# ROCK LORE

Vol. 56, No. 7

SEPTEMBER 2010

## SEPTEMBER 2010

**Blue and Purple zoned Halite from the Carlsbad Potash Mining District, Eddy and Lea Counties, New Mexico. Specimen 4.8 X 3.5 X 1.5 cm, from collection of John L. Dolde. Photo by John L. Dolde ©2010.**

**Official Publication of the St. Louis Mineral and Gem Society**

### *INSIDE THIS ISSUE*

## St. Louis Mineral and Gem Society

**Purpose:** The St. Louis Mineral and Gem Society is a non-profit club established in 1951 to help promote the hobby and knowledge of the Earth Sciences and Lapidary Arts within its' membership and in the community. We consist mostly of amateurs interested in rocks, minerals, fossils, gems, lapidary arts, and earth science. Our members also volunteer as speakers to area schools and as judges at the St. Louis Regional Science Fair.

**Affiliations:** We are affiliated with and sponsor events by the Greater Association of Earth Science Clubs (GSLAESC), and are a member of the Midwest Federation of Gem & Mineral Societies, which is a member of the American Federation of Mineralogical Societies.

**Meetings:** We meet monthly from September to May, on the first Friday of each month. Meetings are located on the Washington University campus, Earth & Planetary Science Building on Hoyt Drive, room 203, at 7:30 PM. Hoyt Drive runs parallel to Skinker Blvd, between Forsyth Blvd and Forest Park Parkway. We have a rock club for children called "Pebble Pups" that get together at our regularly scheduled meetings for discussion and hands-on activities.

**Field Trips:** We promote field trips to local and out-of-state mining sites and collecting areas for the purpose of self-collecting and exposure to how we use and mine minerals.

**Mineral Show:** We host an annual Fall Mineral, Gem and Fossil Show in early November of each year. The show includes exhibits by members, institutions and prominent collectors. There are demonstrators, and both local and national dealers, who show and sell minerals, fossils, lapidary supplies, jewelry, books and other items related to the hobby.

**Club Parties:** We host a Club Picnic in June and a Christmas Party in December of each year. These events include food, auctions and other activities.

**Memberships:** Single Adult - $15.00/year, Family - $20.00/year, Junior (ages 10-17) - $5.00/year, Junior w/o Rock Lore - $3.00/year, Life - $150.00. Memberships include a subscription to our Monthly publication Rock Lore unless otherwise stated.

**Website: http://www.stlrockclub.com/**

### 2010 ST. LOUIS MINERAL & GEM SOCIETY OFFICERS

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|---|---|
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| 1ST VP (PROGRAMS) | Harold Schlegel |
| 2ND VP (ROCK LORE ) | John L. Dolde |
| SECRETARY | Melissa Perucca |
| TREASURER | Joe Erlanger |

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## EDITORS NOTE

Well, it's here again, meeting time! The next meeting of the St. Louis Mineral and Gem Society will be on September 3, 2010 at the usual place - Washington University, room 203 of the Earth and Planetary Sciences Building at 7:30 pm. This upcoming meeting season proves to be a good one. Harold Schlegel is however looking for anyone with interest in giving a presentation at the meetings over the next 10 months. In the past a few club members have given some great presentations covering cleaning of minerals to collecting adventures, as well as some geologic presentations.

If you have some experiences or advice to share with other members this is the way to do it! So again, if you are interested please contact Harold Schlegel and schedule your presentation. Remember this is your club, and by presenting something you can be a bigger part of the club, facilities are available for use in aiding your presentation. Let's see something new!

I know personally there is a lot of information that many of us don't get because it is not shared, so please share what you know, be an active participant and don't just hide in the shadows! Let me know if I can help out, I am only a phone call or email away! I am even working on something to share with everyone at a future meeting so stay tuned. Thanks, and see you in September.

-John L. Dolde, LPG, RG, Editor-

Contact the editor at johndolde@yahoo.com

# SLMGS NEWS

## SLMGS - PRESIDENTS' MESSAGE

**By Jack Uxa, President**

While it is still a couple of months away please start thinking about being involved with leading the club. We have 28 members who help in various ways to keep the club running, we have 119 members. Many of those 28 have been "leading" for many years. So how about some new blood next year.

We also are already making preparations for our annual show which is held in November so make sure to mark your calendars. Again as mentioned above it is usually the same folks helping out year after year, let's see some new faces this year at the show.

This is a great way to become familiar with others in the club as well as a good time. So if you haven't volunteered to help before NOW is YOUR chance! Help is needed for a plethora of things including setting up display cases, manning the admission table, assisting vendors and many more. So PLEASE sign up and be an active part of YOUR club!

## SLMGS - SEPTEMBER MEETING

The September meeting kicks off the next ten months of membership meetings on Friday September 3rd at 7:30 p.m. This month there will not be a program, but instead a chance to show off your finds from the summer months! Members are encouraged to bring in whatever it is they collected, purchased or added to their collections to share with everyone present whether it is fossils, minerals, geodes, new works of lapidary art , or jewelry.

## PEBBLE PUPS

For the September meeting, Mr. John Macke will lead our group of Pebble Pups in discovering the minerals of granite; quartz, feldspar, and mica.

## SLMGS - ANNUAL SHOW

**By John Dolde**

If anyone is interested there are four spots available to set up a display at our annual show in November at the Viking Conference Center in Sunset Hills. The LSMGS currently has four display cases that need to be filled for public viewing during the weekend of the show.

This is a great opportunity to show off some of your specimens, including: fossils, minerals, lapidary work, or anything else you might have that is related to the hobby. Year after year it seems that the same folks are the ones displaying. This year let's try to get some new blood into the displays! Take it from me it is always fun to put together a display for others to enjoy.

## SLMGS ROCK LORE RECEIVES HONORABLE MENTION

**By John L. Dolde, Editor**

Earlier this year I entered our newsletter in the annual A.F.M.S. Editors' contest to see how our newsletter would fare against other newsletters in the rock hobby world. Two issues of Rock Lore were sent off to be judged in this contest and I had no idea what to expect. I have tried hard to improve our newsletter for YOUR sake!

Well about a month ago I found out what the

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results of this entry were. Rock Lore received an Honorable Mention (13th Place) for small bulletins in the contest and I was very happy to say the least. The newsletter was judged on numerous criteria including; First Impression, Vital Information, Formatting/Editorship, Club News, Federation News, and Articles.

Rock Lore scored very well in some of these categories but not so well in a couple of others. Overall, your newsletter received 79 out of a possible 100 points. Many of the discrepancies have been addressed and are now (hopefully) adequate. Only time will tell as I plan on entering the Rock Lore again for the 2010 contest to see if the scores go up.

So once again, I am asking for your help to make this publication one of the best out there. Please send me your articles, poems, stories, cartoons, photos, or whatever as long as it pertains to the rock hobby. This is YOUR newsletter and you can contribute as often as you like, I would definitely welcome the material, so please get those stories tog ether and send them to me.

If you do not have access to a computer or are lacking in word processing skills don't fret, please write them down the old fashioned way and I would be glad to re-type them for inclusion. For information on the other winners in the Small Bulletin class please see the following A.F.M.S. news item.

## A.F.M.S. NEWS

### 2010 AFMS Bulletin Editor's Contest Winners

**from Linda Jaeger, AFMS Chair**

The 2010 AFMS Bulletin Editor's Contest is now history. Awards were announced and presented during the annual breakfast with the editors at the AFMS Convention in California in mid-June. As always, it was good to meet so many editors and to be able to put a face to a name.

It's not too early to start thinking about entering the next contest. Entries will be accepted first by your regional BEAC chair - watch your federation newsletter for entry guidelines and dates. All club bulletins and articles printed during 2010 will be eligible to enter.

