation for NMS Junior Rockhounds titled: "The Land & Geology of Pennsylvania with a Special Focus on Minerals and Fossils in the State College Region." Do you know what minerals and fossils can found around the area? You will learn if you attend this program.

The program will consist of a slide show with lots of photographs of the land and rocks – along with colorful computer graphics. The program will last about 45 minutes, and the speaker will be available for questions afterwards. Each Junior Rockhounds attendee will receive a sample cluster of Pennsylvania calcite crystals as a souvenir.

This presentation is planned for Wednesday September 12th, 2007 at 7:00 p.m. in the Earth & Engineering Sciences Building (Room 114) on the west side of the Penn State campus (free parking is available near the door). Junior Rockhounds will be notified of any updates. Contact Robert Altamura at 234-5011 if you have any questions. H

Come to the Picnic!

Members should have received a mailed invitation to the NMS picnic (4:00 p.m., August 18). Please respond if you will attend. Non-members who would like to attend are also welcome; please contact John Passaneau (see p. 4).

NMS Bylaws Revisions

Board members have been working on suggested changes to the Bylaws in preparation for NMS's application for 501(c)(3) tax-exempt status. The draft Bylaws, and notes on the changes from the current Constitution and Bylaws, will be available very soon on the NMS web site (or members may contact Dave Glick for printed copies - see p. 4) and will be discussed at the August meeting. Members are requested to participate by examining the draft and providing any of their own improvements to David Glick or another Board member **by August 31**. This timing will allow the required notice in advance of a vote at the Annual Meeting on October 17.

Current practice is to have just one document called Bylaws, so provisions of our current Constitution have been worked into the draft Bylaws. We have tried to retain ideas and wording from our current documents, and to keep added sections short. Some of the most notable changes include clarification of membership categories, authorization of an Executive Committee which can act between Board meetings, and limits on compensating Board members for providing products or services. - - *Editor*



"State College Oolite" display; see article below. *D. Glick photo.*

Popular Mineralogy Supplement

With this issue we begin the inclusion of Dr. Andrew Sicree's Popular Mineralogy supplement with our Bulletin. In the future we expect to integrate of these articles into the Bulletin, and to provide the Bulletin and the Supplement on the NMS web site. *-- Editor*

Harrisburg Show at Another New Location

Central Pennsylvania Rock & Mineral Club's 42nd annual Gem, Mineral & Jewelry Show will be held Sept. 15 and 16, 2007, Saturday 10 a.m. - 6 p.m. and Sunday 10 a.m. - 5 p.m. The new location for this year is the Sporting Hill Elementary School, 210 S. Sporting Hill Rd., Mechanicsburg, PA. It's not far from Exit 3 of Route 581. There will be vendors of jewelry, beads, gemstones, minerals and fossils; children's activities; educational exhibits; and free prizes. Admission \$5.00; children 12 and under and scouts in uniform free with adult. *-- Editor*

NMS Oolite Display featured at EMS Museum

by Bob Altamura

During May several members, led by Daniel Bontempo, who had been digging, cutting, or polishing local oolitic chert ("the State College Oolite") convened a meeting at the Penn State Earth & Engineering Sciences Building for the purpose of establishing an "Oolitic Chert Study Group." This meeting was well attended and interest was high. Attendees shared their knowledge and experiences concerning this local rock. Discussion about the oolitic chert at this meeting ranged from geology to lapidary.

Under the leadership of Daniel Bontempo and Bob Altamura, a display inspired by the study group was prepared for the recent Nittany Gem & Mineral Show. The display (shown in the photo above) includes: samples of rough rock as one might find in the field, cut slabs, a large and varied collection of tumble polished oolite, finished jewelry, location maps, photomicrographs of ooids, and Xerox copies of the title page of a paper on the State College oolite that was published decades ago by a Penn State graduate student.

