

GEM & MINERAL JOURNAL

Volume 18 Issue 11
December 2009

Presidents Message:

Hello To All,

Well another busy year is coming to an end. We had a year full of field trips, Festivals, workshops, monthly meetings and programs.

Speaking of programs, we will need to nominate a first Vice-President for the upcoming year. Meeting nights would be boring without a planned program, don't you agree? The Club needs someone to step up and fill this office. You can count on getting help with lining up programs from the members and other officers. I know that everyone knows someone that is willing and able to give us a demonstration on a rock related subject that is interesting to rock hounds. We love to see new places to collect or jewelry displays or a new idea on what to do with rocks and minerals. Put on your thinking caps and be creative.

As you may know, for the past three years, the GMSL has set up a large fluorescent mineral display at the Salem Gem & Mineral show the weekend after Thanksgiving. This year we were contacted on the day before Thanksgiving and asked if the Club could take a four table sales booth in the center of the arena and display items for public sales. A lot of volunteers stepped up and made it a successful event. I would like to thank all of you for the hard work and effort you put into this great opportunity. As a token of the Clubs' appreciation, there will be a drawing for several prizes for all the volunteer workers at the December 16th meeting. While at the Salem G&M



Show we were able to buy some more equipment to use at our workshops. Included in the deal were 2- 10" flat lap capping machines, a 20" vibrating lap, a dual shaft 6" belt grinder and a Graves faceting machine. All came with plenty of accessories. These can be put to good use in the upcoming year.

Please remember to bring your favorite covered dish to the meeting to share with others during our Christmas potluck dinner meeting, Wednesday, December 16th. Also if you would like to exchange a rock related gift, bring a wrapped gift to be opened during the Dirty Santa gift exchange. This has been a lot of fun in the past. Also if you have a specimen or two that you found this year or have a specimen or two that you need to have identified please bring them to the meeting for bragging rights or identification. We all enjoy a good story about rock hunting.

At the end of the business meeting we will have elections for 2010 officers. Please come and support your club. I feel next year will be even better than the last. I hope to see you at the December 16th Christmas Dinner meeting. There will be plenty of time to visit and swap stories, so come on out and join us.

Keep Looking Down,
John Haskins

From the First VP:

NO ARTICLE SUBMITTED

Happy Holidays!

2009 ELECTED OFFICERS**John Haskins - PRESIDENT**

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JoAnn Mason &

Tom Powers

COMMITTEE**CHAIR PERSONS:****Field Trips-** David Callahan**Hospitality-** Anne Torning**News Articles-** Natalie Darling**Silent Auction-** Warren Darling**Special Events-** Dee Tinsley**Swap for Rocks-** Warren Darling**Website-** Alan Rice**Workshops-** Dave Woolley**FRA Adult Liaison-** David Murphy**Membership-** Ralph Torning

November Meeting Minutes

Meeting: Wednesday, Nov. 18th, at 7:00 PM.**Attendance:** 42 members and 9 guests**Hospitality:** Thanks to all who brought food for our refreshments. Anne Torning announced that she would be resigning as hospitality chair at the end of the year. We will need someone to fill this position.**On Time Drawing:** Dave Callahan, Jon Glass, JoAnn Mason, Tom Powers, Lloyd and Lucille Watson were all winners of donated prizes.**Old Business:** Officer nominations were open to the floor. The slate is as follows: President: John Haskins; 1st VP: Open; 2nd VP: Dave Callahan; Secretary: Brenda Glass; Treasurer: Frank Midkiff; Editor: Natalie Darling; Members-at-large: Tom Powers and JoAnn Mason. We are still looking for a suitable candidate for the first VP position. If you are interested or have a nomination please contact John Haskins or come forward at this months meeting.**First Vice President:** Not in attendance. John Haskins announced the program would be a video.**Second Vice President:** Dave Callahan announced upcoming field trips (all of which were cancelled due to weather conditions). He also had the sign up sheet for volunteers willing to help out at the Roanokeshow. Dave said there was a new field trip policy being put in place- **Anyone arriving late to the quarry or collecting site will not be allowed to collect that day.** It is imperative that everyone wishing to participate be present by the designated time for the safety briefing and hazard training. This policy will be strictly enforced.