I want to thank the judges who donated their time and efforts to evaluating the submissions for this year.

They were:

Adult Articles - Judith Washburn, Rochester, IL
Adult Articles, Advanced - Diane Dare, Holiday, FL
Junior Articles - Jim Brace-Thompson, Ventura, CA
Written Features - Barbara Fenstermacher, Aiken, SC
Drawn Features - Judy White, Tulsa, OK
Poetry, Cecilia Duluk, Dearborn Heights, MI
Mini Bulletins - Terry Yoschak, Rocklin, CA
Small Bulletins - Kay Waterman, Claremore, OK
Large Bulletins - Mike Wall, Seattle, WA
New Editor - Carolyn Weinberger, Glyndon, MD
Special Publications - Alan Hukill, East Lansing, MI

And now, here are the results *(Small bulletins only)* of the contest for this year.

### Small Bulletins, Top 10

**1. *The Conglomerate,* 5/09**
**Barbara Hartman, Editor**
Reno Gem & Mineral Society
Sparks, NV (CFMS)

**2. *The Rockytier,* 10/09**
**Rhonda Taylor, Editor**
Lubbock Gem & Mineral Society
Lubbock, TX (SCFMS)

**3. *The Strata Data*, 10/09**
**Michele Yamanaka, Editor**

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The Three Rivers Gem & Mineral Society
Ft. Wayne, IN (MWF)

**4. *The Mountain Gem*, 12/09**
**Linda Behr, Editor**
The Gem & Mineral Society of Franklin, NC
Franklin, NC (SFMS)

**5. *Quarry Quips*, 11/09**
**Carolyn White, Editor**
Wichita Gem & Mineral Society
Wichita, KS (RMFMS)

**6. *CentrILL Gems*, 4/09**
**Regina Kapta, Editor**
Central Illinois Gem & Mineral Club
Decatur, IL (MWF)

**7. *The Pineywoods Rooter*, 11/09**
**John D. Nash, Editor**
Pine Country Gem & Mineral Society
Jasper, TX (SCFMS)

**8. *The Rockhounder*, 9/09**
**Wendell C. Mohr, Editor**
Gem, Lapidary, & Mineral Society of Montgomery County, MD, Gaithersburg, MD (EFMLS)

**9. *The Post Rock*10/09**
**Sara Murphy, Editor**
McPherson Gem & Mineral Club
McPherson, KS (RMFMS)

**10. *The Roadrunner*, 5/09**
**Lola Lamb, Editor**
Big Spring Prospectors Club
Big Spring, TX (SCFMS)

## Small Bulletins, Honorable Mention

***The Rockfinder*, 11/09**
**Tom Noe, Editor**
Michiana Gem & Mineral Society. South Bend, IN (MWF)

***The Rockhound Gazette,* 3/09**
**Daleene Caldwell, Editor**
Stillwater Mineral & Gem Society
Stillwater, OK (RMFMS)

***Rock Lore,* 9/09**
**John L. Dolde, Editor**
St. Louis Gem & Mineral Society, St. Louis, MO (MWF)

***Rock Talk*, 3/09**
**Jessica Thomson, Editor**
Southern Maryland Rock & Mineral Club
Waldorf, MD (EFMLS)

***The Shawnee Slate*, 7/09**
**Llewellyn Allspach, Editor**
Shawnee Gem & Mineral Club, Shawnee, OK (RMFMS)

***Rock Chatter,* 12/09**
**Eric Brosius, Editor**
The Rock & Mineral Club of Lower Bucks County, PA
Levittown, PA (EFMLS)

***Bulletin of Mineralogical Society of Southern California*, 5/09**
**Shou-Lin Lee, Editor**
Mineralogical Society of Southern California
Whittier, CA (CFMS)

**From: A.F.M.S. Newsletter, Volume 63, Number 7 - June - July 2010, http://www.amfed.org/news/n2010_06_Updated.pdf.**

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# M.W.F. NEWS

## LIVINGSTON METEOR FALL

**by Dan Trocke, Badger Lapidary & Geological Society, Inc.**

Just a quick update on the Livingston Meteor Fall. I stumbled across a relatively new webpage (link below) that generously shares a very detailed strewnfield map that pinpoints the locations of about 50 meteorite finds, and shows better resolution radar images than I had seen before. The site offers some good analysis of why the meteorites ended up where they were found and suggests some promising locations to continue the search. If you have any interest in this meteor fall, I'm sure you'll appreciate this website. http://www.meteoritesusa.com/meteorite

**From: MWF News - September 2010 - ISSUE NO. 494, www.amfed.org/mwf.**

# How Gems are Classified

**by Donald Clark CSM**

There is one curious fact that permeates gemology, nothing is ever simple and straight forward. For every principle or example put forward, there is always an exception to be found. When it comes to classifying gems, there are several ways of doing it. Each method has its own purpose, so that is simple, but each method also has its exceptions to pay attention to.

**Precious and Semiprecious**

A couple centuries ago the terms "Precious" and "Semiprecious" gems came into common use. There are so many exceptions to this classification, that it no longer has any value. For example diamonds have always been considered precious gems, yet there are diamonds that sell for $100 a carat. You can see them, (with sufficient magnification,) as accent stones on inexpensive jewelry. On the other hand there are garnets that sell in excess of $1,000 a carat. Garnets have traditionally been considered semiprecious gems, but some of them are worth more than ten times what a low quality diamond is.

These terms are still used occasionally, but they are frowned upon. The U.S. Federal Trade Commission, (which sets legal definitions,) has considered making it illegal to use them because they can be deceptive. If you want to appear professional and well educated you should eliminate them from your vocabulary.

**Diamonds and Colored Stones**

Gems can be divided into two categories, "Diamonds" and "Colored Stones." This is due to the extreme hardness of diamond. It takes special tools to cut diamonds that aren't suitable for cutting colored stones, and the reverse is also true. (As usual, there are a few exceptions to this.)

There are also differences in the mining and distribution of diamonds. They are the one of the few gems that has a consistent supply. The marketing is monopolized, which is also different from all other gems.

From this perspective a blue diamond is still a diamond, it is not a colored stone. A colorless sapphire or topaz would be classified as a colored stone. In spite of the wording there are only two categories, diamonds and everything else.

**Natural and Man Made**

There are a couple of terms commonly used for gem material that is created in a laboratory. "Synthetic" refers to materials that duplicate their natural counterparts. Emerald, sapphires and spinel are common synthetics.

"Homocreate" materials have no counterpart in nature. This category includes the synthetic garnets, GGG and YAG. Cubic Zirconium was long thought to be a synthetic, but tiny crystals have now been found in nature. (They were not large enough to be used as gems.)

While natural and man made materials can share the same physical and optical properties, there are still considerably differences, the main one being rarity. A natural gem takes considerable time to form and is usually millions of years old. Plus, many feel they have aesthetic qualities not found in mass produced materials.

While natural and man made materials appear nearly identical, their values vary considerably. For this reason it is important to be able to distinguish between the two.

It is also worth pointing out the definition of an "imitation." Anything that is posing as something else is an imitation. For example, a white topaz

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posing as a diamond is an imitation. A CZ, described as a Cubic Zirconium, is not an imitation.

**Organics and Inorganics**

Another approach is to separate gems into organics and inorganics. Organic gems are those whose creation is associated with living organisms. Amber begins life as tree sap and pearls are created inside an oyster. Hence, they are classified as organic materials.

Inorganic covers everything else. That "everything else" is primarily the mineral kingdom. Here one notable exception comes from the political arena. In the United States, the definition of a mineral includes the requirement that it is created in the earth. This has the weight of law so there is a certain amount of wisdom in accepting the definition, especially when advertising.

By requiring a mineral to be created in the earth, that puts lab made materials in a separate category. They may have identical chemical make up, physical and optical properties of their natural counterparts, but they can't legally be described as a mineral in the U.S. For purposes of study though, the properties of minerals are shared by lab grown crystals.

**Crystalline and Amorphous Materials**

Not all gem materials are crystalline. There are also amorphous materials that have no regular pattern to their molecules, no crystalline structure. Amber and opal are good examples of amorphous materials. Glass is also an amorphous material. Man made glass is used as an imitation gem, however there are natural glasses as well. They include obsidian and techtites like moldavite. It is important to note that amorphous materials can be both organic, as is the case with ivory and amber, or inorganic.

**Aggregates**

There are a number of requirements for crystals to form. Among them are the proper chemicals, heat, pressure, time and space. If the material cools off too quickly, or if there isn't space for the crystals to grow, you end up with an aggregate.

An aggregate will look much like an amorphous material, but internally it is composed of thousands of microscopic crystals. The most common example of this is the chalcedony family, which contains agates and jaspers. These are all members of the quartz family, so they have many characteristics in common. They will have the same density and same refractive index as a whole crystal of quartz, but considerably different appearance.

**Rocks**

Rocks are a mixture of minerals, where crystals and amorphous materials have a single ingredient. While not a gem material, granite is one of the most common and best known rocks. If you look at it carefully, you will see black, white and gray bits all bound together in a single material.

In the gem world lapis lazuli is the best known rock.

**Minerals**

Now we are getting into the heart of how gems are classified. The vast majority of gems are minerals. Mineral "species" are defined by a combination of their "chemical makeup" and their "molecular structure."

"Chemical makeup" refers to the atoms the mineral is composed of. Diamond has the simplest chemical makeup, with carbon being the only element present. Corundum is composed of just two elements, aluminum and oxygen. Its chemistry is

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expressed as $Al_2O_3$, meaning there are two aluminum atoms and three oxygen atoms in a molecule of corundum. The chemistry of other gems can get a lot more complicated. For example, tourmaline's chemistry is expressed as $Na(Li,Al)_3Al_6B_3Si_6O_{27}(OH)_3(OH,F)$.

"Molecular structure" refers to how the molecules attach to each other. While you can't see the individual atoms, you can see the result of how they attach to each other in whole crystals. Diamonds form crystals that look like two pyramids attached at their bases. Quartz forms elongated crystals with six sides.

This is a result of the molecular structure. It's as if you had two sets of tiles to work with. Those with four sides will form one kind of design, others with six sides form an entirely different set of designs. The two styles can't be fit together, six sided tiles and four sided tiles are different systems.

These two elements, chemical make up and molecular structure, must be taken together when defining a mineral. The best example is comparing diamond and graphite. Graphite is used in pencil leads. It is very soft and black. Diamonds are the hardest substance in nature and colorless.

Both diamonds and graphite have the exact same chemical makeup, being pure carbon. It is only when you add the second element of molecular structure that you can show how they are different. Conversely, you will find that several minerals share the same structure, then it is the chemistry that defines them.

**Species and Varieties**

It is important to note that we are discussing pure minerals. In nature it is common for a mineral to have impurities. These are present in very tiny amounts, usually 3% or less of the crystal by weight. They aren't considered to change the primary chemistry, so they don't change the name, or species, of the mineral. However, they do change some of the mineral's characteristics so we come up with a subclassification called a "variety."

While impurities don't make a significant difference in the chemistry of a mineral, they can make a significant difference in its appearance and this can have a considerable effect on its value.

A pure mineral is usually colorless and it is the impurities that give it color. An excellent example is corundum. In its pure form it is completely colorless. Add a bit of chromium and we call it a ruby, a bit of titanium and iron and it becomes a blue sapphire. Pure beryl is also colorless. Add a touch of chromium and you have an emerald, a bit of iron and you get an aquamarine. Just a tiny bit of these impurities and a mineral suddenly becomes exceptionally valuable!

Corundum and beryl are called "mineral species." Their colored versions are "varieties." Another very common species is quartz, which has the varieties of amethyst, citrine and smoky quartz.

Now there always has to be an exception or two, so here we go. Not all minerals are colorless in their pure state. Garnet is one of the most obvious examples. Also, there are several species of garnets as well as varieties. Garnets all share the same structure and a lot of similarities in their chemical make up. However, they do have variations in chemistry and, with each variation of chemistry, we have a new species.

The following example is not up to scientific standards of accuracy, but it will help to illustrate how garnets vary. Look at your hand and consider it to be a model of a garnet molecule. All garnets will have the same structure, the shape of your hand, and pretty much the same chemistry. The last joints of your fingers represent separate atoms. While most of the atoms remain the same, different atoms can reside in those places. If you change

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the atoms, (the chemistry,) you change the species, that's the rule. However, you can see that the shape of your hand hasn't changed shape, nor have any of the other basic characteristics. Hence they are still garnets.

Common red garnets are either almandine or pyrope. However, the purest almandine garnet ever found contains 80% almandine and 20% pyrope. The opposite is also true, the purest pyrope contains 20% almandine. (It is actually more complicated than this, with a small percentage of other garnet species involved.)

When a gemologist needs to put a name on a garnet, they will call it by the component that is in the majority. As you can see, this is not always a clear distinction. If the purest pyrope garnet ever found is only 80% pyrope, then there are a lot more that are closer to being only 50% pyrope. For most garnets, it is best to describe them simply as almandine/pyrope.

There are some garnet blends that take on a distinct set of characteristics. A good example is a rhodolite garnet. A rhodolite is approximately 70% pyrope and 30% almandine. What makes it distinctive is its purple coloring. (Remember the two major components are red, hence the purple is distinctive.) This quality is distinct enough that rhodolite is considered a variety of garnet. Not necessarily of pyrope, but simply a variety of garnet.

**Series and Blends**

As mentioned above, garnets are never found in their pure state, but always in combination with each other. For example, most of our gem grade garnets are in the almandine - pyrope - spessartite series. Almandine, pyrope and spessartite are individual species of garnet and they are always found together. The element that makes up the majority is the one whose name is given to the gem. This kind of blend, (always having almandine, pyrope and spessartite together,) is called a solid state series. The feldspar minerals also form in a series like this.

**Mineral Groups**

Minerals are also classed as groups. This is more important to the mineralogist than the gemologist, but it helps to know the terminology. The two fields overlap and the terms show up in gemological text books from time to time.

The garnet group would contain the three species mentioned above, (almandine, pyrope and spessartite,) plus hydrogrossular, kimzeyite, goldmanite, schorlomite, knorringite, yamatoite, andradite and uvarovite. Of these later additions, only the last two are gem material.

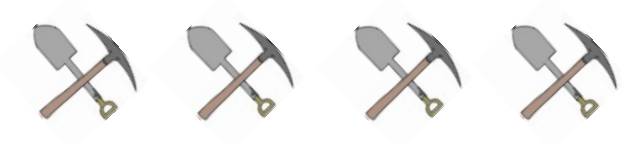
A similar situation exists for the tourmaline and feldspar groups. They have several members, but only a few are used as gems.

**Mineral Classes**

Minerals are also categorized by common chemistry. For example, all minerals that contain silica will be grouped as silicates. This kind of grouping isn't important to all gemologists, but you should at least know that it exists.

It is important to mineralogists, chemical gemologists and occasionally to the gem cutter. For example, if a lapidary is about to cut a gem for the first time, the best polishing compound is a mystery. If he knows what group the gem in question belongs to, it would be reasonable to start with compounds that work for other gems in that group.

**From: International Gem Society web page, http://www.gemsociety.org/info/igem8.htm, used with permission of the author.**



# MINERAL HABITS

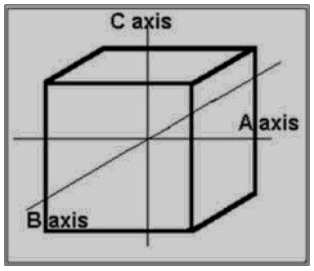
**by Donald Clark CSM**

Did you know that crystals have habits? No, they don't take up jogging or drink to excess. In crystallography habits refer to the way they form. When discussing the molecular structure of minerals it was mentioned that diamonds have four sides and quartz crystals have six. These are examples of "mineral habits" or "crystal systems."

There are six crystal systems. All minerals form crystals in one of these six systems. You may have seen more than six shapes of crystals, but they are all variations of one of these six habits.

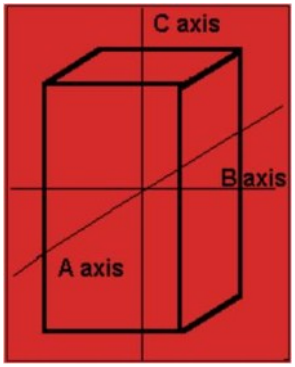
Each system is defined by a combination of three factors; how many axes they have, their lengths and the angles they meet. An axis is a direction between the sides. The shortest one is A, the longest one C. There is a B axis as well and sometimes a D axis.

**Isometric**



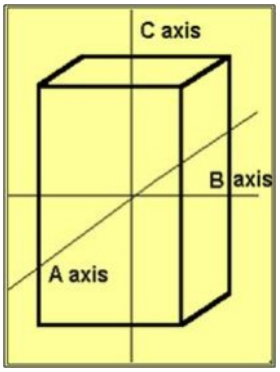

The first and simplest is the isometric or cubic system. It has three axes. They are all the same length and they all intersect at 90° to each other. Because of the equality of axes, minerals in the cubic system are singly refractive. That does not apply to any other crystal system.

**Tetragonal**



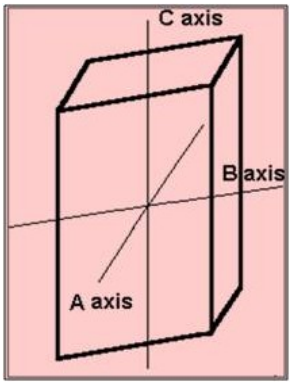

The tetragonal system also has three axes that all meet at 90°. It differs from the isometric system in that the C axis is longer than the A and B axis which are the same length.

**Orthorhombic**



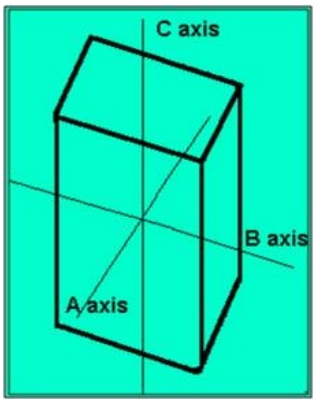

In this system there are three axes, all of which meet at 90° to each other. However, all the axes are a different length.

**Monoclinic**



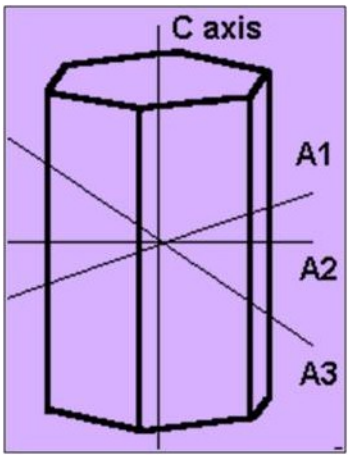

The above crystal systems all have axes sides that meet at 90°. In the monoclinic system all the axes are different lengths. Two of them, the A and C axes, meet at 90°, but the third one does not.

**Triclinic**




In this system all the axes are different lengths and none of them meet at 90°.

**Hexagonal**




The above represent every variation of four sided figures with three axes. In the hexagonal system we have an additional axes, which gives the crystals six sides. Three of these are equal in length and meet at 60° to each other. The C or

*(Continued on page 11)*

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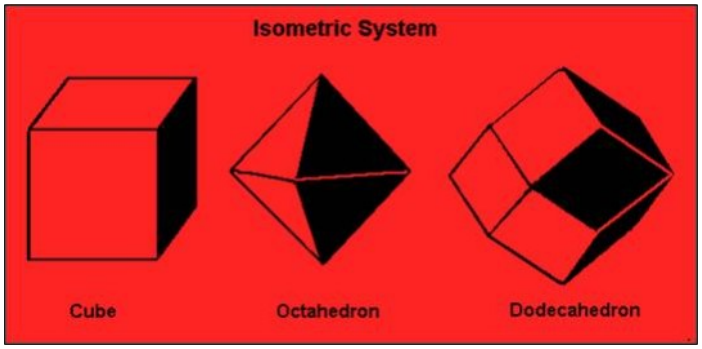
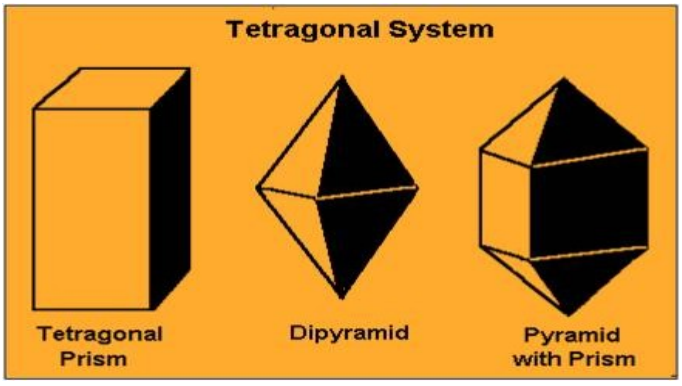
vertical axis is at 90° to the shorter axes.

Mineralogists sometimes divide this into two systems, the hexagonal and the trigonal, based on their external appearance. However, for purposes of gemology, the above six categories are sufficient.

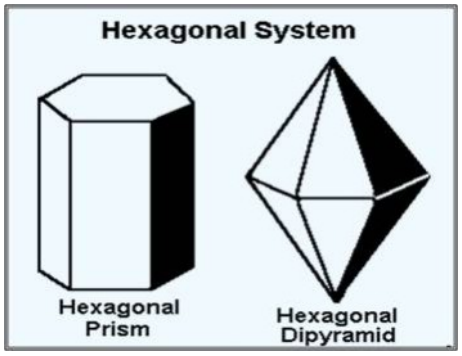



Minerals that form in the isometric system include all Garnets, Diamond, Fluorite, Gold, Lapis Lazuli, Pyrite, Silver, Sodalite, Sphalerite, Spinel.

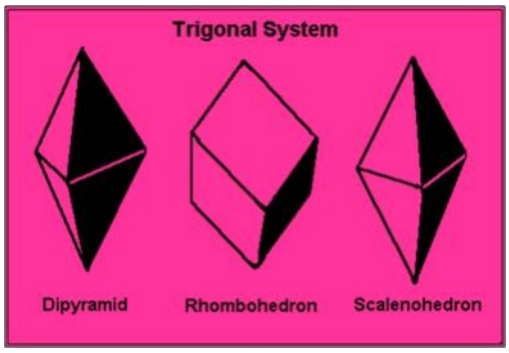
Minerals that form in the tetragonal system include Apophyllite, Idocrase, Rutile, Scapolite, Wulfenite and Zircon.



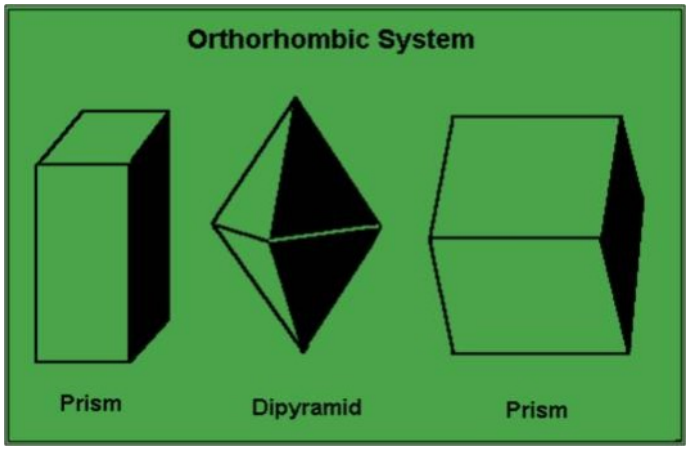

Minerals that form in the hexagonal system include Apatite, Beryl, (aquamarine, emerald, heliodore and morganite,) Taaffeite and Zincite.




Again, the trigonal system is a subsystem of the hexagonal. Most gem references will list these as hexagonal.

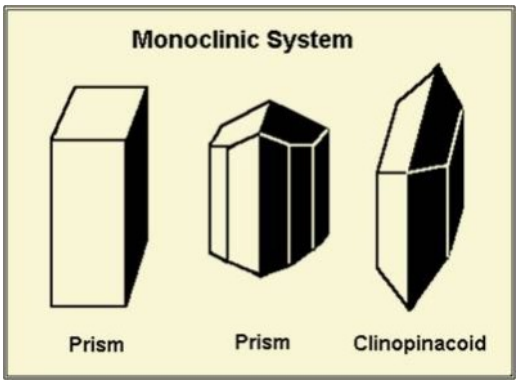



Minerals that form in the trigonal system include all varieties of Quartz, (agates, aventurine, chalcedony, jasper, tiger eye, citrine, amethyst, etc.,) Benitoite, Corundum, (rubies and sapphires,) Hematite, Rhodochrosite and Tourmaline.




Minerals that form in the orthorhombic system include Andalusite, Celestite, Chrysoberyl, (including alexandrite,) Cordierite, (Iolite,) Danburite, Epidote, (except zoizite, includes tanzanite and thulite,) Enstatite, (Hemimorphite,) Fibrolite/ Sillimanite, Hypersthene, Olivine, (Peridot,) Sulphur, Topaz and Zoisite.

Minerals that form in the monoclinic system include Azurite, Brazilianite, Crocoite,

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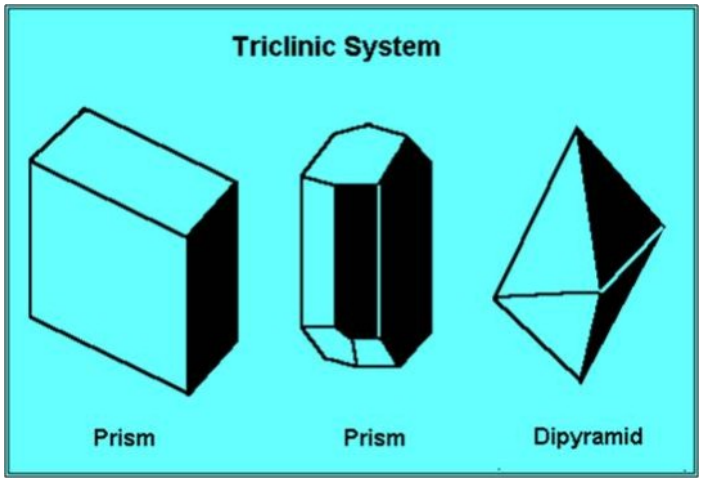
Datolite, Diopside, Jadeite, Lazulite, Malachite, Orthoclase Feldspars, (including albite moonstone,) Staurolite, Sphene, Spodumene, (including Hiddenite and Kunzite.)




Minerals that form in the triclinic system include Amblygonite, Axinite, Kyanite, Labradorite, Microline Feldspar, (including Amzonite and Aventurine,) Plagioclase Feldspars, (including Labradorite,) Rhodenite and Turquoise.

**From: International Gem Society web page, http://www.gemsociety.org/info/igem9.htm, used with permission of the author.**

## INDIANA STATE STONE
## SALEM LIMESTONE

**By John L. Dolde**

The Mississippian Age Salem Limestone, which is quarried in the state of Indiana for dimension stone has been used world-wide as a high quality building material. This use is due to the distinct properties that the stone possesses. These properties include very high compressive strength (>4000 psi), a very high modulus of rupture (>700psi), and a very high resistance to failure caused by high winds (>1000 psi). This limestone is a chemically pure stone and averages 97% $CaCO_3$ and 1.2% $MgCO_3$ and is classified as a chemical stone. It is for these reasons that this stone has been used in some of the most famous buildings in the world.

**The Empire State Building façade is covered with Salem Limestone from Indiana. Photo by Jiuguang Wang. From: Wikipedia, http://en.wikipedia.org/wiki/File:Empire_State_Building_from_the_Top_of_the_Rock.jpg, Photo used in accordance with Creative Commons license.**

Some of the most notable structures built that incorporate this limestone are the Empire State Building in New York City, The Pentagon, and the U.S. Holocaust Memorial and Museum in Washington, D.C. Additionally the Indiana State House is constructed of the Salem Limestone. More recently in 1997 repairs to a damaged spire of the Cathedral of

**The Pentagon, Washington D.C. is constructed of Indiana Limestone. DoD photo by Master Sgt. Ken Hammond, U.S. Air Force, as *a work of the U.S. federal government, the image is in the public domain.***

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the Immaculate Conception in Denver, Colorado were performed utilizing this building material. Pieces of the original spire were removed from the structure following a lightning strike which caused major damage and shipped to an Indiana quarry for replication and subsequent reinstallation at the cathedral.

The Salem Limestone was officially declared the Indiana State Stone on March 1, 1971 by Indiana Code: IC 1-2-9-1, Sec. 1. The regal type rock "Limestone" which is found and quarried in south and central Indiana from the geologic formation named the Salem Limestone, is hereby adopted as the official stone of the State of Indiana (Formerly: Acts 1971, P.L.3, SEC.1.).

**References:**

Indiana State Stone: Limestone, State Symbols USA, 2010 http://statesymbolsusa.org/Indiana/Stone_limestone.html

Hill, John R., Indiana Limestone, Indiana Geological Survey, 2010 Indiana University.

Romano, Michael. "CATHEDRAL SPIRE AWAITS INDIANA ROCK RECTOR EXPECTS REPAIRS FINISHED BY CHRISTMAS.(Local)." Rocky Mountain News (Denver, CO). Thomson Scientific, Inc. 1997. *HighBeam Research.* 1 Sep. 2010 <http://www.highbeam.com>.

## GEODES: A LOOK AT IOWA'S STATE ROCK

**By Brian J. Witzke**

Iowa geodes have long been objects of curiosity, their sparkling interiors containing some of the most beautiful crystals to be found anywhere in the Midwest. Although geodes are known from many localities around the world, one of the most productive and famous collecting regions is encompassed within a 35-mile radius of Keokuk, Iowa. Rock collectors commonly refer to geodes from this region as "Keokuk geodes." In keeping with the world-renowned status of the Iowa geodes, the Iowa General Assembly declared the geodes as the official "State Rock" in 1967.

**Keokuk geode with calcite crystal on interior walls, from the collection of John L. Dolde. Photo by John L. Dolde, 2008.**

The word "geode" is derived from Latin meaning "earthlike," a reference to their rounded shape. Most Iowa geodes are roughly spherical, often lumpy or cauliflower-like in external form, with diameters typically ranging between about two and six inches. However, specimens up to 30 inches are known. The most prized geodes have hollow interiors, although many geodes are solid objects in which crystal growth has filled most or all of the interior volume. Although the distinction may seem subtle, it is important to contrast geodes with other crystal-lined cavities or "vugs." Geodes differ from vugs in possessing an outer mineral layer which is more resistant to weathering than the host rock. As such, complete geodes commonly weather

**Keokuk geodes, from the collection of John L. Dolde. 1-1/2 " to 6'. Photo by John .L. Dolde, 2008.**

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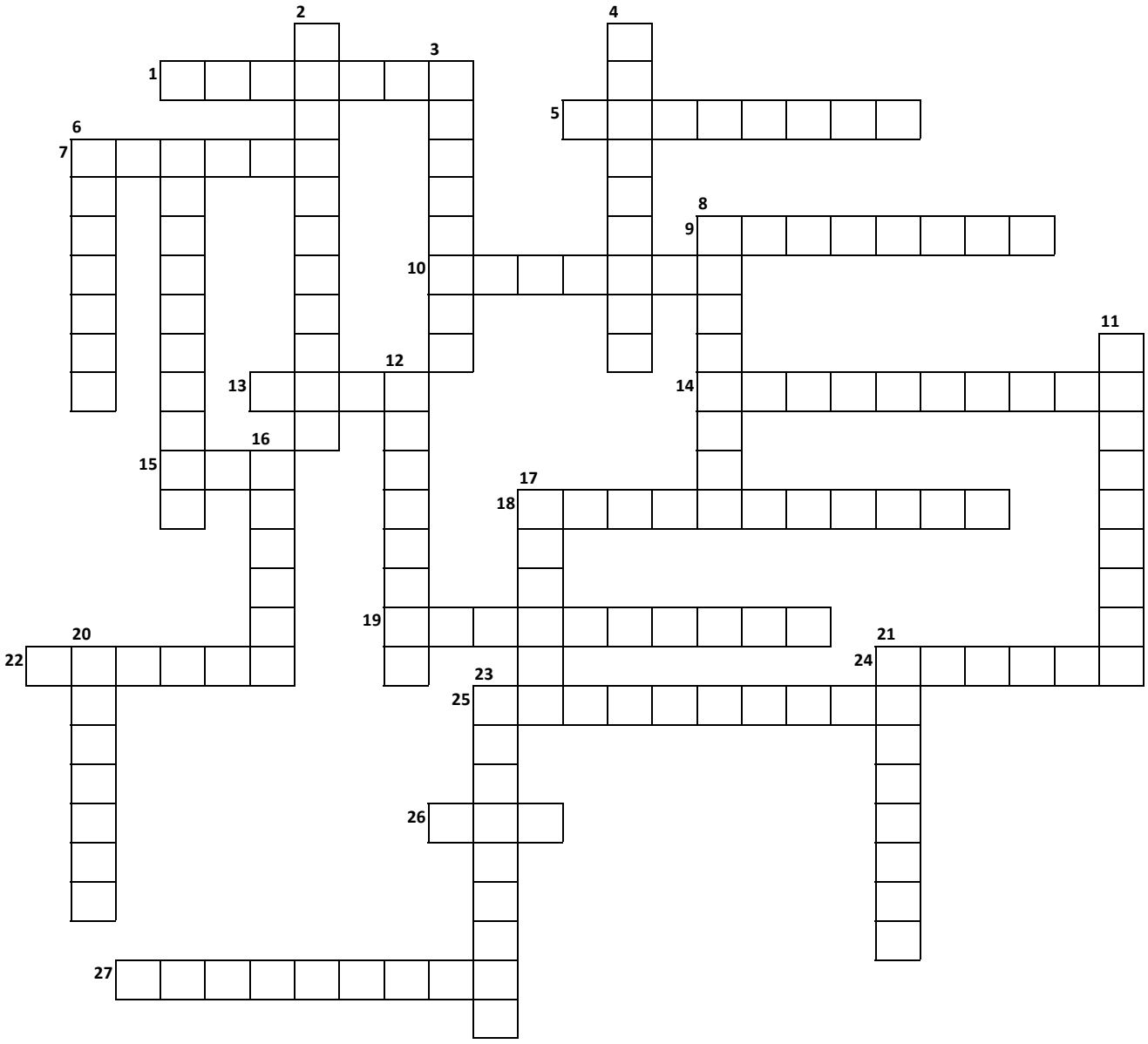

## Across

1) Rock created from a melt.

5) $Fe^{2+}TiO_3$

7) Missouri State Mineral and ore of Pb.

9) Mineral commonly used as a flux in smelting steel.

10) $Cu_3(CO_3)_2(OH)_2$

13) Common mineral in granite.

14) Principal or of the metal zinc.

15) Metal derived from processing of cassiterite.

18) Ore of silver and antimony.

19) Rock formed from detrital or chemical processes.

22) Dark black variety of tourmaline.

24) Common name for Sodium Chloride

25) California State Rock.

26) Cavity where mineral crystals may form.

27) Mineral name for Lodestone.

## Down

2) Formed by intense heat and pressure.

3) Quartz and Feldspar are this kind of mineral.

4) Nickel sulfide

6) Crystalline igneous rock formed from magma.

8) Most common mineral in the Earth's crust.

11) Silica poor mineral, $(Na,K)AlSiO_4$

12) Color caused by Fe residing in crystal lattice.

16) Also known as "Devil's Copper."

17) Iron sulfide also known as "Fools Gold."

20) Primary constituent of limestone.

21) Non-magnetic ore of iron.

23) Large crystals can form in this type of solution.

*(Continued from page 13)*

out of rock exposures and accumulate in stream bottoms. Crystal-lined vugs would not weather in such a manner.

Geodes from the Keokuk area contain a variety of minerals, but quartz is dominant in most. Quartz is silicon dioxide, the primary mineral in ordinary sand. Beautiful transparent to white quartz crystals cover the walls of many geode cavities. These crystals become larger and fewer in number towards the center of the geode, and terminate in characteristic pointed hexagonal pyramid shapes. Microcrystalline quartz, or chalcedony, whose component crystals are too small to be seen with the naked eye, forms the outer shell in all "Keokuk geodes." Chalcedony layers also encrust the interior walls of many geode cavities, covering the surfaces of the earlier-generation quartz crystals in a variety of colors, including white, gray, blue, yellow and orange. Calcite is a common and attractive calcium carbonate mineral in many geodes, which occurs in a variety of crystal habits and colors. An additional 17 minerals have been identified in "Keokuk geodes." Some of the more noteworthy include: kaolinite, a white clay mineral; dolomite in saddle-shaped crystals; pyrite or fool's gold, an iron sulfide; and sphalerite, a blackish zinc sulfide.

**Large Keokuk geode, ~6 inches in diameter from the collection of John L. Dolde. Photo by J.L. Dolde, 2008.**

**Keokuk geode with quartz lining on interior walls, from the collection of John L. Dolde. Photo by J.L. Dolde, 2008.**

Iowa's renowned "Keokuk geodes" can be found in specific stream drainages and excavations in parts of southeastern Iowa (especially in Lee, Henry, and Van Buren Counties), including the area near Geode State Park. Most geodes are derived from strata of the lower Warsaw Formation, a widespread rock unit of Mississippian age. Muds deposited in a shallow sea about 340 million years ago were primarily calcium carbonate and clay, and were subsequently lithified to form the shales, shaley dolomites, and limestones that we see today. Fresh geodes can be dug out of exposures of the lower Warsaw Formation, where they are concentrated in certain layers. Where water and streamflow have eroded these strata, concentrations of geodes may accumulate in stream channels. Although the bulk of Iowa's geodes are derived from the Warsaw Formation, geodes also are known from other formations of Devonian and Mississippian age at scattered localities in eastern and central Iowa.

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The origins of geodes have vexed geologists for a considerable time, and many hypotheses have been put forward. The most recent geologic research, however, agrees on three general points: 1) Geode precursors were concretions (nodules formed by outward growth around some nucleus) which grew within soft, unlithified sediment. 2) The outer shells of these concretions were replaced subsequently by chalcedony. 3) The interiors of the concretions were dissolved, leaving a hollow space into which quartz crystals could grow. The composition of the original concretions is unclear, though geologists propose they were either limestone or anhydrite, a fairly soluble calcium sulfate mineral related to gypsum.

The minerals now seen inside geodes were transported in groundwater solutions and then precipitated as replacements of the geode walls or as crystalline growths within their hollow interiors. The ultimate source of the mineralizing waters remains speculative. Many common geode mineral, especially quartz, are only weakly soluble. Therefore, substantial volumes of water had to migrate through the lower Warsaw strata to precipitate the observed minerals.

Collecting geodes can be both fun and educational. Once you've located exposures of lower Warsaw strata or a geode-bearing stream course, all that's required is a little patience and a good bricklayer's or rock hammer. A sharp blow with a hammer is usually sufficient to crack open individual geodes, exposing their crystalline interiors to daylight for the first time. Remember that most geode-collecting localities are on private land, and permission must be secured before entering.

*Additional information is found in Horick, P.J., 1974,* The Minerals of Iowa: *Iowa Geol. Survey, Educ. Series 2, 88 p.*; *Sinotte, S.R., 1969,* The Fabulous Keokuk Geodes: *Wallace-Homestead Co., Des Moines, 292 p.*

Reprinted from *Iowa Geology 1987 No. 12,* Iowa Department of Natural Resources

**From: Iowa Geological and Water Survey, http://www.igsb.uiowa.edu/browse/geodes/geodes.htm**

## *THE GEOLOGIST'S LAMENT*

**By R. L. Frism 1940**

Gather 'round me, hear my story,
I'm a rockhound in distress
I'm a rockhound bathed in troubles
I'm an outcast, more or less.

I have fossils in the kitchen,
I have crystals in the hail.
I have minerals in the bathtub;
I have relics on the wall.

I have oxides on the carpet
I have oil upon the floor.
I have blacklight in the parlor
I have bones behind each door.

Attic rooms are fairly sagging.
Rocks pave the cellar floor,
Pockets bulge with gemmy pieces,
All of this and millions more.

Wifey thinks that I am goofy
I don't know, she may be fight.
She insists I have silicosis,
Or some contagious form of "ite"

Says my head is lined with agate
(A freak displacement of the bone),
Says my brain is just a nodule.
Says my heart is turned to stone.

Threatens me with separation;
Storms about our rockhound home,
Says life for me is just a geode
Or a hunk of mammal bone.

Are you rated as a fossil?
Are you obliged to live alone?
How do you maintain a hobby,
And still maintain a happy home?

Via the "Lodestar". Lodestar got it from 'lodestone", the publication of the Fort Collins Rockhound Club in Colorado. March 2001 edition. Via Gravel Gazette 10/01.

**From: 2008 SCRIBE CD**

## DINOSAURS — WHAT IS LEARNED FROM THEIR TRACKS?

**by Dee Grover**

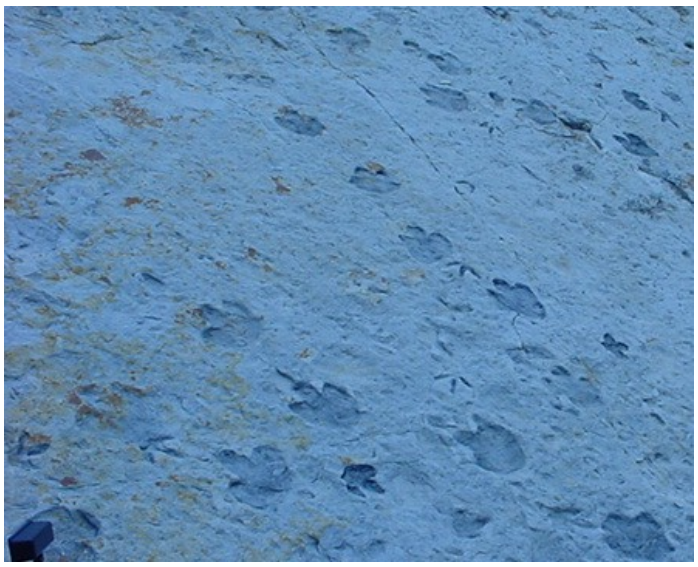
The tracks of dinosaurs, when associated directly with bones, can exhibit a very large bank of information about the animal that made the tracks. This is especially true if there is a series of tracks that display a walk, a jog, or running activity.

One example that tells us a fascinating tale is located 23 miles north of Moab, Utah. Following the directions provided by BLM to the parking area, we walked up a small hill and looked down into what appeared to be a dry streambed that was topped by a slate looking rock. Imprinted in the rock were 14 or 15 very deep tracks that were probably made by a huge four-footed dinosaur, said by paleontologists to be a *Brontosaurus.*

After about four steps the *Brontosaurus* suddenly made a sharp 90-degree turn and his prints disappeared under the banks of the stream bed. A turn of this magnitude is highly irregular for an animal of his (or her) size. Closer examination of the site reveals a very large theropod track which was made by an *Allosaurus.* The track was aimed at the left shoulder of the *Brontosaurus* at the point when the 90-degree turn was made. it is surmised by me that was the last step taken by the *Allosaurus* as he jumped upon the back of the *Brontosaurus* and had "Baby (giant) Rib Rack" for lunch.

Other tracks that are sited in areas that are completely trampled with hundreds of dinosaur tracks are described as "dinturbation." The proof in that is that some dinosaurs lived in packs. Evidence based mainly on tracks, also backed by bones, shows horned dinosaurs such as *Triceratops, Ankylosaurus,* and *Protoceratops* were gregarious as were herbaceous dinosaurs such as Brontosaurs, Iguanotids, and types of duckbills.

Some measurements can give ballpark figures of length, height, size and speed of the maker of the tracks. The length of the foot times four equals the



**Dinosaur trackway, Dinosaur Ridge, Colorado.. Photo by John L. Dolde, © 2006.**

hip height for smaller dinosaurs. And five and one-half times for larger ones. Length of stride can determine speed of the animal, provided the bone structure of the leg is known. If a step is shorter than four feet while walking and more than four feet while running, the speed will be 5- 10 kilometers per hour. The distance of the midpoints of the manus (front) and pes (back) foot strides equals the hip to shoulder measurement and gives a good estimate of the size of the animal.

Some slender, long-legged dinosaurs such as *Coelophysis* could probably attain speeds of 40-4 5 kilometers per hour. Huge dinosaurs such as *Titana-*

*(Continued on page 18)*

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*saurus* could probably only move 5 kilometers per hour as he shook the earth in his walk. Speed can be judged by the angulation (angular deflection of the foot from the center line of both feet as they move) of the tracks and the length of the steps and strides. Studying modern animals has helped in this study. Migration has been proved by the discovery of tracks of disabled animals or those with missing digits which have been tracked intermittently for many miles. Probably they were in search of food or traveling to breeding/nesting grounds.

(Dee Grover, and FGMS Ichnoloist, wrote this article for *Lithosphere 6/00,* via THE GLACIAL DRIFTER 1/01)

via T-Town Rockhound 11/01

**From: 2008SCRIBE CD**

## Rockhounding Clues & Tips

**By C. E. Johnson**

There are many clues out there in the field to guide us, so we just need to know what they are and what they mean, and of course we need to be observant and curious, or we will be just wasting our time.

Assuming that we are already out there in the field, anything that appears uncommon or odd such as rust or stains, sudden changes in color of rock or its grain-size, or differences in compositions, may be worth investigating closely, for instance, rust or stains could be oxidation" products of mineral deposits containing one or more metal-bearing minerals such as those of iron, copper, lead, zinc, uranium, tungsten, manganese, nickel, cobalt, molybdenum, bismuth, and silver (in the form of a chloride). Metal-bearing deposits, of course, indicate a mineralized area, so whether or not you are interested in the metals, such an area is very much worth investigating for other types of minerals. However, even many of those metallic minerals often occur in very attractive forms, whether beautifully crystallized or not.

Sudden changes in color of a rock formation could mean "segregations" or "differentiations" of some of the rock's "accessory" minerals (which are more desirable or valuable than the usual common "rock-making" minerals), or "hydrothermal" alteration of parts of the rock formations (which is a good indicator of mineralizing solutions in the area). Any increase in texture or grain size of an intrusive igneous rock formation such as one of the granite family, would be especially encouraging for several reasons.

Because one or more of the rock's "accessory" minerals would be especially valuable in larger sizes; and such rock formations often breed "pegmatites", which are always very much worth exploring because of their very special valuable minerals typically occurring in very large sizes, and often very well crystallized. Of course, probably most of us are familiar with quartz or calcite "vein" material, and the significance of it.; and the presence of certain "indicator" minerals, and other clues are always a plus, but I can't include them all in this article.

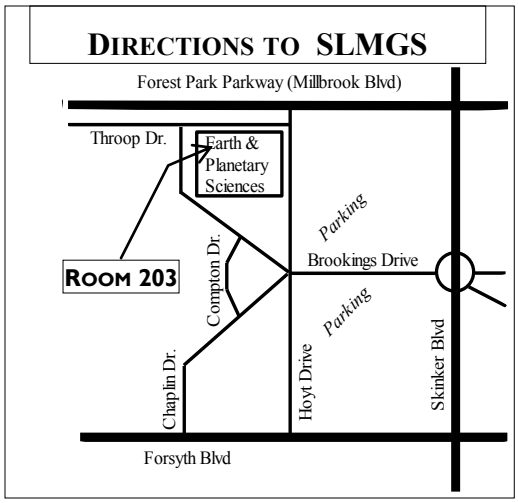
Lava flows with many cavities (or "bubble-holes"), are fairly obvious, and they are often happy-hunting-ground for agate material and zeolite crystals, etc. Our best clues are rock formations, to begin with, if we are familiar with them, because areas can be chosen before leaving home, simply by using geologic maps, which describe the types of rock formations shown in any particular area. However, with or without a geologic map, the usual clues as shown above are standard procedure for rockhounds and prospectors.

*(Continued on page 19)*

## UPCOMING EVENTS

### SEPTEMBER

**3: St. Louis, MO. St. Louis Mineral and Gem Society Meeting,** Washington University campus, Earth & Planetary Science Building on Hoyt Drive, room 203, at 7:30 PM.




**10-12: Greenfield, IN.** 500 Earth Sciences Club's 34th Annual Show; Hancock County 4-H Fairgrounds, Apple St.; Fri. 10-8, Sat. 9-7, Sun. 10-4; Contact: Don Mahoney, 17914 Juniper Rd, Argos, IN 46501, (574) 892-5264.

**11-13: Toledo, OH.** Toledo Gem & Rockhound Club's 38th annual show; Stranahan Complex, 4645 Heatherdowns Blvd.; Fri. 2-8, Sat. 10-6, Sun. 11-5; CONTACT: Jerri Heer, 247 Decatur, Toledo, OH 43609, (419) 531-8124; e-mail: jheerx6@aol.com; Website: toledogemandrockhounds.com.

**17-19: Lincoln, MO.** Mozarkite Society of Lincoln, Inc.'s 51st Annual Show & Swap; Lincoln City Park, Shelter House; Fri. 8-5, Sat. 8-5, Sun. 8-5; Contact: Ted Bolich, 1201 S. 7th Street, Clinton, MO 64735, (660) 890-4983.

**24-26: Joplin, MO.** Tri-State Gem and Mineral Society's 12th Annual "Rock-a-thon" Gem and Mineral Show, Joplin Museum Complex, 504 Schifferdecker Ave.; Fri. 9-6, Sat. 9-6, Sun. 9-4; CONTACT: Chris Wiseman, jmccwiseman@sbcglobal.net.

***For more show listings check out the Rock and Gem Magazine website at: http://www.rockngem.com/showdates.asp.***

*(Continued from page 18)*

We always have rock formations wherever we go, and the types of formations determine whether or not any of the above clues will exist in any given area; and what those clues will be and what minerals to expect, so learning enough about rocks and minerals to be able to use geologic maps as a very valuable tool is of course the best approach to rockhounding and prospecting, and I highly recommend it.

This and your usual visits to the usual pay-to-dig collecting sites complement each other perfectly. There are many potential areas out there, and geologic maps are a great help in choosing which areas are favorable for which type of minerals before leaving home, and of course, will guide you in the field.

It's not necessary, of course, to be familiar with rock formations to explore for minerals, but if you are naturally curious and you enjoy exploring, at least do yourself a favor and take samples and make notes of those curious-looking areas while traveling to & from those pay-to dig collecting sites, and find out what your rock samples are and what relationship they may have with what kinds of minerals. Surely there's someone in your community that you can ask about it, at schools or libraries, universities or colleges, local U. S. G. S. Offices, or Bureau of Land Management, or forestry service offices, etc.

Happy hunting!

**From: 2008SCRIBE CD**

**John L. Dolde, Editor**
**936 South Second Street**
**Festus, MO 63028-2007**

**John L. Dolde, Editor**
**936 South Second Street**
**Festus, MO 63028-2007**

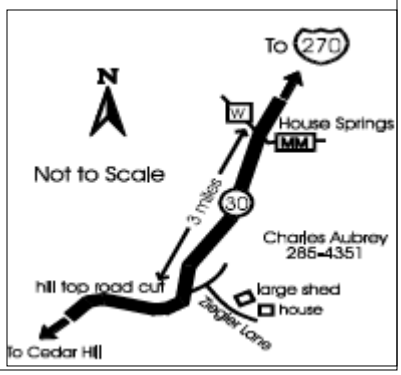
## *Rock Breaking Party*

**WHAT:** The annual "rock breaking party" where we break, sort and otherwise prepare the rock & mineral specimens for the rockhound starter kits given out at the Club's November Show.

**WHEN:** Saturday, October 2, 2010 beginning at 10:00 AM. Things usually wrap up by around 4:00 PM. You don't have to be there right at 10:00 AM, and you don't have to stay all day. Whatever time you can spare is appreciated.

**WHERE:** The rocks are stored and the "party" is held at the property of Connie Aubrey, mother of former club member Serena Crisp.

**DIRECTIONS:** Take I-270 to Route 30 (Gravois Rd.). Proceed south on Route 30 about 20 miles, to House Springs (the intersection of Route 30 with Highways W and MM). Stay on Route 30 about another 3 miles. Just as you crest a hill passing through a large road cut, turn left onto Old Hwy 30. Within about 100 yards, branch right, onto Ziegler Lane (gravel road). This road works its way up a hill. After about another 100 yards, set back on the left side of the road, you should see the large, tan, metal storage building where the "party" takes place. A steep concrete driveway also branches there, which goes up the hill to Connie's house. Don't go up the concrete drive – turn left just before that, and you're there!




**DETAILS:** Bring your goggles, gloves, heavy rock hammer, chisels, and energy. You may pack a picnic lunch and beverages, or there are fast food facilities back in House Springs.