

# Nittany Mineralogical Society Bulletin

Nittany Mineralogical Society, Inc.

P.O. Box 10664

State College PA 16805

September, 2009

**Visit our web site:** [www.ems.psu.edu/nms/](http://www.ems.psu.edu/nms/)

*Editor (see page 8):*

David C. Glick

**September 16th meeting:**

## Show and Tell

by the members and guests

*Our September meeting will be held Wednesday the 16th in the room 114 auditorium of Earth & Engineering Sciences Building on the west side of the Penn State campus in State College, PA. Maps are available through 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, free door prize drawings and free refreshments, and is open to all. Bring your friends and share an enjoyable evening! - - Editor*

The program topic for September will be **Show and Tell**, presented by anyone and everyone who would like to "show and tell" for 5 or 10 minutes or so. This is a great chance to bring in lapidary work, new specimens, books, photos, equipment, projects in progress, interesting contrasts and comparisons, **anything you like** which represents some area of interest in our hobby or science, 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. Connect with other members who have similar interests, or awaken an interest or spark an idea in someone else. We've had many fun and interesting reports in the past, and look forward to more this time around. - - Editor

### ATTENDING THE SEPTEMBER 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.

**NMS will participate in the  
Spring Creek Family Festival  
on October 4<sup>th</sup>  
- Please come by -  
see page 2**

**Junior Rockhounds:**

### Meetings Start Monday, Sept. 14

Junior Rockhounds meetings will resume on Monday, September 14<sup>th</sup>, at 7:00 p.m. in room 117 of Earth & Engineering Sciences Building, Penn State's University Park "West Campus." This is the same location as the last couple of years, and the same building as our regular meetings.

Meetings are scheduled for the second Monday of the month:

September 14

October 12

November 9

December 14

We encourage those who attend to become NMS members; just \$7.00 covers a whole year 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

### Elections and Annual Meeting:

Election of officers will be held at the October 21<sup>st</sup> meeting, which is the Annual Meeting of the members of the corporation. The Bylaws specify that the report of the Nominating Committee shall be announced and provided to all members at or before the regular September meeting.

The Committee expects the slate of candidates to be:

President: David Glick

Vice President: Robert Altamura

Treasurer: John Passaneau

Secretary: Ellen Bingham

We also seek volunteers for the appointed positions of Publicity Chair and Refreshments Coordinator, and volunteers to help with a variety of specific duties.

### Field Trip News

Nittany Mineralogical Society is planning a mineral collecting field trip for Saturday, Sept. 26. Every member who is interested in attending field trips should be on the e-mail notification list (or, if you don't have e-mail, we can notify you by telephone) to learn the specifics. Check the appropriate box on your dues form. If you'd like to move on or off the list during the membership year, simply contact Field Trip Chair Ed Echler (see p. 8). - Editor

**NMS to Exhibit at the  
Clearwater Conservancy  
Spring Creek Family Festival  
Millbrook Marsh Nature Center  
October 4<sup>th</sup>**  
by Bob Altamura

Bob Altamura will present an educational exhibit on "Historical Ironmaking and Iron-ore Minerals" at the 2009 Spring Creek Family Festival. The Festival will be held at the Millbrook Marsh Nature Center on Puddintown Road near State College during the afternoon of October 4<sup>th</sup> (noon to 5 p.m.). Last year nearly 500 people attended the festival. The educational aspects of the NMS exhibit will include how historical iron furnaces such Centre Furnace near State College and the Kent Iron Furnace in western Connecticut operated. Samples of iron ore from Pennsylvania and Connecticut will be displayed and discussed. Have you ever seen stalactites of hematite?



Centre Furnace near State College, Pennsylvania. R. Altamura photo.

Souvenir iron-ore samples from the Scotia area near State College, hematite ore from near Huntingdon, and furnace slag from an iron furnace will be given away to visitors. NMS will also donate a gift basket as a fundraiser for ClearWater Conservancy at the event. The fundraiser will support the Connections Program which pays for area school children to attend the Nature Center during the school year.