Dave is planning to order the turn tables for all who ordered them, and money is due now. The order can not be placed until all money is received. The cost is less than \$4.00 each.

Treasures Report: Franklin Midkiff: Treasury balance is \$4533.21. Our profit from the Apple Festival exceeded \$1600.00. Thanks again to all who came out to help.**New Business:** Dave Woolley announced that there would be no workshops at his home during the months of November and December.

We will need to start on workshops early this spring to replenish our supply of bookends and other items to sell at next years festivals.

*Minutes submitted by
Natalie Darling, Editor*

The purpose of the Gem & Mineral Society of Lynchburg, VA, INC. is to promote education in The Earth Sciences including: Mineralogy, Geology, Gemology, Paleontology, and Crystallography

*The Gem and Mineral Society of Lynchburg VA, Inc.
Meets on the third Wednesday of each month,
From 7:00pm- 9:00pm
In the auditorium of the Parks and Recreation Building
301 Grove St. Lynchburg, VA 24501
Public is invited, Please join us!*

Programs

The program for the November meeting was a hobby related video.

Please join us for the December 16th, 2009 meeting as we close out another productive year of rockhounding with our annual holiday covered dish dinner. Bring along your family and a dish to share.

We will also play our famous "Dirty Santa" game. If you wish to play, please bring a **nice** wrapped hobby related gift. (About a \$10.00 value). Everyone with a gift can play the game. Please Note- this is not a game for sore losers or children who may not fully understand that just because you open something you really like does not necessarily mean you will get to keep it. But if all players contribute a fair gift, we should all go home with something nice. It's lots of fun, just wanted to make everyone aware of the rules prior to playing.



Everyone is also encouraged to bring along a specimen or two that needs identifying or just to brag about. If you found something interesting this year, please share the experience with us. Everyone does not get to go on all field trips, so don't assume that everyone has seen what you found.

Solar Turntable Offer

The solar turntable offer has been finalized.

I will be accepting cash or checks made out to GMSL at the December meeting. If you pay with cash, please have the correct change.

You know how many you signed up for, so please bring the correct cash or check. I will attempt to call everyone that signed up to confirm the quantities.

The cost will be \$3.65 each and that is based on the 330 units requested by the members.

Before I can place the order, I must have everyone's payment, as we must prepay for the order. Stragglers will hold up the ordering process for everyone.

Thank you for your cooperation.

David Callahan

Field Trip Report



*Field Trip Report submitted by
Dave Callahan,
Field trip chairman.*

For further information on field trips, contact David Callahan, 540-297-1853
Email dbc11@aol.com

Past Field Trips.

November and December have not been good months for field trips. Our November 14th trip to the Martin Marietta Quarry in Haw River NC was cancelled due to heavy rain in the area causing unsafe conditions in the quarry. We will reschedule the trip in the spring. Our December 5th trip to the Dale Quarry near Richmond was cancelled due to the potential of snow in the area. Again making unsafe conditions in the quarry and on the roads. The Dale trip will be rescheduled for February.



Future Field Trips

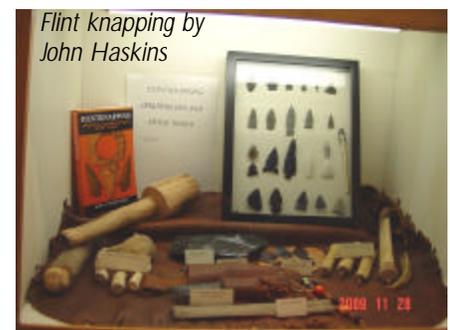
Nothing is finalized at this time for January, but there will be the possibility of a trip to the James Madison University Geology lab and museum. Information will be made available by the January Newsletter and at the meeting.

