# SLABS & CABS

## OFFICIAL BULLETIN OF THE GULF COAST GEM & MINERAL SOCIETY
## P.O. BOX 1817
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**Next Meetings**

General meeting
16 June 2009
At the Shop
Timon Blvd

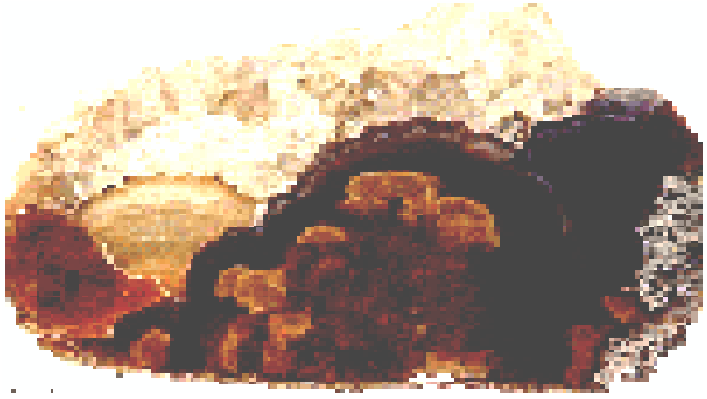
Board Meeting
7 July 2009
Main Library 6:30 PM

**Membership Fees for 2010**

Membership dues for 2010 are due in January 2010

We have 4 types of memberships and they are as follows:
Single $ 15.00
Spousal $ 20.00
Junior $ 5.00
This is for any member from the age of 6-17 years Of age
Honorary

Dona Grimes, Membership chair lady



**Tequila Sunrise**
**Found on the Woodward Ranch**
**Just north of Agate Hill**

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**We are on-line**
**www.gcgms.org**
**Thanks to Chris Davis of Spurfire and Owen Hopkins**
**For getting us back up and running! Take a look.**

## Minutes of the May Meeting of the Gulf Coast Gem & Mineral Society

Held 5/19/09 at the Corpus Christi Museum of Science and History.

**Program Highlights**
Suzy called the meeting to order at 7:00 p.m.
Program-Jerrold Simpson and Kevin Schleicher showed pictures from Big Bend field trip
Raffle Winners-Lois Pattillo won Terlingua Picture Rock, Jerrold Simpson won Malachite

**Auction** –Brought in $45.00 dollars
1. Cactus from Cecil Parker's ranch- Won by Letty Rodriguez
2. Bag of Agates won by Suzy Nick
3. Tiger's eye cabs- Suzy Nick
4. Agate Brooch- Suzy Nick

**Membership** – Suzy introduced 4 guests/new members-1 adult and 3 junior, plus 2 more junior who were not there. There are 115 members, 87 regular, 8 honorary, 20 junior

**Minutes** – Motion to approve by Linda Simpson, second by Mike McCraw, approved

**Treasurer report** – Given by Suzy Nick-Kyle Hinkle moved to approve, second by Kevin Schleicher, motion approved.

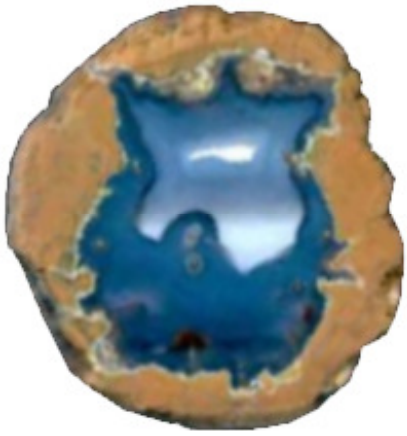
**Shop report** – Dick Cline stated that there was a leak in the building that was fixed, There is a bent saw blade and a leak under the sink. Jerrold Simpson said there are 4 people in the Cab class Monday night at 6:00. Shop will be open Saturday 9:00-12:00 and Monday at 6:00

**Fieldtrip report** – Linda Simpson proposed a trip to Pipe Creek near Bandera to where a lady is selling her husband's rocks, She has several tons. The rocks are $1.00 per pound. Call Mike McCraw if you want to go to Venice, Florida this summer agatized coral and shark teeth.

**Education Report-**Mike Mendenhall-gave report, continuing Junior Rockhound merit badge program.
**Show report** – Members are encouraged to assemble displays for next years show. Cases will be available.

**Federation Report** – Bill Pattillo said the South Central- Show/meeting is in October
American Federation annual meeting will be in Billings, Mo.-July 30-Aug 2
Bill Pattillo has raffle tickets.