This State College Oolite display currently resides in the Penn State Earth & Mineral Science Museum (Deike Bldg.) for an indefinite period of time, as part of an ongoing arrangement with the Museum to exhibit NMS displays. H



Clockwise from top: At our Show, displays in new cases attracted attention; activities in the lobby provided lots to do; the micromount station gave a different view on the world of minerals. *R. Altamura photos.*

Letter from the President



Dr. Robert (Bob)
Altamura

raltamur@fccj.edu

THE SHOW: Act II
(2007)
– Thank you to all!

It was another busy summer preparing for NMS's second big Nittany Gem & Mineral Show. It seemed that as soon as Minerals Junior Education Day was over (April) – that we were gearing up in full for "the Show." Many did volunteer work for the Show, and we continued our arrangement with club-member Bernie Pisarchick to serve as promoter/Director of the Show. The result of everyone's work efforts was that many visitors including club members enjoyed and benefited from a well-thought-out event.

We put together a Show that offered many things, including: a dozen professional vendors' stations, both lapidary and micromount demonstration stations, a lecture series, a kids' station including our own hands-on gem and fossil mini-mine activity, gold-panning station, jewelry-making classes, silent auctions, a member consignment station, displays, short field trips, and a refreshment & food station. All these activities were of interest to the over 500 attendees who passed through the doors over the two-day event. Attendees included approximately 340 adults, 120 kids, and 30 volunteers; some of whom attended the Show on both of its days of operation. This was truly a grand result and of benefit to our broad community. Several visitors were inspired to become new members of the club.

It is always a joy to see the club again come together in a common effort in line with the club mission of earth science education. Our next big event will not be until our Holiday Mineral Sale & Social late in the year. When the time comes - please consider joining in the fun by volunteering to make that event successful.

The success of the 2007 Nittany Gem & Mineral Show is due to those who volunteered or helped through cooperation and donations. We thank the dealers. We also thank all those who participated and contributed in any way in making our first-time refreshment & food station and consignment station a success. We thank those who donated items or helped with door-prizes or the silent auctions, or participated or supported the Show in any other way, including attending the Show. We would like to give a special thanks to the Gold Prospectors Association of America – Bald Eagle Chapter for their help and support of the Show, but also our other educational activities.

We are grateful to all who participated in the event. Spectacular effort, everyone!
H

NEWS FROM THE FEDERATIONS

Nittany Mineralogical Society 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 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 June covered plans for the October EFMLS convention (Newark, New York, October 5, 6 and 7, 2007). President Fran Sick encouraged clubs to have up-to-date bylaws which their members are aware of and can follow [*very timely for the NMS. -Editor*]. Scholarship funds and kids activities are discussed, and there is a report on the fun experienced at the Spring Wildacres Workshop sessions (and a registration form for the Sept. 10-16, 2007, session). New slide, videotape and DVD programs available for borrowing from the EFMLS library are listed. The Editor shares some hints, and the safety section covers rules for field trips. Please see the Newsletter for more!

The AFMS Newsletter is available by the same methods. The June issue covers mapping as an activity for Junior programs, and includes the final invitation to the June AFMS convention in Roswell, NM. President Bob Carlson comments on the diversity of current AFMS club activities, including those for juniors. President-elect Shirley Leeson writes about the AFMS Endowment Fund and other successful programs. The safety article addresses poisons in a variety of environments. - *Editor*



The Show's mini-mine provided excitement and specimens for kids. R. Altamura photo.

Some Upcoming SHOWS AND MEETINGS

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

Sep. 8 (rain date Sep. 9), **2007**: NJ Mineralogical Soc. 35th Ann. Gem & Mineral Show. Fanwood Train Station, North Martine Ave. & North Ave., Fanwood NJ 07023. Approx. 1.3 mi. S of Route 22. 9:00 - 4:30.