Information about the Festival (including a streaming video of the 2008 Festival) and about ClearWater Conservancy can be found on their web site at <[www.clearwaterconservancy.org/springcreekday.htm](http://www.clearwaterconservancy.org/springcreekday.htm)>. There is no admission fee. Events at the Festival include: music; talks; educational and fun activities; gift baskets raffle; exhibits; and food. If you attend – please stop by the NMS table to say hi and see our presentation. H

**EFMLS Prize Drawing Tickets**

At the September meeting, we will have for sale prize drawing tickets at \$1 each or 5 for \$4 to support the EFMLS Eastern Foundation Fund, which is used for projects such as the video program library. Ellery Borow says, "...I urge folks to check out the color images on the EFMLS website in the March, April and May issues of the News." If we run out of tickets, we can arrange to get more. The drawing will be held at the EFMLS Convention in October.

- Editor

**NMS donates teaching specimens**

In the May issue, we asked for donations of rock and mineral teaching specimens for fifth graders in Oxford, NY. From donations, some quick collecting and NMS stock, we were able to supply several of the needed items. NMS member Tim Holtz delivered them when visiting the area, and he reported that they were gratefully received.

- Editor



Tim Holtz (at right) delivers teaching specimens to Oxford Academy.  
Photo courtesy of Tim Holtz.

**Central Pennsylvania Rock & Mineral Club's  
Gem, Mineral & Jewelry Show  
September 12 - 13 2009 at the Zembo**  
from their flyer

The Central Pennsylvania Rock & Mineral Club will hold their 44<sup>th</sup> annual show at the Zembo Shrine, Third and Division Streets, in Harrisburg, PA. Hours are Saturday, Sept. 12, 10 a.m. -6 p.m. and Sunday, Sept. 13, 10 a.m. - 5 p.m. In addition to vendors of jewelry, beads, gemstones, minerals and fossils, there will be children's activities, free prizes, and educational exhibits. Children 12 and under and scouts in uniform are free with an adult; regular admission is \$5.00 and discount flyers are available. H

**A Note from the President**

by David Glick

Our Junior Rockhounds programs resume on Monday, September 14<sup>th</sup>, thanks once again to Dr. Andrew Sicree. Monday evenings were about the only time that Dr. Sicree could schedule them this semester, so we hope that works for you, too. If you know of any children who like rocks, minerals, and fossils, please invite them to come and see what we do.

Another good event for kids and adults who like rocks and nature is the Spring Creek Family Festival on October 4th. Bob Altamura will organize an encore of the iron ore minerals and historic iron furnaces station from Junior Ed. Day; see the article on page 2.

Elections and the annual meeting of the corporation are coming in October. I'm very pleased that Ellen Bingham, who has contributed a great deal by organizing the food booth at our show for the last three years, is running for Secretary. At the same time, we owe many thanks to Frank Kowalczyk, who has devoted his time to filling that position for two years. Frank has many years of service on the Board in a variety of positions including President. Thank you, Frank!

We have a full slate of candidates for elected office, but could still use volunteers for appointed positions involving publicity, meeting refreshments, and more. Please contact me if you might be interested. H

**Autumn Mineralfest Show****October 3 at Macungie**

The Pennsylvania Earth Sciences Association will hold its Mineralfest Mineral, Fossil and Gem Show at Macungie on Saturday, October 3. The show is indoors at the Macungie Memorial Park, 8 miles southwest of Allentown, PA; from I-78 at Fogelsville, take Route 100 south 6 miles to Macungie, turn left onto Poplar Street across from the Bear Swamp Diner.

As usual, there will be over 100 tables of minerals, fossils, gems, geodes, and crystals, plus fluorescent displays, gold panning, food, and free specimens and special activities for children. See their illustrated web site at [www.mineralfest.com](http://www.mineralfest.com)

-Editor

*111 years ago in The Mineral Collector, Sept. 1898:*

**PYROMORPHITE.**

From the famous old Wheatley Mines near Phoenixville, PA. Very nice little specimens 5c. to 50c., larger and better specimens \$1.00 to \$2.00. Also from the same mines, RED and YELLOW WULFENITE, CERUSSITE and CALAMINE.

**Delaware Co. Amethysts.**

From Delaware Co., Pa., fine Amethysts, 25c to 75c, also Xld. MUSCOVITE, MOONSTONE and SUNSTONE.