**Old Business –** None
**New Business –** No formal meetings until September. Board meetings will continue.
Motion to Adjourn by Mike Mendenhall, Second by Mike McCraw
Respectfully submitted,
Kevin Schleicher
Secretary GCGMS 2009



**Oregon Thunderegg**
**Madras Oregon**
**Specimen & Picture**
**By Art Worley**

## Minutes of the May Board Meeting of the Gulf Coast Gem & Mineral Society

Held 5/12/09 at the Corpus Christi Main Library.

Suzy Nick, President, called the meeting to order at 6:40 pm. Board members in attendance were Suzy Nick, Jerrold Simpson, Linda Simpson, Mike Mendenhall, and Gene Schade.

**Membership report** – Suzy Nick gave the membership report. There are 115 members on the roster: 87 regular members, 8 honorary members and 20 junior members.

**Minutes** – No minutes were read or approved.

**Treasurer report** –Gene Schade gave the Treasures report. There are still two outstanding bills that have not been invoiced yet. One is for the mail outs and one is for ticket printing. It appears at this point, that the show made a profit over last year's show. Jerrold Simpson made a motion to accept the report as presented. Motion was seconded by Suzy Nick. The motion passed.

**Shop report** – Jerrold Simpson reported that one of the 18" saw blades had gotten bent on the previous Monday. It is not repairable and needs replaced. Jerrold also started a cabochon class on Monday.

Dick Cline reported that he needs to find out whom to contact at City Hall to make repairs on the building. There was a water line broke and there is a hole in the ceiling that allows water to enter.

**Fieldtrip report –** A possible field trip was discussed for the 23rd or 24th of this month. Linda Simpson gave a report about a lady in Bandera (actually Pipe Creek) is selling her father's collection of rock for $1.00 a pound. It will be brought before the general membership at the next meeting.

Jerrold had talked to a previous member and set up a possible field trip for the Jr. Rockhounds. More details to follow.

**Old Business** –Jerrold Simpson brought copies of the shop rules for review. Revisions were suggested and a copy will be made available at the next club meeting.
Waivers signed before members use the shop equipment were damaged in the last flooding of the building. All members who use the lapidary shop need to re-sign a waiver.

**New Business –**Several items of new business were brought to the table for discussion.
Mike Mendenhall discussed what community project we could do. Suzy Mick and Linda Simpson discussed the possibility of developing a "traveling trunk" that would travel to schools. The Club could put together the samples and Linda could coordinate the distribution to teachers through her work. The possibility is being investigated.

Mike also brought up the idea of the membership brochures distributed to jewelry shops or member's places of business.

Dick Cline would like the club to recognize a certain individual for contributions to the club. This member will be announced at a later date. A motion was made by Jerrold Simpson and seconded by Dick Cline to honor this person. The motion carried.

The meeting was adjourned at 8:20 pm.

Respectfully submitted,
Linda Simpson, acting secretary for this meeting

**Oregon Bullseye Tube Agate**
**Madras Oregon**
**Specimen & Picture**
**By Art Worley**

**GCGMS Lapidary Shop Rules**

1. The lapidary shop equipment may not be used by anyone who has not signed a liability waiver.

2. Shop equipment use flat fee is $2.00 per hour. Sign in on arrival. Pay Supervisor and sign out before leaving the shop.

3. "Open shop" hours are to be used only by those who have taken the cabochon class or have shown proficiency on the equipment.

4. All children under the age of 17 must be accom panied by an adult trained on the use of the equipment.

5. Supervisor must inspect rock "set-up" prior to anyone starting slab saw.

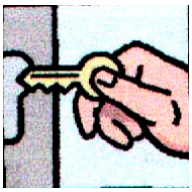
6. Long hair should be tied back, loose sleeve should be secured, and safety procedures fol lowed.

7. Safety glasses are recommended and are the re- sponsibility of the individual. Some are fur- nished by the GCGMS, or you may bring your own.

8. The last person to use a piece of equipment before the shop closes is responsible for cleaning that piece of equipment and the work area. This may include tabletop, sponges, aprons, catch trays, etc.

9. Shop Supervisor is the final authority on shop rules and usage.

Revised May 2009



Those with keys to the Lapidary Shop are
Mike McCraw—361-993-6425
Jerrold Simpson—361-851-8788
Cell - 361-877-3073
Hank Swan—361-993-9861/361-857-2405
Richard Cline—361-853-8084
Please call one of these when you would like to use the shop. They will not all be available at the same time, and once in a while none of them will be available Most of the time at least one of them should be able to work out a time and date the shop could be open for you. Remember the club has a lot of good equipment to use.
Several different classes are being conducted on Monday evening from 6:00 PM to 9:00 PM. The shop is open during these times for use of the equipment even if you are not involved in a class.
Shop is also open Saturday 9:00 Until Noon.