Pictures from the 2009 Roanoke Show held over Thanksgiving Weekend. Thanks to all members who offered the use of specimens and display items, and also to those who came out to help work in our sales booth or the fluorescent mineral display. It takes a lot of man-hours for a show this big, and all help is greatly appreciated.

Special thanks to Don McIntyre for submitting the pictures for all to enjoy.



*John & Nona Haskins and Dave Callahan.
Below and upper right: displays by John and Nona Haskins at the Roanoke Show.*



The steps of making a rock sphere (left) & the finished spheres made by our club members, from rocks collected on field trips.

The following, (which will be continuous through page 9) was written and submitted by club member/geologist Dave Woolley. I thought that printing it in it's entirety rather than over several months would make it much more enjoyable. Thank You, Dave for your continued support and dedication to our club.

ESSENTIAL CRYSTALLOGRAPHY The Six Crystal Systems + Refractive Indexes

All fragments of a particular mineral species will belong to one crystal system, have the same crystallographic axes, and share similar optical properties.

The Cubic Crystal System

Visualize a cube. Imagine lines drawn inside a cube such that each line touches the middle of two opposing faces; six faces, three lines. Note that the length of each line is identical and that the three lines meet at the center, angled 90 degrees from each other. These three lines or **Crystallographic Axes** make a practical presentation of the Cubic Crystal System. These three axes will also touch the six corner points of an octahedron: the cube and the octahedron are the two most common **forms** of the Cubic Crystal System. A form is dictated by the internal geometry of the atoms in the molecules of a crystal. There are several other Cubic Crystal System forms such as the dodecahedron, typical of garnet, the pyritohedron, with five edged faces sometimes seen in pyrite, and the tetragonal trisoctahedron, a rare form for garnet. Within the six Crystal Systems there are 48 possible forms. There are also numerous combinations of forms within each System such as a pyrite crystal as a cube with octahedral corners modified with tetragonal trisoctahedron faces, plus pyritohedron faces and pyritohedral striations on the cubic faces. Forms and outward appearances differ in response to environmental stresses during crystallization such as temperature, pressure, and contaminants. For example, crystallized in a number of unique environments in igneous, sedimentary, and metamorphic rock, more than 1,400 combinations of forms have been described for the mineral calcite. The appearance of a crystal can be aesthetically pleasing: a "perfect" fluorite cube is prized in many collections. A single example of fluorite, however, may be distorted beyond crystal-system-recognition if the build up of one side is more than the other due to the direction of flow of the solution from which the mineral crystallized, or if the crystal became crowded by adjacent crystals.

Indicatrix

Imagine the three Crystallographic Axes of a cube as being contained within a sphere. Refractive Index values can be represented by the length of the Crystallographic Axes; the greater the Refractive Index number, the longer the axes and the bigger the diameter of the sphere. This 'solid' representation of the Refractive Indexes by length of the Crystallographic Axes is called an **Indicatrix**. Thus the Indicatrix of fluorite would have a diameter of 1.434 unites, the representation of the Refractive Index of 1.434. Diamond would have a diameter of 2.407. A simple jeweler's Refractometer can be used to measure the Refractive Indices of transparent sample to assist with identification. An Indicatrix is very useful in visualizing a crystal, regardless of the crystal's form, the outline of a fragment, the orientation of a cut gem, or more importantly, to which Crystal System it belongs.

The Tetragonal Crystal System

Imagine the cube again. Lengthen one axis. By stretching the vertical axis and four vertical sides, a rectangle is created whose sides share two different length edges. The three Crystallographic Axes meet at right angles; one axis is longer than the other equal-length two. The Indicatrix, visualized within the rectangle for the Tetragonal Crystal System example, is a tall oval solid having a central section being a circle containing and being the diameter of the two equal length axes. For Zircon the height is 2.02 and the diameter is 1.92. The long axis represents the higher Refractive Index. That unique length axis is labeled the **Optic Axis**. If the Optic Axis was shorter than the other two, with a lesser Refractive Index value, that Indicatrix would be a short, stubby oval.

