THE BADGER DIGGIN'S

The Badger Lapidary and Geological Society, Inc.
Monroe, Wisconsin

Devoted to the Earth Sciences

Vol. 45, No. 1 January 2010

President's Message

Dear Badgers,

Happy New Year! I am happy to announce that at the Christmas party we found and elected our full panel of club officers for 2010. Please join me in thanking Donna Reese for volunteering as Treasurer, Mary Westby as Vice President, Tyrel Rouse as Officer at Large, and Laurie Trocke as Secretary. The officers and Teri Marché as Show Chair and Jordan Marché as Newsletter Editor will meet this Friday, January 8th to discuss and plan the 2010 fieldtrip and meeting activity calendar. We'll try to incorporate those ideas and suggestions from the membership so don't be shy.

Our first meeting activity for January will be a mini silent auction of club-owned material such as mineral specimens from the Bud Higgins & Dave Zimmerman donations. The purpose of this is to generate funds for the club, give members an exclusive opportunity to purchase these materials and yet another reason to attend meetings. This will be a silent auction set up at the What's Rockin' Table, with approximately 15 specimens.

There will be a larger auction of club materials at Dan and Laurie Trocke's Farm on January 23rd starting at 11:00 AM. This will be open to all Badger club members. The auction will be held in the stone barn which will be heated and hot drinks and sloppy joes will be served. Dan and Laurie Trocke's Farm is at 4771 County Road II, Highland WI, 53543.

Start your engines, strap on your crash beanies, and stay tuned – it's going to be a wonderful year.

Dan Trocke

Newly-elected Badger Lapidary & Geological Society President and aspiring Grand Poobah of the Iowa County Dugong Wrangler's Association.

Next Meeting

Our next meeting will be held at 9:45 a.m. on Saturday, January 9, 2010, at the Monroe Public Library, 925 16th Avenue, Monroe, WI. Take the elevator to the second floor.

Program: Mini-Auction

As a prelude to holding the larger auction two weeks hence, at the Trocke family farm, the Club will hold a mini-auction of materials donated by former president Bud Higgins. A silent auction will be set up on the What's Rockin' Table, involving around 15 specimens. The auction is designed to give members an exclusive opportunity to purchase items, and to generate additional funds for the Club. Come and see what the auction table holds!

Snacks: Provided by the Westbys.

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Tentative Calendar of Club Events – 1st half of 2010

January 9	**Regular meeting: Mini-Auction.**
January 23	**Club Auction – 11:00 a.m. Dan, Laurie Trocke's farm. The auction will be held in the barn; hot drinks will be served. Contact Dan for details and directions (or refer to the October, 2009 *Badger Diggin's*).**
February 13	**Regular meeting**
March 13	**Regular meeting: Fish pond bags (prep.)**
March 27-28	**40th Annual Mineral, Gem, & Fossil Show, Monroe High School, 1600 26th Street.**
	Theme: *Colors of the Earth*
	9 a.m. – 5 p.m., Saturday and Sunday
April 10	**Regular meeting**
May 8	**Regular meeting**
June 12	**Annual Club Picnic; location TBA.**

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Agates

by Ted Tinker

Agates are perhaps the most common gemstones on Earth. They have been found on all seven continents. There are thousands of agate-producing areas, and they have been used to create ornaments and jewelry for around 7,000 years. The term agate was derived from the River Achates (now the Drillo River) in southwest Sicily.

Agate is a microcrystalline form of chalcedony and is characterized by bands or zones that differ in color. It is most often formed where volcanic activity has left gas pockets or veins in the erupted or intruded rock. The formation of agate is surprisingly complex, to put it briefly. Agate is formed when a silica-rich solution enters those empty cavities and then condenses to form a gel. Over a period of time and across a range of temperatures between 40 and 270 degrees Celsius, the gel begins to solidify. The colored bands are a result of impurities in the gel; they are most often composed of iron oxides. When the silica gel comes into contact with incompatible chemicals (i.e, those with like electrical charges), these chemical impurities are rhythmically expelled from the leading edges of microcrystalline fibers. This crystalline growth can then either cling to the cavity's outer wall, producing fortification agate, or form in gravity-based layers, producing onyx (layered agate). Some agates can even contain both.

Because it is under pressure, the entering fluid is mobile, in a jelly-like state, and subject to plastic deformation due to internal forces of crystallization. This can result in interesting and complex variations within the layers. In many agates, the center can be crystalline quartz which is anhydrous (containing no bound water). But if the concentration of the gel is low, there is less growth material available and consequently an agate with a hollow center, called a geode, is formed. Geodes often contain clear or colored quartz such as amethyst or citrine. Occasionally, agate will fill a void left by decaying vegetable matter like a tree limb or root. These are known as limb casts. Fossils, especially of ocean species such as the gastropod *Turritella* and coral, can become agatized.

Sardonyx, a form of layered agate with alternating brown or red bands, was once considered more valuable than gold. It was used to make cameos by cutting into the alternating layers from the top down, thus creating a relief portrait. Each layer would reveal a different color. Sardonyx has the distinction of being the oldest name to apply to a type of cryptocrystalline quartz, and is derived from Sardis, the capital of the ancient kingdom of Lydia (now in Turkey).

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A Whale of a Tale, or,

A Tale of a Whale's Inner Ear

by Wil Ward

Winning the first door prize requires writing an article for the bulletin. The door prize was a fossil whale's inner ear lobe (or bone). The data card read: "Whale inner ear lobe, Miocene, Hawthorn Formation, Colleton County, South Carolina."

Starting from the end, you all know where South Carolina is. Colleton County is on the coastal plain of that state. The Hawthorn Formation is composed of sedimentary rock, sand, clay, mud and dolomite. It is exposed from southern Florida to New Jersey. There must be a lot of marine fossils in it. The Miocene is a geological epoch, being the fourth of the Cenozoic Era, beginning some 23 million years before the present time and lasting some 18 million years.

Around 50 million years ago, whales began to evolve from terrestrial ancestors. [Now that is interesting. I thought that evolution went the other way.] Whales evolved from a small deer-like ancestor named *Indohyus*. The study of the intermediate fossils and finally the discovery of the missing link between whales and their land ancestors, a 48-million year old fossil from the Kashmir region of India, is a fascinating story but one beyond the scope of this article.

The discovery that the inner ears of whales evolved very quickly, allowing them to become fully aquatic early in their evolution, is also very interesting. About 45 million years ago, the semicircular canal, the organ in the inner ear responsible for balance, was adapted to aquatic life. Their transition from land to aquatic animals took around 15 million years. The fossil evidence shows how whales developed a finely tuned hearing underwater.

Whales had to rebuild their ears to regain the ability to hear clearly underwater and be able to pinpoint the direction of sounds. Hearing is the most important sense in modern whales. Dolphins (a member of the family of toothed whales) rely on sound to hunt prey. A blind dolphin can easily find food. But a deaf dolphin will starve. Sound travels farther and faster in water and hearing underwater presents a different set of challenges than hearing on land.

So how do whales hear? Whales are split into two groups: baleen whales and toothed whales. The toothed whales include dolphins and porpoises. All whales have ears but no outer parts. They do have an outer ear canal. They have an ear drum, three small bones in the middle ear, and an inner ear. The inner ear is a fluid-filled sack. There is no use for an outer ear. Baleen whales have an outer ear *area* but it is closed shut by a wax plug. Toothed whales hear via the lower jaw that contains an acoustic fat that transmits sound to the middle ear. The middle ear is filled with fluid and foam. Most mammals on earth have inner ears that are physically a part of their skull bones. The whale inner ear is not a part of the skull but is held in place by a series of ligaments.

There is a lot more about the subject available in that great library in the other room called the Internet.