**Scottish Agate**
**Binn of Glen Farg Scotland**
**Picture 10X Magnification**
**Specimen & Picture**
**By Art Worley**

## Minutes of the April Meeting of the Gulf Coast Gem & Mineral Society

Held 4/21/09 at the Corpus Christi Museum of Science and History.

**Program Highlights**

Suzy called the meeting to order at 7:00 p.m.

Program-Gene Schade-Tuscan Show-Gene showed many pictures from the Tucson Show.

Raffle Winners-Kyle Hinkle, Hazel McGee, Cam Stanley

Prizes included Agate, a Septarian Nodule and a Cathedral Agate from Mexico

**Auction** –Brought in $77.00 dollars

1. Septarian Nodule- Won by Letty Rodriguez
2. 4 Agates 2 Petrified wood, 2 plume agates, won by Suzy Nick
3. Wire wrapped Agate from Howard Ogleby- Terry Burton
4. 2 Moonstone Slabs- Suzy Nick
5. Brazilian Agate Slabs- Dick Cline
6. Red Plume/Pet Wood Slabs- Linda Simpson
7. Stabilized Turquoise Pendant- Suzy Nick

**Membership** – Donna introduced new members Gloria Light, Louis Rosenthal and Hazel McGee

**Minutes** – Motion to approve by Jerrold Simpson, second by Mike McCraw, approved

**Treasurer report** – Given by Gene Schade-Kyle Hinkle moved to approve, second by Jerrold Simpson, motion approved.

**Shop report** – Cab class starting Monday night at 6:00. Shop will be open Saturday 9:00-12:00 and Monday at 6:00

**Fieldtrip report** – Mike McCraw reported on 2 field trips-one to Cecil Parker' place near Big Bend and the other to McMullen County-many specimens were displayed at meeting.

**Education Report-**Mike Mendenhall-gave report, discussed-Junior Rockhound merit badge program.

**Show report** – Jerrold Simpson-got additional bill for taxes from fairground-it was a mistake

**Federation Report** – Bill Pattillo said the South Central- Show/meeting is in October

American Federation annual meeting will be in Billings, Mo.-July 30-Aug 2

Bill Pattillo has raffle tickets.

**Old Business –** None

**New Business –** None

Motion to Adjourn by Kyle Hinkle, Second by Dick Cline

Respectfully submitted,
Kevin Schleicher
Secretary GCGMS 2009

**Oregon Thunderegg**
**Madras Oregon**
**Specimen & Picture**
**By Art Worley**

# Emerald "May Birthstone"

Emerald is May's birthstone. Emeralds range in hue from a deep evergreen to a bright kelly green, and they are beautifully complemented by both white metals and yellow gold.

Emeralds, like all colored gemstones, are graded using four basic parameters, the four Cs of Connoisseurship; Color, Cut, Clarity and Crystal. The last C, crystal is simply used as a synonym that begins with C for transparency or what gemologists call diaphaneity. Prior to the 20th Century jewelers used the term water as in "a gem of the finest water" to express the combination of two qualities, color and crystal. Normally, in the grading of colored gemstones, color is by far the most important criterion. However, in the grading of emerald, crystal is considered a close second. Both are necessary conditions. A fine emerald must possess not only a pure verdant green hue as described below, but also a high degree of transparency to be considered a top gem.

**Color**

Scientifically speaking, color is divided into three components: hue, saturation and tone. Yellow and blue, the hues found adjacent to green on the spectral color wheel, are the normal secondary hues found in emerald. Emeralds occur in hues ranging from yellowish green to bluish green. The primary hue must, of course, be green. Only gems that are medium to dark in tone are considered emerald. Light toned gems are known by the species name, green beryl. In addition, the hue must be bright (vivid). Gray is the normal saturation modifier or mask found in emerald. A grayish green hue is a dull green hue.

**Clarity**

From the collection at the National Museum of Natural History

Emerald tends to have numerous inclusions and surface breaking fissures. Unlike diamond, where the loupe standard, i.e. 10X magnification, is used to grade clarity, emerald is graded by eye. Thus, if an emerald has no visible inclusions to the eye (assuming 20-20 vision) it is considered flawless. Stones that lack surface breaking fissures are extremely rare and therefore almost all emeralds are treated, "oiled", to enhance the apparent clarity. Eye-clean stones of a vivid primary green hue (as described above) with no more than 15% of any secondary hue or combination (either blue or yellow) of a medium-dark tone command the highest prices. This relative crystal non-uniformity makes emeralds more likely than other gemstones to be cut into cabochons, rather than faceted shapes.