The Hexagonal [and Trigonal] Crystal System

If a third axis of the same length is added in the plane of the other equal length two of the Tetragonal System, and they are spaced at 120 degrees from each other, the rectangle becomes a six sided prism, a hexagon shape like a pencil. Again, the odd length axis at right angles to the plane of the equal length axes can be either longer or shorter in length. Since the three equal axes also define a circle, the Indicatrix is again an oval solid with a circular center section, similar to the Tetragonal Indicatrix. If the single axis, the Optic Axis, is longer it has the higher Refractive Index: if shorter with a lower Refractive Index, the Indicatrix becomes a short, squat oval solid. *As with the Tetragonal System, if the Optic Axis is longer than the other axes, the **Optic Sign** is "positive": if shorter the Optic Sign is called "negative".* Think + for positive and - for negative for showing the height of the Optic Axis of Tetragonal, Hexagonal, [and Trigonal] Crystal Systems. The Trigonal System emphasizes one end of each of the three axes, often producing a three sided prism or a three faced termination. Some sources consider the Trigonal a separate crystal system.

The Orthorhombic, Monoclinic, and Triclinic Crystal Systems

Imagine the Tetragonal three Crystallographic Axes. Take one of the two equal length axes and stretch it a little: the three unequal length axes still met at right angles.

The 'tetragonal rectangle' stretches to an 'orthorhombic rectangle' whose sides share three different length edges: the Orthorhombic Crystal System.

Tilt a plane containing any two Axes: the Monoclinic Crystal System.

Change the angle between the remaining two right angle Axes so that no angle is 90 degrees: the Triclinic Crystal System.

The Indicatrix of the orthorhombic, monoclinic, and triclinic crystal systems are also ovals with the following added characteristic. Where the tetragonal and hexagonal Indicatrix has a circle for a center section with one optic axis at a right angle to the circle, the orthorhombic, monoclinic and triclinic Indicatrix have an *oval* center section. This forces the Indicatrix for the final group to have two circular sections plus two Optic Axes tilted equally away from the **oval shaped center section**.

It is easy to visualize this Indicatrix as a solid oval with three different length axes presenting three Refractive Indexes. For example kyanite has three Refractive Indexes: 1.712, 1.720, and 1.728. Note that Crystallographic Axes and Optic Axes have different definitions: The Optic Axis and the "C" axis of tetragonal and hexagonal systems coincide. The Optic Axis and any of the Crystallographic Axes of orthorhombic, monoclinic and triclinic systems may not coincide.

Each advance from cubic to triclinic reduces the amount of symmetry possible making the study of symmetry reduction a way to help identify *near perfect* crystal samples of minerals. Optical measurements made with a Refractometer make mineral identifications much easier because any one crystal sample may be distorted, disrupting symmetry: the cutting of a gem often eliminates observable crystal symmetry. In addition to Refractive Indices the Refractometer provides the Optic Sign which allows the matching of R. I. numbers plus the O.S. to gem and mineral data lists that are available at locations including text books and the internet.

As in the cubic and subsequent crystal systems, an orientation that "looks" through a crystal and "sees" equal length axis at right angles to the "look" direction, has only one refractive index to be measured. Any "look" in a cubic crystal sees a circular section with one refractive index. That unique "look" orientation in tetragonal and hexagonal system crystals is oriented down the "C" axis; they each have only one Optic Axis and are therefore labeled Uniaxial. The Indicatrix for the final group of crystal systems have two Optic Axes, "two look" directions with circular sections, and that group is called Biaxial.

Minerals and gems are grouped in the following manner:

Isotropic: (Having optical properties the same in all orientations.)

Cubic

Anisotropic: (Having optical properties that vary with orientation.)

Uniaxial (Having one Optic Axis which coincides with the "C" Crystallographic Axis.) Tetragonal
Hexagonal [and Trigonal]

Biaxial (Having two Optic Axes that may not coincide with any Crystallographic Axis.)

Orthorhombic
Monoclinic
Triclinic

Naming and Orientation of Crystallographic Axes

Protocols have been developed for referencing the crystallographic axes of the various crystal systems as follows: The three identical axes of a cubic crystal are each called an "A axis". The two or three equal axes of tetragonal, hexagonal, [and trigonal] crystals are called "A axes" while the other longer (or shorter) axis is called the "C axis". The C axis is often pictured in a vertical position. For the remaining crystal systems the general convention is by length: $C < A < B$, or that the C axis is the shortest axis, with exceptions. The excepted minerals are due to crystallographic and optic requirements which will not be enumerated here; consult good mineralogy texts for the particulars. "Rock Forming Minerals" by Deer, Howie, and Zussman, is useful for the silicate minerals: find the "Introduction" volume if not the entire set. "The System of Mineralogy" Volumes I and II by Dana for the non-silicates, plus Volume III for quartz, are highly recommended. Various editions have been published by John Wiley and Sons, Inc.

Review

Isotropic: Cubic crystals have one Refractive Index but no Optic Axis or Optic Sign.

Examples: diamond, fluorite, garnet, sodalite, sphalerite, spinel,

Anisotropic:

Uniaxial crystals have one Optic Axis, two Refractive Indices plus an Optic Sign.

Examples: Tetragonal – rutile, sheelite, vesuvianite, zircon
Hexagonal – apatite, beryl, nepheline, phenakite, [and
Trigonal] – benitoite, calcite, corundum, quartz, tourmaline

Biaxial crystals have two Optic Axes and three Refractive Indices plus an Optic Sign.

Examples: Orthorhombic – andalusite, olivine, tanzanite, topaz
Monoclinic – epidote, sphene, spodumene, staurolite
Triclinic - axinite, kyanite, rhodonite, wollastonite

Sidebar: Dispersion

Dispersion is the breaking up of white light into component colors as it passes through a prism. Un-colored or lightly colored faceted gemstones act as multi windowed prisms that ideally breakup up light into bursts of colors. Generally, the higher Refractive Index the greater the dispersion. Thus a diamond R.I. 2.40 has greater color dispersion than quartz, R.I. 1.54 and 1.55. Faceted diamonds always look more exciting than quartz gems. Dark colored gems filter out all rainbow colors except the base color of the stone.

Sidebar: Birefringence

Materials exhibiting more than one Refractive Index are said to have birefringence. **Birefringence** is the numerical difference between the greatest high R.I. reading and least low R.I. reading *at any one particular wavelength* of light for a mineral. Birefringence is not a characteristic of isotropic crystals, having only one Refractive Index. Birefringence is a measurable characteristic of anisotropic crystals.

Sidebar: Pleochroism and the Dichroscope

In addition to possible color zoning, changing the orientation of a crystal may exhibit different colors depending on the sample's Crystal System. Color variations may be subtle or obvious as certain color frequencies of white light are absorbed allowing others to pass in unique directions. The phenomenon is generally called **Pleochroism**. A **Dichroscope** will separate any two colors side-by-side for comparison. Isotropic minerals have but one color, if any. Uniaxial crystals are **dichroic** having two possible colors; remember that the Optic Axis and the "C" Crystallographic Axis is the same in Uniaxial Crystals. Thus, beryl may have two colors; one when viewed down the length of a crystal, and another color when viewed across the length of a crystal, which includes the influence of both the "C" and the "A" axes. That second view or any random orientation, but not down the Optic Axis will present both colors when viewed through a Dichroscope. Tourmalines may exhibit very strong pleochroism: while a very pleasing color may be present looking through the length of a crystal, the end view might be unpleasant or very dark. Conversely, the end view may be the better color for a gem.

Biaxial minerals are **trichroic** experiencing **Trichroism** having three possible colors; only one color is seen "looking" down either Optic Axes with a Dichroscope. Tanzanite may have a yellow, a blue, and a purple color or other colors in the same sample.

If there is no crystal form for orientation, randomly rotate the sample to find all possible color variations; one for Isotropic minerals, one or two for Biaxial, and one to three for Uniaxial, observable one or two colors at a time through a Dichroscope.