Meeting Minutes

The December meeting was called to order at 7:30 p.m. after a wonderful Christmas dinner. Many thanks to Daisy Peterson for making the arrangements and to the American Legion for the wonderful meal! We welcomed past members, Bill & Donna Meller, and new members, Ted Tinker, Linda & Gene Neill, and Chris Konetski. Ted is working on the website and has already helped out on repairs to the trailer! Thanks, Ted.

The November meeting minutes were approved as printed in the newsletter. Daisy Peterson gave us her last Treasurer's report. She said that there is $1989.91 on the bank as well as another $325 that needs to be deposited. The bank that we were using closed its branch in Monroe. The new Treasurer will chose a new bank and we will transfer our account there.

Daisy explained that part of her job was to reserve the library for the meetings. She said that the upstairs meeting room would not be available for the March meeting or the October meeting. She suggested that the March meeting be held at the Trockes. We make up the fish pond bags at that meeting and the fish pond material is already there. The October meeting is already set up for Lapidary Day at the Trocke's.

There was nothing for *Old Business*, so we moved on to Teri for a report on the show. She said that the dealers are set and that members did some repair work on the trailer. She then explained that the Sales Table would be run a little differently this year. She needs to know who is interested in selling at the club table by March 1st. If you take a place at the table, you must help set up for the show and also help with clean up after the show. She will divide the table into spaces and will draw numbers for the spaces. She would appreciate ideas for speakers.

The first door prize was won by Wil Ward. He won a nice fossil of the inner ear bone of a whale.

Teri also announced that Johanna & Normand were moving back to Canada. Anyone interested was invited to join them for supper.

For *New Business*, Dan said that he had talked to Dave Mellum, the quarry owner near Dodgeville. Dave said that he would let us know when they would be doing shots in the quarry so that we can go back there to look for more fossils when there is fresh material.

The second door prize was won by Gene Neill.

We then moved on to the main event of the evening, the election of officers for 2010. The nominating committee presented the following slate: President – Dan Trocke; Vice President – Mary Westby; Secretary – Laurie Trocke; Treasurer – Donna Reese; and Officer at Large – Tyrel Rouse. Daisy Peterson still offered to take care of reserving the library for the meetings and also to make the arrangements for the Christmas party. John Peterson moved to accept the full slate of officers. Teri seconded the motion and it carried unanimously.

The third door prize was won by Dave Reese – a nice piece of crystal wood from Brilliant, Alabama.

There will be a mini auction of the Bud Higgins collection at the January meeting and a larger auction on January 23rd at the Trockes. The meeting was adjourned at 8:10 and the Gold Brick Game followed.

Respectfully submitted,

Laurie Trocke

What's Rockin'

This month brought some very nice specimens to the What's Rockin' Table. There weren't a lot of items, but what we had was very nice. Ted Tinker brought in a sea salt crystal from Israel and a very nice desert rose (i.e., selenite) from Canada. We also had some other wonderful Canadian pieces from Roy & David Zimmerman. Roy brought in a piece of serpentine, an asbestos sample, and a nice piece of calcite, as well as a great picture of Dave bringing out a huge plate from their pocket in Canada.

Laurie Trocke

From the Show Chair

Re: Club Sales Table

Last year we tried something new, replacing the Silent Auction with a straightforward club sales table. It was an experiment, and by all reports, a successful one. However, it revealed a number of unanticipated issues that need to be addressed to make the process work best for everyone. As a result, I am implementing a few new rules to govern the functioning of the sales table. They are as follows:

1. **Any person who wishes to sell at the club table must sign up by the February meeting**. I will have sign-up sheets at both the January and February meetings. Based on the number of members who request a spot, I will divide up the available space, and number each spot. All will get an equal amount, but some spots will be in the front and some to the side of the table.

2. **Anyone present at the March meeting, who has requested a space, will draw in a lottery style for the space numbers.** That is the fairest way I can think of for assigning the spaces. Anyone not present will be assigned whatever spots are left. However, the spot is not yet assured.

3. **In order to claim your reserved spot at the show, you must appear on the Friday evening before the show opens, and actually help in setting up the show.** There is enough work to be done, even if it is just tearing tape for table covering, or helping to string wires for showcase lighting, that anyone, regardless of age or ability, can find a place to pitch in.

4. **Moreover, I will make note of who helps in tearing down the show, and it will affect your status for the next year.**

Remember that every item on the table needs a Club Sales Slip (see the attached page), filled out and readily available. That will be the only way we have for keeping track of what was sold, and who gets the money. Remember that the club gets 10% of all sales income. If you get this newsletter digitally, simply print out as many copies of this page as you need. If you get a hardcopy newsletter, take the page and xerox it as needed. Start now to prepare your materials for the sales table, and make a display that will really attract attention! Thank you all for your cooperation.

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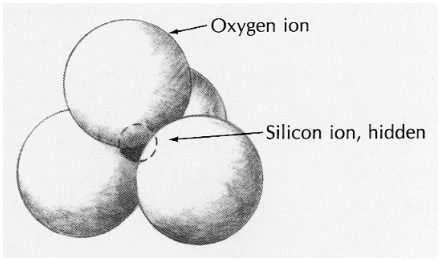
The Silicon Tetrahedron – cont.

by Jordan Marché



Silicon tetrahedron, reproduced from Peter W. Birkeland and Edwin E. Larson, *Putnam's Geology*, 5th ed. (New York: Oxford University Press, 1989), Fig. 3-14A, p. 64.

The principle of 'packing' comes into play here (think of stacking rows of identical spheres, such as marbles or oranges, in the most efficient manner possible). The Si^{+4} ion is *smaller* (0.4 Å radius), because of the loss of its outer shell of electrons. In turn, the O^{-2} ion (1.4 Å radius) is more than three times *larger*, due to the filling of its outer shell. As a result, the most compact arrangement of silicon and oxygen ions consists of a tetrahedron (see figure above), in which the smaller silicon ion is surrounded by four larger oxygen ions, making a three-sided pyramid (plus the base), each face of which is an equilateral triangle. This structure is called the silicon tetrahedron $[SiO_4]^{-4}$. However, if you add up the electrical charges of each component ion [1 * (+4) + 4 * (–2)], you will find that the tetrahedron comes to have a net electrical charge of –4. But this is what is needed in order for these tetrahedra to begin bonding with themselves (or other positively charged metal ions), in successively more complex fashion.

Units consisting of a single tetrahedron are known as *nesosilicates* (e.g., olivine). Paired units, consisting of two tetrahedra that share one oxygen atom, vertex to vertex, are known as *sorosilicates*

(e.g., epidote). Structures consisting of single, closed loops of tetrahedra (usually in groups of three, four, or six units), each of which shares two oxygen atoms, are known as *cyclosilicates*, but are not very common (e.g., tourmaline). Beyond this, tetrahedra can be strung together in either single- or double-chain linear structures, which are known as *inosilicates*. Single-chain inosilicates have each tetrahedron sharing two oxygen atoms (e.g., pyroxene), while double-chain inosilicates have each tetrahedron sharing either two or three oxygen atoms, giving an average value of 2.5 shared atoms (e.g., amphibole). Sheet-like structures, in which each tetrahedron shares three oxygen atoms, are known as *phyllosilicates* (e.g., mica). Finally, these structures may be extended into three dimensions, in which each tetrahedron shares all four oxygen atoms, and these are known as *tectosilicates* (e.g., quartz).

Thus, the silicon tetrahedron $[SiO_4]^{-4}$ serves as the basis for the construction and classification of the entire group of silicate minerals.

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"Buried Treasure"

by Teri Marché

I found the information for this article some time ago, in the July/August issue of *Discover* magazine, and have been waiting to win a door prize to write it. However, I went to see the film, Avatar, this week, and I expect that many of you also will have seen it by now (if not, by all means *see* it, on an Imax-size screen!) If you are familiar with the film, you will understand why this article is even more timely than before.