HARTMAN & LEWIS,  
PHILADELPHIA PA

**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.

The **EFMLS Newsletter** is available through the link on our web site [www.ems.psu.edu/nms/](http://www.ems.psu.edu/nms/) or remind Dave Glick to bring a printed copy to a meeting for you to see.

The September issue begins with an update on the EFMLS Convention, to be held in Bristol, Connecticut, October 16 - 18 (Show on Sat. & Sun., Oct. 17-18). It reports that "The Saturday night banquet speaker is Dan Record whose talk is entitled "To The Rocky Moon – Man's Greatest Adventure".... All EFMLS representatives and delegates that attend the Saturday banquet will receive a NASA lithograph that was issued in January 1994, to commemorate the Apollo Program and the 25th Anniversary of the Apollo 11 Moon Landing (July 1969)." Mary Bateman encourages all, and particularly club representatives, to attend the Convention. Tickets are still available for the drawing to benefit the Eastern Foundation Fund [NMS has these for sale; see page 2]. The proposed slate of candidates for election at the Convention is presented. There's a report (with color photos in the on-line version) of the recent AFMS convention.

The **AFMS Newsletter** is available by the same methods. The September Newsletter begins with a review of the recent AFMS convention in Billings, Montana. There were over 160 displays, 60 of them in competition categories; and an attendance of over 3000. Ted's Safety Corner column addresses radioactivity. Upcoming legislation, updates for next year's web site contest, All American Club competition, fundraiser drawing winners, and full Bulletin Editors Competition results are covered.

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

- Editor

**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 would like to join, dues forms and instructions are available on our web site <[www.ems.psu.edu/nms/](http://www.ems.psu.edu/nms/)>.

**We want to welcome you!**

## *Popular Mineralogy*

*Interesting mineralogy and earth science for the amateur mineralogist and serious collector - #27*

# How Rare is a Rare Earth?

by Andrew A. Sicree

## The Rare Earth Elements

Of the 118 elements known to mankind, only 91 are stable enough to be found naturally on the Earth. Many of these elements are plentiful enough to occur as components of minerals – that is, they show up in the mineral’s chemical formula – but some elements have no discrete mineral species of their own, either because they are too rare or because they mimic the chemistry of other elements. These elements can only be found as trace constituents within chemically compatible minerals. Included in this trace element group are the co-called “rare earth” elements.

The rare earths are a block of fifteen chemical elements, ranging from lanthanum (element 57) to lutetium (element 71), plus scandium (element 21) and yttrium (element 39) thrown in for good measure. The chemical (and thus mineralogical) behavior of these elements is so similar that they tend to “co-travel” (i.e., when you find one, you find others).

## Gadolinite

In 1787, in a quarry at Ytterby, Sweden, Carl Axel Arrhenius discovered a black mineral tentatively called “ytterbite”. Johann Gadolin, a professor at the University of Turku, investigated the mineral, chemically extracting a previously-unknown metal oxide compound from it, which he called “ytteria.” This was the first production of a rare earth oxide chemical. Ytterbite was later renamed to gadolinite in recognition of Gadolin’s pioneering work among the rare earths.

It is interesting to note that the little village of Ytterby, Sweden, has *four* elements named after it. They are yttrium, terbium, erbium, and ytterbium. This reflects that fact that, at the turn of the 18<sup>th</sup> Century, the Scandinavian Peninsula was the Happy Hunting Ground for scientists seeking new elements.

## How Rare Are They?

The rare earths aren’t really all that rare. For instance, the rare earth element neodymium is more abundant than gold in the Earth’s crust, and cerium, the 25<sup>th</sup> or 26<sup>th</sup> most plentiful element, is more abundant than neodymium. The term “rare earth” comes from the now obsolete use of the word “earth” to indicate a metal oxide that couldn’t be smelted (reduced) to the pure metal. The first rare earths were discovered in unusual and uncommon (i.e., rare) oxide minerals (i.e., earths) such as the mineral gadolinite ( $\text{Y}_2\text{FeBe}_2\text{Si}_2\text{O}_{10}$ ).