Sep. 15-16, 2007: Gem, Mineral & Jewelry Show, Central Penn. Rock & Mineral Club, New Location: Sporting Hill Elementary School, 210 S. Sporting Hill Rd., Mechanicsburg PA. Sat. 10-6, Sun. 10-5. www.rockandmineral.org

Oct. 6, 2007: Autumn Mineralfest, Pennsylvania Earth Science Association, Macungie, PA. www.mineralfest.com Sat. only, 8:30 a.m. - 3:00 p.m.

Oct. 5-7, 2007: EFMLS Convention, Newark, NY (just east of Rochester). Hosted by Wayne County Gem & Mineral Club.

Oct. 20 - 21, 2007: Gem & Mineral Show & Sale, Mid-Hudson Valley Gem & Mineral Soc., Rhinebeck, NY. Amazing World of Agates. Sat 9-6, Sun. 10-5. <http://www.geocities.com/nyrockhounds>

Nov. 3-4, 2007: 38th Gemarama, "Gemstones of the Western USA," Tuscarora Lapidary Society. Founder's Pavilion, The School at Church Farm, Exton, PA. H

INVITE A FRIEND TO JOIN THE SOCIETY

The Nittany Mineralogical Society prides itself on having the finest line-up of speakers of any earth sciences club in the nation. If you'd like to be part of our Society, dues are \$20 (full member), \$7 (student), \$15 (seniors), \$30 (family of two or more members, names listed). Your dues are used for programs and speakers, refreshments, educational activities, newsletters, and mailing expenses. Please fill out a membership form, make checks payable to "Nittany Mineralogical Society, Inc." and send them to the

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or bring your dues to the next meeting.

We want to welcome you!

The Society's Schedule

We generally meet on the **third Wednesday** of each month, August through May, in the Earth & Engineering Sciences Building on the west end of Penn State's University Park campus, off White Course Drive. Social hour with refreshments starts at 6:30 p.m., and the meeting starts at 7:30 p.m. Everyone is welcome!

Board Meetings are now generally held on the **first Wednesday** of the month at 7:00 p.m. Please contact the President to verify time and location for a particular month. Board meeting minutes may be requested from the Secretary.

For sale: Equipment & Materials

For sale before Sept. 30: 4-station Star Engineering capping unit with motor, disassembled, 8-10" wheels, \$40. For best offer: additional 8" new carbide wheels; lapidary materials; 6-foot tall display case; work tables (free). Call Daniel Bontempo, 814-689-2864, State College.

For sale: Very large collection of gemstone material, prefer to sell as one lot; including much 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 570 748-3201 after lunch every day, or e-mail: dreinhold@suscom.net

Mineral Business and personal collection for sale (hundreds of specimens plus supplies and equipment included). Call Terry at 570-672-2325 Mon. - Sat. 9:00 a.m. - 11:00 p.m. If I'm not there, leave a message. H

SOCIETY OFFICERS

Dr. Bob Altamura (President) 814-234-5011 (h)

e-mail: raltamur@fccj.edu

John Passaneau (Vice-President) 814-863-4297 (o),

e-mail: jxp16@psu.edu

David Glick (Secretary) 237-1094 (h) xidg@verizon.net

Dr. Duff Gold (Treasurer) 865-7261(o), 238-3377(h)

e-mail: gold@ems.psu.edu

OTHER CONTACTS

Field Trips: Ed Echler 814-222-2642

e-mail preferred [new]: eechler@comcast.net

Junior Rockhounds: Dr. Andrew Sicree 867-6263 (h)

e-mail: sicree@verizon.net

Membership Chair: John Passaneau (see above)

Publicity: Daniel Bontempo deb193@psu.edu

Programs: Craig Brandt: CBMineralz@aol.com

(please put NMS in the subject line).

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 **New 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. 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 the name of the photographer or artist.

POPULAR MINERALOGY

Mineralogy for the amateur mineralogist and serious collector

Asbestos: the Bogeyman of the Mineral World

by Andrew A. Sicree

Is asbestos dangerous?

Asbestos is the misunderstood bogeyman of the mineralogical world.