The movie revolves around the quest for a rare mineral found on the moon Pandora, and the struggles with a native population facing removal and environmental destruction. I thought the producers had a pretty lame moniker for the mineral, "Unobtainuim," but maybe not. Many of the minerals mentioned below are virtually unheard-of to collectors, but we all use the products made from them. So here is a world tour of the Earth's 21st century "Buried Treasure."

Tantalum – a soft metal with a really high melting point, it has exceptional ability to store electricity. It is everywhere in the circuit boards of computers, cell phones, digital cameras, and "in every electrical device there is." Illegal mining in the Congo has undercut legitimate production elsewhere, funded rogue militia groups, and destroyed rainforests. (Price – $36/lb.)

Lithium – probably needs no introduction. We have all used rechargeable lithium batteries, and the demand is only growing with a move to electric and hybrid cars. It is found in lakes hundreds of feet below the deserts of Chile, Argentina, and Bolivia. The water is pumped to the surface to evaporate, and lithium carbonate is refined from the residue. (Price – $1/lb.)

Platinum – along with similar metals such as palladium, rhodium, iridium, ruthenium, and osmium, is vital to auto makers for catalytic converters and fuel cells. It forms the magnetic layer in many computer hard drives and platinum-rhodium alloys are used to make the glass for LCD televisions. South Africa produces over three-quarters of the world's supply. (Price – $1,580/ounce)

Rare Earth Metals - such as gadolinium, dysprosium, europium, neodymium, and yttrium are becoming central to electronics and energy-efficient technologies. Chinese prices undercut U. S. mining after 1984 and that country now provides 97% of the world's supply. Given political differences with China, this could become a real issue. (Price – $68/lb. for yttrium)

Indium – is used to produce transparent, electrically conducting coatings for LCD televisions, computer monitors, and photovoltaic cells. Indium never occurs alone, but must be extracted from zinc minerals (like sphaelerite?). While China is the leading producer, now buying up Australian mines, there are others sources. We get most of our supplies from Canada. (Price – $300/lb)

Palladium – at less than a quarter the price of platinum, it is used in catalytic converters and energy-storing capacitors in "virtually every electronic device." The world's top producer, in Siberia has created an environmental nightmare,

spewing heavy metals and sulfur dioxide into the local area and atmosphere. Designated "one of the top ten most polluted places on earth," locals can mine the soil for metal shavings, the snow is black, and the air tastes of sulfur. (Price – $355/ounce)

This last case also highlights a major issue. As you can see, most of the mining localities are found in developing countries, where cheap (read 'underpaid') labor, and a virtual absence of environmental controls had resulted in prices that undercut those of producers in the developed world. The result is human and environmental exploitation for producing countries, often benefiting terrorist groups and repressive regimes, while destroying economies and jobs in the consuming countries. It is obvious that electrical convenience, energy efficiency, and environmental protection are incredibly complicated issues. I guess James Cameron has a point.

Source: Andrew Grant, "Buried Treasure," *Discover* magazine, July/August (2009), pp. 66-70.

Tuscon Show, February 11-14, 2010

The 56th Annual Tucson Gem & Mineral Show, the largest of its kind in the U.S., will be held at the downtown Tucson Convention Center (TCC), from Thursday, Feb. 11 to Sunday, Feb. 14. Hours are from 10 a.m. - 6 p.m. (Thurs. thru Sat.) and 10 a.m. - 5 p.m. on Sun. This year's convention theme is, "Gems and Gem Minerals." The show is open to the public and features retail dealers *only*. Roughly 250 dealers will be in attendance. Admission is $8.25, plus a $1 ticket tax. For further information, contact the TCC Ticket Office, at 520-321-1000, or visit http://www.tgms.org.

A small contingent of BLGS members and friends are planning to attend, and so a future report on this extravaganza will likely be prepared.

Badger Lapidary and Geological Society
Cash Sales Slip

Specimen: ___________________________

Locality: _____________________________

(Give this section to buyer)
* *
(Give this section to owner)

Specimen: ___________________________

Locality: _____________________________

Owner: _____________________________

Price/Piece: __________________________

Badger Lapidary and Geological Society
Cash Sales Slip

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