The various rare earth elements are not equal in their abundance. For instance, the lighter rare earths (elements 57-62), also called the “cerium earths,” are more enriched in the Earth’s crust relative to what are called “chondritic” abundances than are the heavier rare earths. The heavy rare earths (elements 63-67) are also called the “yttrium earths” because they mimic yttrium. Chondritic abundances refer to the concentrations of elements in certain types of undifferentiated meteorites. These undifferentiated meteorites are thought to be representative samples of the materials making up the early nebula from which our Sun and the planet Earth formed. By comparing the ratios of elements in crust with their chondritic abundance, scientists can gauge the enrichment or depletion of an element relative to the “starting point,” so-to-speak, for our planet. Slight differences in chemistry between the light and heavy rare earths lead to mineralogical differences. For instance, xenotime (tetragonal  $\text{YPO}_4$ ) incorporates the yttrium earths, while monazite, monoclinic  $(\text{Ce},\text{La},\text{Nd},\text{Th})\text{PO}_4$  favors the cerium earths.

Note how the chemical formula for monazite has cerium, lanthanum, neodymium, and thorium in parentheses separated by commas – this means that monazite could contain any of these four elements. Monazite from one locality might be predominately cerium phosphate with minor amounts of lanthanum, etc. Other monazites might contain greater concentrations of lanthanum. Other elements, particularly other rare earths such as neodymium, may also be present. Elements present only at trace levels are not listed in

the mineral's chemical formula. Even some non-rare earths can fit into the structure of monazite. Monazite may contain thorium – monazite sands have, in fact, been mined for thorium.

## Rare Earth Mineralogy

Mineralogically, the rare earths are quite similar in their behavior. Because their ionic charges are typically the same (usually 3+) and their ionic radii are similar, one rare earth element can easily substitute for another in a crystal's structure. Slight differences exist between the mineralogy of the yttrium rare earths and the cerium rare earths.

The chemical mimicry of the rare earths explains why one does not, for instance, find a "lutetiumite" mineral in nature. Lutetium has to be obtained from minerals such as monazite, a rare earth phosphate mineral that typically contains only about 0.003% lutetium. The rare earths are quite difficult to separate chemically and even Mother Nature appears to have some trouble with their separation. Thus, for example, a yttrium mineral such as gadolinite will also include a raft of other rare earth elements in varying concentrations. These elements are not an essential part of the gadolinite structure, but they are present nonetheless.

Minerals containing yttrium (and thus, minerals that tend to also contain the yttrium earths) include gadolinite, xenotime, samarskite, euxenite, yttrialite, fergusonite, yttriotantalite, yttritungstite, thalenite, and yttriofluorite (a variety of fluorite). Minerals that contain cerium and the cerium earths include bastnäsite, monazite, allanite, loparite, lanthanite, cerite, and britholite. The principal ore minerals for rare earth elements include bastnäsite, monazite, loparite, and lateritic clays with strong ion absorption properties.

China currently leads the world in rare earth element production – most of the world's current supplies of yttrium come from the "ion absorption clays" found in southern China. Some pegmatites (extremely coarse-grained igneous rocks with a granitic composition) have high levels of rare earth elements concentrated in their centers in large crystals of usual and rare minerals.

## Neodymium

Among the rare earths is the element neodymium (Nd). Neodymium has been in the news recently because of concern about the world's supplies of the element. Neodymium is never found in nature as the native element; it must be extracted from cerium minerals such as monazite or bastnäsite,  $(Ce, La)(CO_3)F$ .

Neodymium is of interest because it is used in high strength magnets. Neodymium rare earth magnets are the strongest permanent magnets for their weight. This fact makes them desirable for use in computer hard drives, loudspeakers and microphones, and in small, high output electric motors such as those used in model airplanes.

Rare earths are important in the production of electric vehicles and hybrids, too. For instance, every Toyota *Prius* car consumes about 1 kg (2.2 lbs.) of neodymium in the magnets in its electric motor. Additionally, each *Prius* also utilizes 10 to 15 kg (22 to 33 lbs.) of the rare earth lanthanum in its battery. These high-tech uses of rare earths make it apparent that the rare earth elements are going to play an increasingly important role in the more energy-efficient future.

Currently, the major sources of all rare earth production are in China and the Chinese government has been restricting exports. In addition, the Chinese have been attempting to buy controlling interests in other rare earth producing mines around the world. These actions have led to a minor panic that the Chinese may corner the market and establish a rare earth cartel along the lines of OPEC. There are, however, sources of rare earths in Australia, Brazil, Canada, and California, and other potential sources as well. Given that the rare earths really aren't that rare, it is doubtful in the long run that the Chinese will be able to maintain any type of cartel to restrict and control supplies.