**Treatments**

Most emeralds are oiled as part of the post lapidary process, in order to improve their clarity. Cedar oil, having a similar refractive index, is often used in this generally accepted practice. Other liquids, including synthetic oils and polymers with refractive indexes close to that of emerald such as Opticon are also used. The U.S. Federal Trade Commission requires the disclosure of this treatment when a treated emerald is sold. The use of oil is traditional and largely accepted by the gem trade. Other treatments, for example the use of green-tinted oil, are not acceptable in the trade. The laboratory community has recently standardized the language for grading the clarity of emeralds. Gems are graded on a four step scale; none, minor, moderate and highly enhanced. Note that these categories reflect levels of enhancement not clarity. A gem graded none on the enhancement scale may still exhibit visible inclusions. Laboratories tend to apply these criteria differently. Some gem labs consider the mere presence of oil or polymers to constitute enhancement. Others may ignore traces of oil if the presence of the material does not materially improve the look of the gemstone.

Given that the vast majority of all emeralds are treated as described above, and the fact that two stones that appear to be similar in quality may actually be quite far apart in treatment level, a consumer considering a purchase Continued on page 7

of an expensive emerald is well advised to insist upon a treatment report from a reputable gemological laboratory. All other factors being equal, a high quality emerald with an enhancement level graded moderate should cost 40-50% less than an identical stone graded

**Emerald localities**

Emeralds in antiquity were mined by the Egyptians and in Austria, as well as Swat in northern Pakistan.

A rare type of emerald known as a trapiche emerald is occasionally found in the mines of Colombia. A trapiche emerald exhibits a "star" pattern; it has raylike spokes of dark carbon impurities that give the emerald a six-pointed radial pattern. It is named for the trapiche, a grinding wheel used to process sugarcane in the region. Colombian emeralds are generally the most prized due to their transparency and fire. Some of the most rare emeralds come from three main emerald mining areas in Colombia: Muzo, Coscuez, and Chivor. Fine emeralds are also found in other countries, such as Zambia, Brazil, Zimbabwe, Madagascar, Pakistan, India, Afghanistan and Russia. In the US, emeralds can be found in Hiddenite, North Carolina. In 1998, emeralds were discovered in the Yukon

Emeralds are a variety of the mineral beryl (Be3Al2 (SiO3)6,) colored green by trace amounts of chromium and sometimes vanadium. Beryl has a hardness of 7.5 - 8 on the 10 point Mohs scale of mineral hardness. Most emeralds are highly included, so their brittleness (resistance to breakage) is classified as generally poor. The word "emerald" comes from Latin smaragdus, via Greek smaragdos, its original source being a Semitic word izmargad or the Sanskrit word, marakata, meaning "emerald" or "green".

**Oregon Thunderegg**
**Madras Oregon**
**Specimen & Picture**
**By Art Worley**

**Oregon Thunderegg**
**Madras Oregon**
**Specimen & Picture**
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**Scottish Agate**
**Binn of Glen Farg Scotland**
**Specimen & Picture**
**By Art Worley**

# Pearl "Birthstone for May"

A pearl is a hard, roundish object produced within the soft tissue (specifically the mantle) of a living shelled mollusk. Just like the shell of mollusks, a pearl is made up of calcium carbonate in minute crystalline form, which has been deposited in concentric layers. The ideal pearl is perfectly round and smooth, but many other shapes of pearls (baroque pearls) occur. The finest quality natural pearls have been highly valued as gemstones and objects of beauty for many centuries, and because of this, the word pearl became a metaphor for something very rare, very fine, very admirable and very valuable.

Valuable pearls occur in the wild, but they are very rare. Cultured or farmed pearls make up the majority of those that are currently sold. Pearls from the sea are valued more highly than freshwater pearls. Imitation or fake pearls are also widely sold in inexpensive jewelry, but the quality of the iridescence is usually very poor, and generally speaking, fake pearls are usually quite easy to distinguish from the real thing. Pearls have been harvested, or more recently cultivated, primarily for use in jewelry, but in the past they were also stitched onto lavish clothing, as worn, for example, by royalty. Pearls have also been crushed and used in cosmetics, medicines, or in paint formulations.