December 2009



Sunshine News

Roanoke club member David Katt was due to have heart surgery after Thanksgiving, but it was cancelled due to other health concerns that must first be addressed. Please keep David, and his wife Kitty in your thoughts and prayers as they work together on improving David's health.

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16 Meeting 7-9 PM	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		



Happy Anniversary to club members Fred and JoAnn Mason, who will celebrate 50 years of marriage on January 9th, 2010.

Congratulations!



A note on refreshments...
 Just a reminder that this will be the last month that Anne Topping will be serving as refreshments chair for the monthly meetings.

It would be great if someone would come forward as Anne's replacement. We will need for someone to take home the supplies and bring them to the January meeting.

All members contribute food each month; the chair just needs to be the organizer.

Please consider serving your club!

Be Safe- Be Well

By Don Monroe, Safety Committee Chairman

Reprinted from November 2009 issue of Lodestar, Newsletter of the Southeast Federation of Mineralogical Societies, Inc

Hazardous Waste

If you have not been advised about the potential dangers of hazardous waste, I can only assume that you do not read the newspapers or watch TV news. I think we will all agree that there is much "bad stuff" out there that we should all avoid. Well, I want to give you a different slant on this problem. A few days ago I walked out of a public building and noticed that there was a small test strip (used) on the ground. No, I did not pick it up with my bare hand; I used a Kleenex and carried the item to the nearest trashcan. With all of the "bad germs" that may be present in human blood, I am very cautious about other people's blood. As a matter of fact, I am a borderline diabetic and I am very cautious about how I dispose of my test strips. In addition to the obvious contamination, I also suspect that those little strips will not disintegrate for a long, long, time nor will the lancets which we use to draw the little drop of blood for our testing.

At this point I realized that I had really opened a "can of worms" in my mind regarding the hazardous waste that we all may create. Let me share with you a few other waste products that we may encounter. My list includes but is not limited to the following:

- ?? Kleenex- now who does not use Kleenex?
- ?? Sanitary products- we men know just enough to leave them alone
- ?? Disposable diapers- I am appalled at how many times you find used
- ?? Diapers thrown down on the street. Now is that filthy or what?
- ?? Tobacco products (partially consumed) and spit
- ?? Dental floss and chewing gum.
- ?? Syringes- just the threat of aids should terrify us. All of our
- ?? Medical service providers are most careful about this.
- ?? Band aids, bandages and swabs- When your doctor takes a blood sample and puts a little bandage over the hole, what do you do with the little bandages once the bleeding stops?
- ?? Dead things- Animals, pets, bugs and other deceased organisms are not only unsightly, but may be dangerous. In our area we are very suspicious of dead raccoons because of the possibility of rabies.
- ?? Paper products such as cups & paper towels.
- ?? Pet waste- Many, many of us have pets and should be cleaning up after them.
- ??



We live in a society where everything is disposable. It has not always been that way. Way back when we drank out of glasses and cups. We used cloth diapers, napkins and handkerchiefs and laundered these items after using them. Any germs were at least kept in our dwellings. This is no longer the case. We all tend to spread our germs everywhere. Think about it.

The Gem & Mineral Society of Lynchburg, VA Inc.

Natalie Darling, Editor

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The purpose of the Gem & Mineral Society of Lynchburg, INC. is to promote education in The Earth Sciences including: Mineralogy, Geology, Gemology, Paleontology, and Crystallography



Lynchburg Rock Raiders is the official FRA association of The Gem & Mineral Society of Lynchburg, VA INC



Happy Hanukkah



Websites to visit: Lynchburg Gem and Mineral Society:

www.lynchburgrockclub.org

The SFMS Newsletter, the Eastern Federation Newsletter, and the AFMS Newsletters are available for all members to read on line at the Federation Websites:

www.amfed.org/sfms, www.amfed.org and www.amfed.org/efmsl

Hobby Related Newsletters are available free of charge by emailing the editors below. Both are great sources of information and worth checking out.

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