Asbestos can be dangerous to your health, but news reports often speak of asbestos as though it were one single mineral, a single entity. In reality, "asbestos" is not a proper mineralogical species name. Asbestos is the term used in the mining and material industries to denote a fibrous mineral product. Technically speaking, asbestos is any fibrous mineral with flexibility sufficient to allow it to be woven, which stands up to thermal and chemical degradation, has a high tensile strength, and is an electrical resistor. The ability to weave asbestos fibers into cloth and cloth-like products is an important characteristic. Notice that these characteristics are operational. They're not based on chemical formula or crystal system as a mineral definition is.

Wonderfully versatile, asbestos has been used in automotive brake shoe linings, pipe insulation, fireproof coatings in buildings and ships, in acoustic ceiling tiles and vinyl floor tiles, in fire-proof gloves, and a thousand other items.

The mineralogy of asbestos

Six mineral species make up two main types of asbestos. Distinctions can be made between asbestos minerals of the *amphibole* mineralogical group and those of the *serpentine* group. Amphibole group asbestos minerals include *crocidolite*, *amosite*, *tremolite*, *actinolite*, and *anthophyllite*. *Chrysotile* is the serpentine group asbestos mineral. It is important to understand that any one of these minerals can have both an

asbestiform and a non-asbestiform habit. This means that you may find tremolite asbestos, but it is also possible to collect tremolite that is not asbestos. Most often, mineral collectors encounter serpentine and amphibole minerals in their non-asbestiform habits.

Other asbestiform minerals can exist. For instance, I've seen tourmaline crystals with the bottom half in the form of a solid single crystal and the top half in the form of a mass of many thin crystals of fibrous tourmaline.

Of the six principal asbestos minerals, only three were used to any significant extent in manufacturing. Chrysotile (called "white" asbestos), crocidolite ("blue" asbestos), and amosite ("brown" asbestos) were used commercially.

Vermiculite

In the popular mind, the danger of asbestos is synonymous with *vermiculite*. Vermiculite is not an asbestiform mineral. It is an expandable mica, but it can occur in association with asbestos minerals. The W. R. Grace Company vermiculite mine in Libby, Montana, had an unusually high concentration (4-6 percent) of amphibole asbestos in the vermiculite ore. The mine operated from 1921-1990, producing, at one time, nearly 80% of the world's vermiculite.

Because the vermiculite was contaminated with amphibole asbestos, mineworkers and nearby residents were exposed to the asbestos; some developed asbestos-related diseases. This mining company and a dozen others were bankrupted by asbestos-related lawsuits and went out of business. The problem lives on though, because Libby mine vermiculite was used in a variety of building

products including lightweight concrete and blow-in household insulation. Ironically, the energy crisis of the 1970's made it popular to add insulation to old houses, and those who used Libby mine vermiculite to insulate walls and attics unwittingly contaminated their homes with asbestos.

Collector safety

Inhalation of asbestos dusts can cause lung cancer, mesothelioma (cancer of the pleural and peritoneal membranes in the chest and abdomen), and asbestosis (a condition similar to silicosis and coal miners' Black Lung disease in which the lung tissues become fibrous and thus lose the ability to function). Most of those who fall victim to asbestos-caused diseases are people who worked with asbestos, such as ship pipe-fitters and mechanics. The type of disease is connected to the type of asbestos. Any type of asbestos may cause asbestosis, but mesothelioma is caused principally by crocidolite and secondarily by amosite asbestos. Lung cancer can be caused by crocidolite, amosite, or chrysotile asbestos, and smoking tends to increase the risk of cancers caused by asbestos exposure.

Sounds bad, right? But the picture is a little more complicated. Some studies have shown that, while asbestos workers are in danger, people who live in towns with high levels of chrysotile asbestos (such as Asbestos, Quebec) apparently aren't affected.

The mineral collector can collect asbestos minerals with a reasonable amount of safety as long as some sensible precautions are taken. Mineral specimens containing asbestos might be best stored in a sealed plastic bag. Limit your exposure to the asbestos. (Note: it has been shown that smoking increases the dangers of asbestos-related diseases.) Steps should be taken to avoid the generation of dust. Trimming of minerals with asbestos present is best done out-of-doors with the wind blowing away from you. A proper dust

mask is advisable. If you *must* cut a rock containing asbestos, do it outdoors and do it wet. After trimming or cutting asbestos-containing rocks, wash your clothes to avoid carrying asbestos dust into your house.

- A. A. Sicree

*Dr. Andrew A. Sicree is a professional mineralogist and geochemist residing in Boalsburg, PA. **Popular Mineralogy** provides technical answers to your general mineral questions. If you have a question you'd like to have answered, please send email to sicree@verizon.net*
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Weird Geology

Flying sediments

In a Grand Coulee, Washington, farm field, geologists found an upside-down, multi-ton block of earth about three yards long and two wide. The block had crisp "cookie-cutter" sides and had apparently come from a hole 73 feet away. There was no evidence of any heavy machinery having been used – the block apparently was blasted upward by some unknown natural process.

Ref.: *News of the Weird*, by Chuck Shepherd, John J. Kohut, and Roland Sweet, (New American, New York, 1989) p. 151.

Mineral Etymologies

Etymology is the study of word origins. From where do some common minerals' names come?

Quartz: The origin of this name is not clear, but it is possible that it came from the Middle High German term *querch* (*zwerg*) meaning something akin to "dwarf cross". *Zwerg* means "dwarf" or "goblin". Germanic miners had a rich mythology of dwarves or goblins, some of whom were malicious, inhabiting their mines and causing mischief for the miners. Perhaps intergrown quartz crystals may have been seen as the "crosses" of these sprites.

Mineral: The modern, more rigorous, scientific definition of this word arose in the early 1800s, but usage distinguishing a mineral as a material which is neither animal nor vegetable apparently arose in the early 1600s. The word *mineral* originally meant "substance obtained by mining" and was derived from the Middle Latin *minerale* for "something mined" which comes from *minera*, or "mine."

Minerals & Men - Wulfenite

The lead mineral *wulfenite* is named for an 18th Century scholar and Catholic Jesuit priest, Franz Xavier Freiherr von Wulfen. Born in 1728 at Belgrade, Franz Xavier joined the Jesuits at age 17. He completed his education at age 27 and at age 35 was ordained a priest. Soon thereafter, the Jesuit order was suppressed and Franz Xavier moved to Klagenfurt, Austria, where he remained until his death in 1805.

The "Freiherr" in his name is a title, translated as "Free Lord" and meaning "Baron," hence the "von" which was used to indicate a baron. His father was a lieutenant field marshal in the Austrian military, a position that helped to insure that the son would have access to a top-quality education.

Franz Xavier proved himself to be an excellent scholar with a broad interest in the natural world. He collected and studied minerals, but also insects, and plants, being especially fond of lichens. (I like to think that his interest in lichens stemmed from the fact that he found them covering up the rocks he wished to collect.)

Wulfenite is a tetragonal lead molybdate, $Pb(MoO_4)$. Often found as thin tabular crystals, typically less than one-half an inch on a side, with a bright orange-yellow to orange-red color and a resinous luster. One of the most famous localities for wulfenite is the Red Cloud Mine, in La Paz County, Arizona.

The author of treatises on plants, animals, and minerals, Franz Xavier von Wulfen also wrote *Minera plumbi spatosa Carinthiaca*, ("Carinthian lead-spar minerals"). Printed in 1781-1786, this treatise dealt specifically with the "yellow lead ore" that was later named wulfenite.

Sources: Catholic Encyclopedia, vol. XV, (1912); Schuh, C. P. (1997) Biographical notes, in Wilson, W. E. (ed.) *Xavier Wulfen's Treatise on Carinthian Lead Spars*, Mineralogical Record, Tucson.