In several European languages, the word "pearl" is synonymous with "bead", which can lead to confusion during translation.

### Definition of a pearl

Almost any shelled mollusk can, by natural processes, produce some kind of "pearl" when an irritating microscopic object becomes trapped within the mollusk's mantle folds, but the great majority of these "pearls" are not valued as gemstones. Nacreous pearls, the best-known and most commercially-significant pearls, are primarily produced by two groups of molluscan bivalves or clams. A nacreous pearl is made from layers of nacre, by the same living process as is used in the secretion of the mother of pearl which lines the shell.

A "natural pearl" is one that forms without any human intervention at all, in the wild, and is very rare. Many hundreds of pearl oysters or pearl mussels have to be gathered and opened, and thus killed, in order to find even one wild pearl, and for many centuries that was the only way pearls were obtained. This was the main reason why pearls fetched such extraordinary prices in the past. A cultured pearl, on the other hand, is one that has been formed with human intervention on a pearl farm. The vast majority of pearls on the market today are cultured pearls.

One family of nacreous pearl bivalves, the pearl oysters, lives in the sea while the other, very different group of bivalves live in freshwater; these are the river mussels such as the freshwater pearl mussel. Saltwater pearls can grow in several species of marine pearl oysters in the family Pteriidae. Freshwater pearls grow within certain (but by no means all) species of freshwater mussels in the order Unionida, the families Unionidae and Margaritiferidae.

### Physical properties

The unique luster of pearls depends upon the reflection, refraction, and diffraction of light from the translucent layers. The thinner and more numerous the layers in the pearl, the finer the luster. The iridescence that pearls display is caused by the overlapping of successive layers, which breaks up light falling on the surface.

In addition, pearls (especially cultured freshwater pearls) can be dyed yellow, green, blue, brown, pink, purple, or black.

Pearl is the birthstone for the month of June. These unique gems, when of fine quality, look like they have a glow from within. South Sea and Tahitian pearls, the largest and typically most expensive, are spectacular on a strand, or as a pendant or earrings. Smaller cultured and freshwater pearls also stand out with their classic beauty and timeless elegance. Pearls are the perfect June gift that will satisfy even the most discerning tastes.

### Freshwater and saltwater pearls

Freshwater pearl mussel, Margaritifera margaritifera

Freshwater and saltwater pearls may sometimes look quite similar, but they come Continued on page 9

from very different sources.

Natural freshwater pearls form in various species of freshwater mussels, family Unionidae, which live in lakes, rivers, ponds and other bodies of fresh water. These freshwater pearl mussels occur not only in hotter climates, but also in colder more temperate areas such as Scotland: see the freshwater pearl mussel. However, most freshwater cultured pearls sold today come from China.

Saltwater pearls grow within pearl oysters, family Pteriidae, which live in oceans. Saltwater pearl oysters are usually cultivated in protected lagoons or volcanic atolls.

**Creation of a pearl**

The difference between natural and cultured pearls focuses on whether the pearl was created spontaneously by nature — without human intervention — or with human aid. Pearls are formed inside the shell of certain mollusks: as a defense mechanism to a potentially threatening irritant such as a parasite inside its shell, the mollusk creates a pearl to seal off the irritation.

The mantle of the mollusk deposits layers of calcium carbonate ($CaCO_3$) in the form of the mineral aragonite or a mixture of aragonite and calcite (both crystalline forms of calcium carbonate) held together by an organic horn-like compound called conchiolin. The combination of aragonite and conchiolin is called nacre, which makes up mother-of-pearl. The commonly held belief that a grain of sand acts as the irritant is in fact rarely the case. Typical stimuli include organic material, parasites, or even damage that displaces mantle tissue to another part of the animal's body. These small particles or organisms enter the animal when the shell valves are open for feeding or respiration. In cultured pearls, the irritant is typically a cut piece of the mantle epithelium, together with processed shell beads, the combination of which the animal accepts into its body.

**Natural pearls**

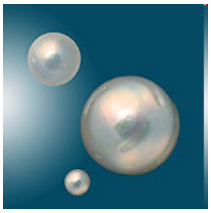
Natural pearls are nearly 100% calcium carbonate and conchiolin. It is thought that natural pearls form under a set of accidental conditions when a microscopic intruder or parasite enters a bivalve mollusk, and settles inside the shell. The mollusk, being irritated by the intruder, secretes the calcium carbonate and conchiolin to cover the irritant. This secretion process is repeated many times, thus producing a pearl. Natural pearls come in many shapes, with perfectly round ones being comparatively rare.

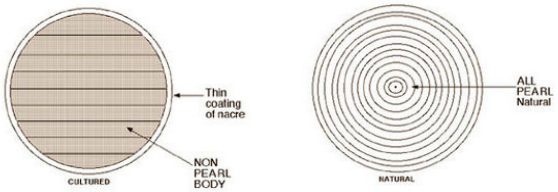
**Cultured pearls**

Nuclei from Toba Pearl Island, Japan

Cultured pearls (nucleated and non-nucleated or tissue nucleated cultured pearls) and imitation pearls can be distinguished from natural pearls by X-ray examination. Nucleated cultured pearls are often 'pre-formed' as they tend to follow the shape of the implanted shell bead nucleus. Once the pre-formed beads are inserted into the oyster, it secretes a few layers of nacre around the outside surface of the implant before it is removed after six months or more.

When a nucleated cultured pearl is X-rayed, it reveals a different structure to that of a natural pearl. A cultured pearl shows a solid center with no concentric growth rings, whereas a natural pearl shows a series of concentric growth rings.





# Concretion

A concretion is a volume of sedimentary rock in which a mineral cement fills the porosity (i.e. the spaces between the sediment grains). Concretions are often ovoid or spherical in shape, although irregular shapes also occur. The word 'concretion' is derived from the Latin con meaning 'together' and crescere meaning 'to grow'. Concretions form within layers of sedimentary strata that have already been deposited. They usually form early in the burial history of the sediment, before the rest of the sediment is hardened into rock. This concretionary cement often makes the concretion harder and more resistant to weathering than the host stratum.

There is an important distinction to draw between concretions and nodules. Concretions are being formed from mineral precipitation around some kind of nucleus while a nodule is a replacement body.

Descriptions dating from the 18th century attest to the fact that concretions have long been regarded as geological curiosities. Because of the variety of unusual shapes, sizes and compositions, concretions have been interpreted to be dinosaur eggs, animal and plant fossils (called pseudofossils), extraterrestrial debris or human artifacts.

### Origins

Detailed studies (i.e., Boles et al., 1985; Thyne and Boles, 1989; Scotchman, 1991; Mozley and Burns, 1993; McBride et al., 2003; Chan et al., 2005; Mozley and Davis, 2005) published in peer-reviewed journals, have demonstrated that they form subsequent to burial during diagenesis. They quite often form by the precipitation of a considerable amount of cementing material around a nucleus, often organic, such as a leaf, tooth, piece of shell or fossil. For this reason, fossil collectors commonly break open concretions in their search for fossil animal and plant specimens. One of the most unusual concretion nuclei, as documented by Al-Agha et al. (1995), are World War II military shells, bombs, and shrapnel, which are found inside siderite concretions found in an English coastal salt marsh.

Depending on the environmental conditions present at the time of their formation, concretions can be created by either concentric or pervasive growth (Mozley, 1996; Raiswell and Fisher, 2000). In concentric growth, the concretion grows as successive layers of mineral accrete to its surface. This process results in the radius of the concretion growing with time. In case of pervasive growth, cementation of the host sediments, by infilling of its pore space by precipitated minerals, occurs simultaneously throughout the volume of the area, which in time becomes a concretion.

### Appearance

Sandstone Concretion at Año Nuevo State Reserve

Concretions vary in shape, hardness and size, ranging from objects that require a magnifying lens to be clearly visible to huge bodies three meters in diameter and weighing several thousand pounds. The giant, red concretions occurring in Theodore Roosevelt National Park, in North Dakota, are almost 3 m (10 ft) in diameter. Spheroidal concretions, as large as 9 m (30 ft) in diameter, have been found eroding out of the Qasr El Sagha Formation within the Faiyum depression of Egypt. Concretions are usually similar in color to the rock in which they are found. Concretions occur in a wide variety of shapes, including spheres, disks, tubes, and grape-like or soap bubble-like aggregates.

### Composition

They are commonly composed of a carbonate mineral such as calcite; an amorphous or microcrystalline form of silica such as chert, flint, or jasper; or an iron oxide or hydroxide such as goethite and hematite. They can also be composed of other minerals that include dolomite, ankerite, siderite, pyrite, marcasite, barite and gypsum.

Although concretions often consist of a single dominant mineral, other minerals can be present depending on the environmental conditions which created them. For example, carbonate concretions, which form in response to the reduction of sulfates by bacteria, often contain minor, percentages of pyrite. Other concretions, which formed as a result of microbial sulfate reduction, consist of a mixture of calcite, barite, and pyrite.

Continued on Page 11

## "Code of Ethics"

- I will respect both private and public property and will do no collecting on privately owned land without permission from the owner.
- I will keep informed on all laws, regulations or rules governing collecting on public lands and will observe them.
- I will, to the best of my ability, ascertain the boundary lines of property on which I plan to collect.
- I will use no firearms or blasting material in collecting areas.
- I will cause no willful damage to property of any kind such as fences, signs, buildings, etc.
- I will leave all gates as found.
- I will build fires only in designated or safe places and will be certain they are completely extinguished before leaving the area.
- I will discard no burning material - matches, cigarettes, etc.
- I will fill all excavation holes which may be dangerous to livestock.
- I will not contaminate wells, creeks, or other water supplies.
- I will cause no willful damage to collecting material and will take home only what I can reasonably use.
- I will practice conservation and undertake to utilize fully and well the materials I have collected and will re cycle my surplus for the pleasure and benefit of others.
- I will support the rockhound project H.E.L.P. (Help Eliminate Litter Please) and will leave all collecting ar eas devoid of litter, regardless of how found.
- I will cooperate with field-trip leaders and those in designated authority in all collecting areas.
- I will report to my club or federation officers, Bureau of Land Management or other authorities, any deposit of petrified wood or other materials on public lands which should be protected for the enjoyment of future generations for public educational and scientific purposes.

Continued from Page 10

### Occurrence

Two cm diameter iron concretion in the Fremont Sandstone near Emery, Utah

Concretions are found in a variety of rocks, but are particularly common in shales, siltstones, and sandstones. They often outwardly resemble fossils or rocks that look as if they do not belong to the stratum in which they were found. Occasionally, concretions contain a fossil, either as its nucleus or as a component that was incorporated during its growth but concretions are not fossils themselves. They appear in nodular patches, concentrated along bedding planes, protruding from weathered cliffsides, randomly distributed over mudhills or perched on soft pedestals.

Small hematite concretions ("blueberries") have been observed on Mars. See Martian spherules.

### Types of concretions

Some of the names of concretions are septarian concretions, cannonball concretions, Moqui (Moki) marbles, and pop rocks.

### Septarian concretions

Septarian concretions or septarian nodules, are concretions containing angular cavities or cracks, which are called "septaria". The word comes from the Latin word septum; "partition", and refers to the cracks/ separations in this kind of rock. There is an incorrect explanation that it comes from the Latin word for "seven", septem, referring to the number of cracks that commonly occur.

The process which created the septaria, which characterize septarian concretions, remains a mystery. A number of mechanisms, i.e. the dehydration of clay-rich, gel-rich, or organic-rich cores; shrinkage of the concretion's center; expansion of gases produced by the decay of organic matter; brittle fracturing of the concentration by either earthquakes or compaction; and others, have been proposed for the formation of septaria. At this time, it is uncertain, which, if any, of these and other proposed mechanisms is responsible for the formation of septaria in septarian concretions (McBride et al. 2003). Septaria usually contain crystals precipitated from circulating solutions, usually of calcite.

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Siderite or pyrite coatings are also occasionally observed on the wall of the cavities present in the septaria, giving rise respectively to a panoply of bright reddish and golden colors. Some septaria may also contain small calcite stalagtites and well-shaped millimetric pyrite single crystals.

A spectacular example of septarian concretions, which are as much as 3 meters (9 ft) in diameter, are the Moeraki Boulders. These concretions are found eroding out of Paleocene mudstone of the Moeraki Formation exposed along the coast near Moeraki, South Island, New Zealand. They are composed of calcite-cemented mud with septarian veins of calcite and rare late-stage quartz and ferrous dolomite (Boles et al. 1985, Thyne and Boles 1989). Very similar concretions, which are as much as 3 meter (9 ft) in diameter and called "Koutu Boulders", litter the beach between Koutu and Kauwhare points along the south shore of the Hokianga Harbour of Hokianga, North Island, New Zealand. The much smaller septarian concretions found in the Kimmeridge Clay exposed in cliffs along the Wessex Coast of England are more typical examples of septarian concretions (Scotchman 1991).

**Cannonball concretions**

Cannonball concretions are large spherical concretions, which resemble cannonballs. These are found along the Cannonball River within Morton and Sioux Counties, North Dakota, and can reach 3 m (10 ft) in diameter. They were created by early cementation of sand and silt by calcite. Similar cannonball concretions, which are as much as 4 to 6 m (12 to 18 feet) in diameter, are found associated with sandstone outcrops of the Frontier Formation in northeast Utah and central Wyoming. They formed by the early cementation of sand by calcite (McBride et al. 2003). Somewhat weathered and eroded giant cannonball concretions, as large as 6 meters (18 ft) in diameter, occur in abundance at "Rock City" in Ottawa County, Kansas. The Moeraki and Koutu boulders of New Zealand are examples of septarian concretions, which are also cannonball concretions. Large spherical rocks, which are found on the shore of Lake Huron near Kettle Point, Ontario, and locally known as "kettles", are typical cannonball concretions. Cannonball concretions have also been reported from Van Mijenfjorden, Spitsbergen; near Haines Junction, Yukon Territory, Canada; Jameson Land, East Greenland; near Mecevici, Ozimici, and Zavidovici in Bosnia-Herzegovina; and many other places. Reports of cannonball concretions have also come from Bandeng and Zhanlong hills near Gongxi Town, Hunan Province, China.

**Elongate concretions**

Elongate concretions form parallel to sedimentary strata and have been studied extensively due to the inferred influence of phreatic (saturated) zone groundwater flow direction on the orientation of the axis of elongation (e.g., Johnson, 1989; McBride et al., 1994; Mozley and Goodwin, 1995; Mozley and Davis, 2005). In addition to providing information about the orientation of past fluid flow in the host rock, elongate concretions can provide insight into local permeability trends (i.e., permeability correlation structure; Mozley and Davis, 1996), variation in groundwater velocity (Davis, 1999), and the types of geological features that influence flow.

**Moqui Marbles**

Moqui Marbles also called Moqui balls, and "Moki marbles", are iron oxide concretions, which can found eroding in great abundance out of outcrops of the Navajo Sandstone within south-central and southeastern Utah. These concretions range in shape from spheres to discs, buttons, spiked balls, cylindrical forms, and other odd shapes. They range from pea-size to baseball-size. They were created by the precipitation of iron, which was dissolved in groundwater. These concretions are argued to be a terrestrial analogue of the Martian hematite spherules, called "blueberries" (Chan and Parry 2002, Chan et al. 2005).

**Kansas Pop rocks**

Kansas Pop rocks are concretions of either iron sulfide, i.e. pyrite and marcasite, or in some cases jarosite, which are found in outcrops of the Smoky Hill Chalk Member of the Niobrara Formation within Gove County, Kansas. They are typically associated with thin layers of altered volcanic ash, called bentonite, that occur within the chalk comprising the Smoky Hill Chalk Member. A few of these concretions enclose, at least in part, large flattened valves of inoceramid bivalves. These concretions range in size from a few millimeters to as much as 0.7 m (2.3 ft) in length and 12 cm (0.4 ft) in thickness. Most of these concretions are oblate Continued on page 13

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spheroids shape. Other "pop rocks" are small polycuboidal pyrite concretions, which are as much as 7 cm (0.23 ft) in diameter (Hattin 1982). These concretions are called "pop rocks" because they explode if thrown in a fire. Also, when they are either cut or hammered, they produce sparks and a burning sulfur smell. Typical examples of iron sulfide concretions, called “Kansas Pop Rocks”, which are found in the Smoky Hill Chalk Member of the Niobrara Formation of Kansas.

Contrary to what has been published on the Internet, none of the iron sulfide concretions, which are found in the Smoky Hill Chalk Member, were created by either the replacement of fossils or by metamorphic processes. In fact, metamorphic rocks are completely absent from the Smoky Hill Chalk Member (Hattin 1982). Instead, all of these the iron sulfide concretions were created by the precipitation of iron sulfides within anoxic marine calcareous ooze after it had accumulated and before it had lithified into chalk.

Iron sulfide concretions, such as the Kansas Pop rocks, consisting of either pyrite and marcasite, are nonmagnetic (Hobbs and Hafner 1999). On the other hand, iron sulfide concretions, which either are composed of or contain either pyrrhotite or symthite, will be magnetic to varying degrees (Hoffmann, 1993). Prolonged heating of either a pyrite or marcasite concretion will convert portions of either mineral into pyrrhotite causing the concretion to become slightly magnetic.

**A septarian nodule**

Septarian nodule in the Bristol City Museum, Bristol, England. This is a local concentration of calcite, forming a hard lump in mudstone. Radiating shrinkage cracks have filled with veins of calcite. From the Oxford Clay, Wiltshire, England.

**Oregon Thunderegg**
**Madras Oregon**
**Specimen & Picture**
**By Art Worley**

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