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*Dr. Andrew A. Sicree is a professional mineralogist and geochemist residing in Boalsburg, PA. This Popular Mineralogy newsletter supplement may not be copied in part or full without express permission of Andrew Sicree. Popular Mineralogy newsletter supplements are available on a subscription basis to help mineral clubs produce better newsletters. Write to Andrew A. Sicree, Ph.D., P.O. Box 10664, State College PA 16805, or call (814) 867-6263 or email sicree@verizon.net for more info.*

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## Neodymium Glass

Add neodymium oxide ( $Nd_2O_3$ ) to molten glass and the result is a beautiful lavender glass. Neodymium-doped glass finds use in high-power solid state lasers used for nuclear fusion, producing a 351 nm laser beam. But this beautiful glass has an additional feature: under sunlight or incandescent lights it is lavender, but under fluorescent light, the glass appears light blue. And under trichromatic (three wavelength) light, the glass looks greenish. This is a synthetic version of the "alexandrite effect" observed in the alexandrite variety of chrysoberyl.

# Volcanic bombs

The Star-Spangled Banner describes the shelling of Ft. McHenry in Baltimore by the British Navy. Francis Scott Key wrote his famous poem describing the “bombs bursting mid-air...” during the bombardment. One might suspect that Key’s work also serves to describe the experience of a volcanic eruption. After all, don’t volcanoes spit out volcanic “bombs,” too?

Volcanic bombs, however, in spite of their names, do not typically blow up. Vulcanologists (scientists who study volcanoes) use the term “volcanic bomb” to describe blobs of lava that are thrown out of a volcano during an eruption and cool mid-air forming aerodynamic shapes. The molten state of the lava when the bomb is lobbed upward separates volcanic bombs from rocks, ash, clinkers, pumice, and dust that might also be ejected from a volcano.

Volcanic bombs come in a wide variety of shapes depending upon the viscosity (fluidity), stickiness, and temperature of the lava. Descriptive names are given to them: spherical, ribbon, almond, spindle, and even cow-pie bombs have been described. Cow-pie bombs, for instance, form when the lava is still molten when it lands. The impact upon hitting the ground splatters the molten lava into a cow-pie-like blob. Depending upon the strength of the eruption, volcanic bombs can be cast hundreds of meters from the erupting crater. Volcanic bombs greater than six meters across have been reported.

One type of volcanic bomb will, occasionally, explode on impact. The so-called bread-crust bombs cool mid-air to form a thin shell incasing their still-molten interior. As the molten lava continues to cool, interior pressures may build up (from escaping gases). When the bomb hits the ground the outer shell cracks and the bomb explodes much like one of Francis Scott Key’s bombshells.

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## Geo-Sudoku

by David Glick

This puzzle contains the letters CDEHINORT, and one row or column spells out a type of meteorite. 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.

O				T			R	I
						E		
	E	I	N	C		O		
		N	D			T		
N		O			D		R	
T				I			O	
	T			N		H	D	
H	O	N			D	R	E	
D			O	H		I	C	

The following puzzle contains the letters AEIMNOTYZ, and one row or column includes the name of one of the less-rare rare-earth minerals.. 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.