What is Prasiolite?

Perhaps you've seen this clear, lime or mint green gemstone at mineral shows. Various sold under trade names such as green amethyst, lime citrine, vermarine, or mint quartz, prasiolite is simply green quartz. Pleasant green color and reasonable prices make it a popular gemstone.

Prasiolite's green color is due to minor traces of iron (Fe) trapped in the quartz (hexagonal SiO_2). An alert collector might ask, "Isn't the yellow color of citrine caused by iron? How can it also give a green color?"

The answer appears to depend upon the valence (or ionic charge) of the iron impurities. If you take iron in its ground state (Fe^0) and take away two electrons, you get the ferrous iron (Fe^{2+}) ion. Take away another electron and you have ferric iron (Fe^{3+}). When synthetic citrine is prepared, scientists introduce traces of ferric iron (Fe^{3+}). Prasiolite, on the other hand, appears to require ferrous iron (Fe^{2+}).

Interestingly, amethyst also requires iron. It is well known that citrine responds to irradiation by turning to amethyst. You can take naturally purple amethyst, heat it to somewhere above 400°C, and it transforms into yellow citrine. If you then subject it to radiation (either naturally over many years, or artificially for a few minutes in a gamma-ray irradiation facility), the yellow color of the citrine converts to the purple of amethyst.

Synthetic prasiolite is manufactured using ferrous iron (Fe^{2+}), but it is also possible to produce prasiolite from white quartz or light amethyst found in Uruguay and Brazil. Specimens are first irradiated at gamma-ray irradiation facilities, then heated, to "green" the quartz. Although rare, naturally green prasiolites are known to occur as well; they are found in association with hot springs.

Sources: Colored Stone, editorial, Sept/Oct. 2006, p. 4; www.rusgems.com/tech_cr_quartz.php;

Crystal Matrix Crossword

Oxides

ACROSS

- 1 Rebs
 4 bismuth oxide mineral
 9 bottom of sea
 12 aluminum sulfates
 14 atomic adsorption
 15 Dorothy's Aunt
 16 relative of a shark
 17 wise guy
 18 manganese oxide mineral
 20 antimony
 21 runs dams in Tenn.
 22 gives crimson flame test
 23 each
 24 combines with gold
 26 kernite, borax, etc.
 31 rock chisel or hammer
 33 Irish group
 35 crystal faces are ____
 36 Energy Dispersive Spec.
 37 bothers rockhounds
 38 woman's name
 39 rural delivery
 40 thrown in harbor
 41 toothy fish
 42 type of bullet
 43 slippery fish
 44 fossil resin
 46 police force
 47 the words
 50 Saint in Brazil
 51 baby's mineral
 52 deep sea vent environ
 54 named for Gadolin
 55 city in Iraq
 56 post script
 58 tidal movement
 59 not off
 60 Ilfeld Harz mineral
 65 means white
 67 learn young 68 game
 69 where it's ____
 70 gold is an ____
 71 estimated
 72 titanium dioxide mineral
 73 ____-dye

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 10 to take food
 11 happens to some agates
 13 mineral conductor
 18 oxide coating on silver
 19 sphere
 23 Earth Observing System
 25 long stretch of time
 27 osmium
 28 region in Ethiopia
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 30 oxide of antimony
 32 strange
 34 smallest unit
 37 crystal growth medium
 38 to scratch a mineral
 40 tetragonal (ab)
 41 hollow spheroids
 42 barrel (ab)
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 49 thulium
 51 lowest horns
 53 near the surface
 57 statistic (ab)
 59 love, honor, & ____
 60 same woman's name
 61 absolute (ab)
 62 The ____ Khan
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 64 est time of arrival
 66 landing ship, tank

LAST MONTH'S SOLUTION

S	L	R	G	I	B	B	E	T	S	C	A	R
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