N	I					T	M	
Y		M			T			I
E	I		M	Z		A	O	
T	A	E						M
Z	N		O		E	I	T	
E	Y	M		A			N	
M			Y	N	I			
	Z	O	T	E				

# Crystal Matrix Crossword

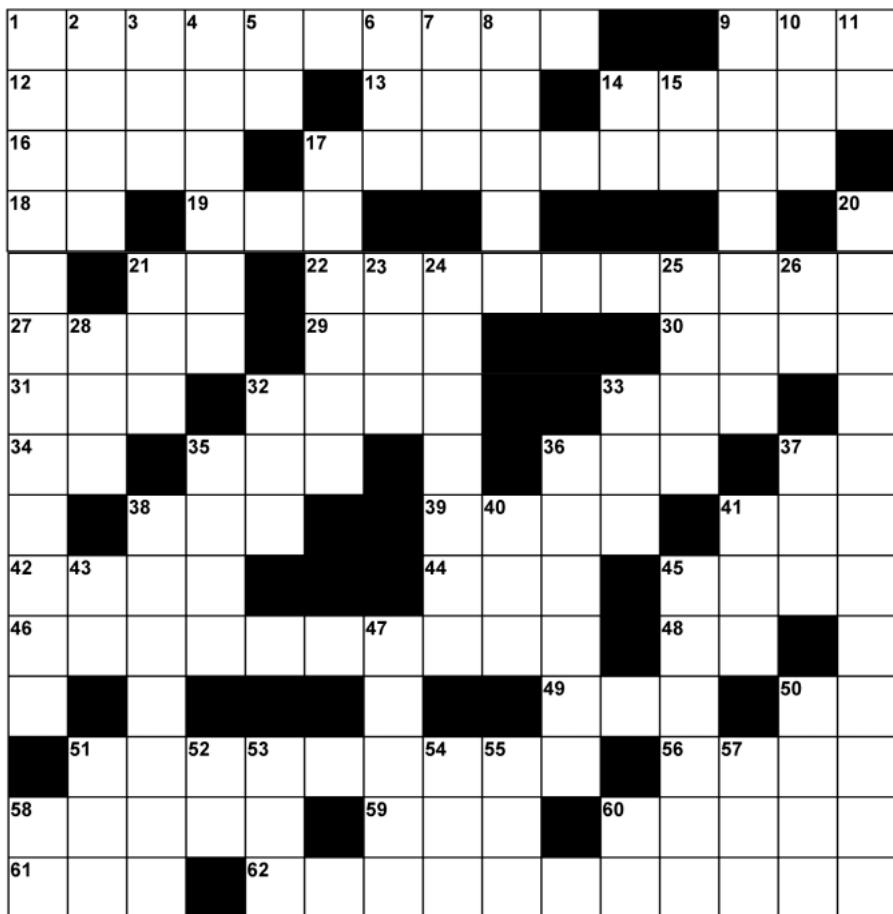
## Fossillike

### ACROSS

- 1 common in the Cretaceous
- 9 charged particle
- 12 approximately
- 13 plural of is
- 14 frequency unit
- 16 what some fish have
- 17 time of early life
- 18 light (ab)
- 19 of the egg
- 21 arsenic
- 22 how fossil bones are obtained
- 27 comet's cloud
- 29 family
- 30 Vulgate Edition (ab)
- 31 poison \_
- 32 better than none
- 33 done with a bow
- 34 can be liquid metal
- 35 peace
- 36 three parts
- 37 Galilean star
- 38 insect that bothers you
- 39 a bad defeat
- 41 read only memory
- 42 weak tide
- 44 National Wildlife Refuge
- 45 controls characteristics
- 46 of duckbills
- 48 anti-tree tool
- 49 place of science
- 50 yep
- 51 rock made of fossils
- 56 bad boy, sausage
- 58 of bones
- 59 means house, vicinity
- 60 how to expose fossils
- 61 mineral last name
- 62 fossil shelled Crustacean

### DOWN

- 1 bizarre Cambrian fossil
- 2 next to
- 3 \_\_ Quixote
- 4 horn corals (fossils)
- 5 overtime
- 6 auto club
- 7 universal resource locator
- 8 fossil \_\_ form limestone
- 9 found at KT boundary
- 10 over the counter
- 11 New Zealand
- 14 hertz
- 15 of the dawn



- 17 digs up fossils
- 20 covers fossil trees in Yellowstone
- 21 girl
- 23 Hilary (nickname)
- 24 inside volcano
- 25 fifty seven
- 26 Netherlands (ab)
- 28 egg
- 32 old witch
- 33 in the eye of the beholder
- 35 metamorphosis stage
- 36 ancient reptile
- 37 child of Apollo
- 38 aluminum ore
- 40 to possess
- 41 big carnivorous dino
- 43 for example
- 45 mafic igneous rock
- 47 gotten from C-14
- 50 gem gemstone
- 51 landing ship, tank
- 52 Maine
- 53 \_\_cene, recent dawn

- 54 October
- 55 neither \_\_
- 57 long skinny cylinder
- 58 Cockney "hey"
- 60 European Community

### August Puzzle Solution:



