



Wickenburg Gem & Mineral Society, Inc.

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The purpose of this organization shall be to educate and to provide fellowship for people interested in rocks and minerals; to foster love and appreciation of minerals, rocks, gems, and the Earth.

NON-FOLIATED METAMORPHIC ROCKS — Hornfels, Marble, Quartzite, Metaconglomerate, Serpentinite, & Anthracite

By Susan Celestian

Non-foliated Metamorphic Rocks are rocks that have been transformed, without developing any preferred orientation of minerals. This occurs when the parent rock is primarily composed of minerals that are equi-dimensional (such as calcite and quartz), or at least have no prominent long or short dimension. Refer to Figure 1, on page 3.

HORNFELS is a category reserved for metamorphic rocks that are siliceous, dense, generally dark, and fairly non-descript. See Figure 2.



FIGURE 2 HORNFELS A boulder of hornfels (dark, dense, tough) “adorns” a garden in Chantilly, Virginia. *Photo courtesy of the USGS*

MARBLE results from the metamorphism of limestone or dolomite. There are generally no mineralogy changes -- the marbles are still composed of calcite or dolomite -- however, the crystals usually enlarge, giving the rock a sugary look. Marble is soft and will fizz in acid.

When the parent rock contains impurities, such as clay (with iron and manganese), the resulting marble may have colorful stripes or bands. These latter rocks can be quite aesthetic. See Figures 3-5.



FIGURE 3 MARBLE This marble resulted from the metamorphism of a pure limestone. It is composed of large calcite crystals.

Photo by Stan Celestian

Non-foliated continued on page 3.....

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Meeting Minutes — January 13, 2017

The meeting was called to order at 7 PM. The pledge of allegiance was recited. There were 47 members and 6 new members present. The December minutes were read and accepted. The treasurers report was read and accepted. There was about \$1000 profit for the past year. The budget is on target and the same budget as last year will continue. The Gem and Mineral show had \$4898 income, about \$1000 less than 2015. This is due to the nugget not being received as early as in 2015, causing the income to be decreased, and the front desk raffle receiving less than in 2015. There are vendors signing up for the 2017 show already.

Old Business: Mel will be vice president for the next year. Thanks were given to Marty for taking over the president's duties over the past year. Thanks were given by Beth to all that worked the show, and the show was a success. The speaker system for the loud speaker for the show was discussed, with no conclusions reached regarding improvement.

New Business: If anyone is lost in the desert and there is no cell phone, it was discussed flashing a mirror if anything flies overhead. The Bullard mine and Rally mine may be under a claim, and more research will be done to see if we can go there. The gold nugget will not be purchased for the Gold Rush Days as the WGMS will not be participating. All and Erma discussed having a potluck an hour prior to meetings. A motion was made and passed. We will begin dinner at 6PM and clean up prior to the meetings.

Show and Tell: Terry won the raffle.

Door Prizes: Nadine, Dean, and Jim won door prizes.

A presentation was given by Dale. He showed a presentation of the Badlands formation by the National Park Service and pictures of his and Debbie's trip to that location. He also had some of the fossils found there. Mel will do a presentation next month.

The meeting was adjourned at 8:30 PM.

Respectfully submitted, Judy, Secretary

A request from a researcher, for material:

For years, Dr. Joseph B. Lambert (Northwestern University, Department of Chemistry) and I have been studying plant exudates (resins, gums, and phenolics), copal (partially polymerized resin), and amber (fossilized resin) as part of my research program with the Paleobiology Department, Smithsonian Institution, National Museum of Natural History. Links to some of our recent papers are included below for reference and I will be happy to send the pdf of a few other papers, if requested.

<https://blaypublishers.files.wordpress.com/2016/11/lambert-et-al-2016-leb-43215-2321.pdf>

<https://blaypublishers.files.wordpress.com/2016/02/lambert-et-al-leb-34-japanese-amber.pdf>

<https://blaypublishers.files.wordpress.com/2015/07/lambert-et-al-nmr-monocot-exudates1.pdf>

<https://blaypublishers.files.wordpress.com/2015/01/le-b-24-1-30-lambert-et-al.pdf>

I am interested in expanding our analyses of these materials and I am reaching out to as many gem and mineral clubs in the United States as possible to request small samples of plant exudates, copal, and amber with good geographical and botanical provenance data. We only need samples of about 100 milligrams (approx. the volume of a new eraser on a school pencil) in our NMR studies. If you have samples and would like us to analyze them (for free), please contact me at blayj@si.edu or at blayajorge@gmail.com. Please, do not send samples at this time. If we think that your samples are new to our analyses, I will contact you and provide mailing instructions. Thank you for your consideration of this request.

Sincerely and gratefully, Jorge Santiago-Blay, PhD

NOTES FROM THE EDITOR

Have a geological interest? Been somewhere interesting? Have pictures from a club trip? Collected some great material? Write a short story (pictures would be great). I'd like topic suggestions also.

Deadline for the newsletter is the end of the month.

Mail or Email submissions to:
Susan Celestian, editor
6415 N 183rd Av
Waddell, AZ 85355
azrocklady@gmail.com

.....Metamorphism continued from page 1

FIGURE 1

METAMORPHIC ROCK CHART

FOLIATED: Rocks with 'layers' or banding	<p>SLATE: PARENT: mudstone, shale or sometimes basalt Breaks into 'layers' or sheets (slaty cleavage) Is denser/harder than shale, its parent rock No visible crystals, although has a bit more sheen than shale Black, gray, green, red</p>
	<p>PHYLLITE: PARENT: slate, mudstone, shale Very similar to slate, but larger crystal size (still invisible to naked eye) gives rock a satiny sheen ("phyllitic sheen")</p>
	<p>SCHIST: PARENT: mudstone, shale, granite or other igneous rock "Layers" (schistosity) Very shiny, due to now-visible crystals of micaceous minerals - biotite, chlorite, muscovite May have large, included crystals (porphyroblasts)</p>
	<p>GNEISS: PARENT: granite or sedimentary rock Black and white banding (due to the segregation of dark-colored, dense, and light-colored, less-dense minerals) Crystalline</p>
	<p>METACONGLOMERATE: PARENT: conglomerate Retains look of sedimentary conglomerate, but is much denser (breaks through the pebbles) Pebbles are squished, and elongated parallel to each other</p>
NON-FOLIATED: Rocks with no 'layers' or banding	<p>HORNFELS: PARENT: mudstone, shale, clay-rich sedimentary rock Non-descript, dark, fine-grained, dense</p>
	<p>MARBLE: PARENT: limestone or dolomite Fine to coarse-grained (latter is sugary-looking) Will fizz in acid (composition: calcite, dolomite) Soft</p>
	<p>QUARTZITE: PARENT: quartz sandstone Very dense Very hard (composition: quartz) MAY retain a bit of the original sandy texture</p>
	<p>METACONGLOMERATE: PARENT: conglomerate Retains look of sedimentary conglomerate, but is much denser (breaks through the pebbles)</p>
	<p>SERPENTINITE: PARENT: peridotite or Mg-rich gabbro/basalt Tends to be green-brownish, due to composition (serpentine-group)</p>
	<p>ANTHRACITE: PARENT: lignite, bituminous coal Black, shiny Conchoidal fracture Less dense than crystalline rock</p>

.....Metamorphism continued from page 3



FIGURE 4 BANDED MARBLE This pink and green marble is banded, due to the presence of clay impurities in the parent limestone. This rock is from a marble quarry near Aguila, Arizona.

Photo by Stan Celestian



FIGURE 5 FINE_GRAINED MARBLE Hewitt Canyon has long been a popular site for Arizona rockhounds. Here one finds an attractive fine-grained, green and red banded marble. And as a fine-grained rock, it takes a great polish. *Photo by Stan Celestian*

QUARTZITE forms when quartz sandstone is metamorphosed. Like marble, there is no mineralogy change. Instead, the quartz crystals become intergrown with each other and with the cementing medium, making the hard rock very very dense. It may retain a vague sandy appearance, however, the rock will break through the grains (rather than around them, as in a sedimentary sandstone). See Figure 6. Examples of quartzite are illustrated in Figures 7-8.

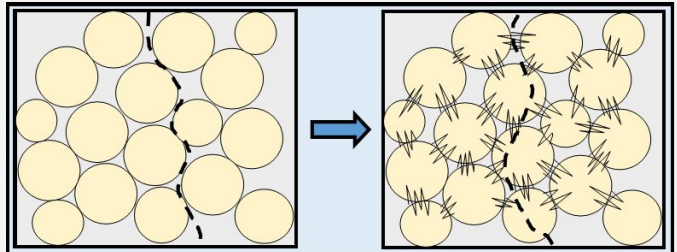


FIGURE 6 SANDSTONE TO QUARTZITE In this diagram, the left side represents a sandstone, with grains of sand lying adjacent to each other. When broken, the rock will break between the grains -- the dashed line. The right side represents a quartzite, where the grains of sand have intergrown (sutured contacts). When broken, the rock will break through the grains -- the dashed line.

Diagram by Susan Celestian

FIGURE 7 QUARTZITE This quartzite's parent was a very pure quartz sandstone, hence the white color. In the inset, you can get a feel for how hard and dense it is. Although visually similar to the white marble in Figure 3, this rock will easily scratch glass.



Photos by Stan Celestian



Non-foliated continued on page 5.....

.....Non-foliated continued from page 4

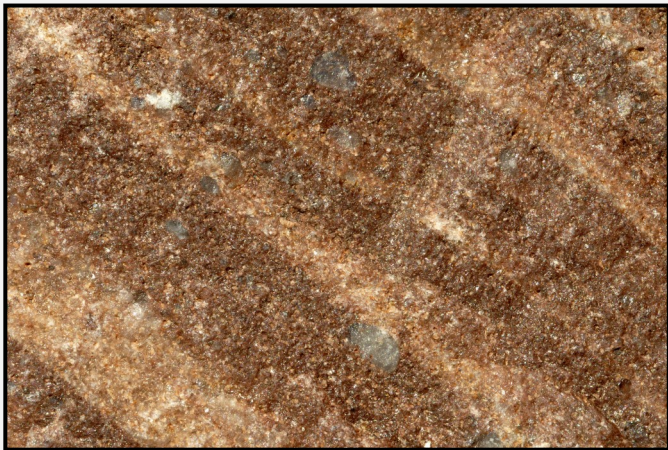


FIGURE 8 BANDED QUARTZITE This rock formed from a “dirty” sandstone -- one with inclusions of clay or other impurity. In the close-up view you can still see sand grains -- even a few large ones, although this rock is very strongly bonded.

Photos by Stan Celestian

METACONGLOMERATE was described in the discussion of foliated metamorphic rocks. There is almost no difference between a foliated and a non-foliated metaconglomerate. In the case of the latter, the conditions never reached the point that the pebbles were deformed -- the rock just gets harder and denser, while retaining its original sedimentary texture. See Figures 9-11.



FIGURE 9 METACONGLOMERATE This rock originated as a poorly sorted conglomeratic sandstone.

Photo by Stan Celestian



FIGURE 10 METACONGLOMERATE This rock was collected from the bed of the Gila River, south of Phoenix, AZ. Since conglomerates are “dirty” with significant clay and other minerals, they are often quite colorful after metamorphism.

Photo by Stan Celestian



FIGURE 11 META-CONGLOMERATE

This very coarse metaconglomerate was part of the landscaping at the Princess Denali Hotel in Denali NP, Alaska. Low-grade metamorphism means that the rock is not as dense as those in Figures 9 or 10.

Photo by Stan Celestian

Non-foliated continued on page 6.....

.....Non-foliated continued from page 5

SERPENTINITE forms when mafic and ultramafic igneous rocks are exposed to hydrothermal fluids. The igneous rocks absorb large amounts of water, the volume increases, density decreases, and minerals from the Serpentine Subgroup (such as chrysotile, antigorite, lizardite -- all hydrous magnesium silicates) form. Most of these minerals are some shade of green (although may be yellowish, brown, black), and range from fibrous, or asbestiform, to waxy to greasy. See Figure 12.



FIGURE 12 SERPENTINITE This is a specimen of antigorite (massive) and chrysotile (fibrous) Serpentinite from the Salt River Canyon. It formed about 1 billion years ago, when diabase sills intruded in contact with the Mescal Limestone (1.2 billion years old). The asbestos here was mined from 1914 through 1982.

Photo by Stan Celestian

And finally **ANTHRACITE**, also known as hard coal, is composed of 86%-98% carbon, as low-grade metamorphism has converted sedimentary bituminous coal to metamorphic anthracite by cooking out all fibrous organics and volatiles. It is generally black, with conchoidal fracture, and bright sub-metallic luster, resulting in a golden to blue color on the reflective surfaces. It ignites with difficulty, and burns with a blue, smokeless flame. See Figure 13.

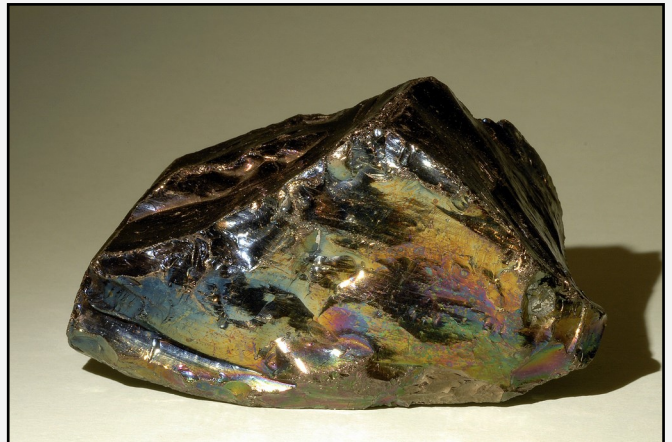


FIGURE 13 ANTHRACITE COAL This is a piece of the ever-dwindling supply of Pennsylvania anthracite coal. Notice the rainbow of colors on the fracture surfaces. It formed when some of the vast beds of bituminous coal was heated up during the folding and uplift of the Appalachian Mountains.

Photo by Stan Celestian

And here is a note from a California lapidary blogger, inviting us to join here online:

Lapidary Lovers – a blog just for us!

Lapidary lovers now have a blog just for us! www.LapidaryWhisperer.com has just come online and I hope you will check it out. It's an online community for lapidary lovers where I'll post a new blog entry every other Wednesday.

Yes, rocks and slabs whisper and tell me what they want to be, then I commit lapidary on them to bring out their stories.

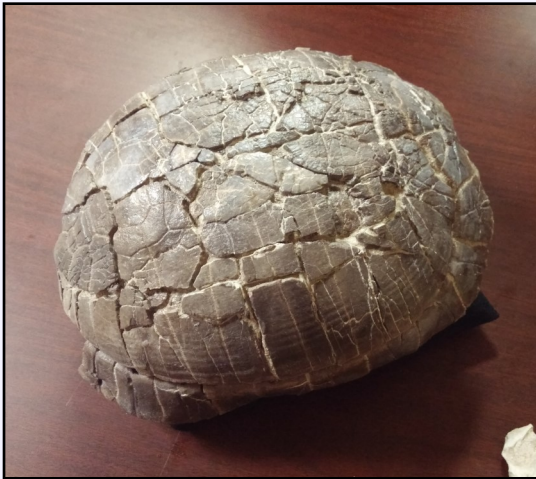
I'd love to hear what you think about the blog. Please write me directly at Donna@LapidaryWhisperer.com or if the comment box isn't showing at the bottom of the blog entry, click on "No Comment" at the bottom and the comments block will appear.

Let's enjoy this wonderful art and craft together!

COLLECTING FOSSILS IN SOUTH DAKOTA

In September, Dale and Debbie spent time hunting fossils, on a ranch, in the Oligocene-aged beds of the White River Badlands, in South Dakota. During the Cretaceous, the area was inundated by an interior seaway, where marine reptiles and ammonites dominated. The sea retreated and by the Oligocene, the White River Badlands was a mature river valley, with meandering streams, floodplains, marshes, and forests where turtles, crocodiles, rhinos, horses, dogs, cats, camels, tapirs, titanotheres, and many other animals frolicked. Many of these creatures were quickly buried upon death, and preserved in the sands and silts being deposited. Those fossilized remains are now being exposed by erosion.

Some of the fossils Dale and Debbie found are pictured below.



The crown jewel of the adventure was a turtle fossil -- look at that jigsaw puzzle Dale put together! And he found some rodent teeth and bones inside -- empty turtle shells evidently made good nesting areas -- until a flood filled it with silt and sand.

Photo by Susan Celestian



In addition to the turtle, Dale and Debbie unearthed various vertebrae, jaw fragments with teeth, leg bones, and more. FIELD TRIP!!!! ☺ *Photo by Susan Celestian*



Badlands topography in Badlands National Park. *Photo courtesy of the National Park Service*

UPCOMING AZ MINERAL SHOWS

Monthly - Tempe, AZ Gallery TCR , 906 S Priest, #107; Sat 9-6; Free. For dates, go to: https://www.facebook.com/pg/gallerytcr/events/?ref=pag_e_internal

January 1 - February 29 - Quartzsite, AZ For show schedules <http://www.desertusa.com/cities/az/quartzsite.html>

January 20-22 - Globe, AZ Gila County Gem and Mineral Society; Gila County Fairgrounds, 900 E Fairgrounds Rd, Globe, AZ 85501; Sat 9-5, Sun 10-4; \$3/person, \$5/couple, students and children free.

February 9-12 - Tucson, AZ Tucson Gem and Mineral Society; Tucson Convention Center, 260 S Church St; Thurs-Sat 10-6, Sun 10-5; Admission: \$13, under 14 free with adult.

February 18-19 - Apache Junction, AZ Apache Jct Rock and Gem Society; Skyline High School Gymnasium, 845 S Crismon Rd; Mesa, Arizona 85208; Sat 9-5, Sun 10-4; \$3/adult, \$1 students, children under 12 free. http://www.ajrockclub.com/About_Who_We_are_Annual_Show.html

March 25-26 - Anthem, AZ Daisy Mountain Rock and Mineral Club; Boulder Creek High School Gym, 40404 N Gavilan Peak Pkwy; Sat 9-5, Sun 10-4; \$3/adult, \$2 seniors/students; children free.

June 2-4 - Flagstaff, AZ Coconino Lapidary Club Gem, Mineral and Jewelry Show, Silver Saddle Outdoor Market, Hwy 89N & Silver Saddle Rd (3.5 mi north of Flagstaff Mall); 9-4 daily; Admission: free.

If you are travelling, a good source of shows AND clubs is <http://www.the-vug.com/vug/vugshows.html> or <http://www.rockngem.com/ShowDatesFiles/ShowDatesDisplay.All.php?ShowState=AZ> For out-of-the-country shows: <http://www.mindat.org/shows.php?current=1>

A good source for a list of Arizona Mineral Clubs and contact information is http://whitemountain-azrockclub.org/Public_AZ_Clubs_Links.html

UPCOMING WGMS FIELD TRIPS

ANDERSON MINE

WHEN: Thursday, February 2, 2017

TIME: 9:00

**MEET: Left side of road at Alamo Road and Hwy 93, 2 miles north of Wickenburg (just before Date Creek Road)
NO 2-W DRIVE VEHICLES**

DATES SUBJECT TO CHANGE

CONSIDER VOLUNTEERING TO PLAN OR HELP PLAN TRIPS. YOU WOULD NOT NEED TO LEAD EVERY TRIP, BUT KEEP THINGS ON TRACK



<http://www.wickenburggms.org/>

If you ever have photos from a club field trip, send a couple to Dale, for posting on the website.

Officers and Chairperson

- President:** Craig Jones.....208-523-9355
- Vice President:** Martin Hagan..... 602-469-7770
- Secretary:** Judy Zimmerlee..... 517-652-1355
- Treasurer:** Debra Keiser..... 928-684-1013
- Program Director:** Dale Keiser..... 928-684-1013
- Publicity:** currently open position
- Membership:** Roma Hagan 602-469-7662
- Editor:** Susan Celestian 602-361-0739
- Field Trip:** Craig J, Bob B, Marty H
- Show Chair:** Beth Myerson.....480-540-2318
- Scholarship Chair:** Steve Hill..... 928-533-3825
- Historian:** Jeanine Brown..... 928-684-0489

Meetings are held the **2nd Friday most months** at **Coffinger Park banquet room**. Potluck dessert at 6:30 pm. Business meeting at 7:00 pm. **Exceptions: February and December** meetings are held on the **first Friday of the month**. We do not meet in the summer — **no meetings in June, July or August**.

**Membership Dues: \$15.00 Adults per Person
\$ 5.00 Juniors and Students**

Meeting Dates for 2017

Wickenburg: Jan 13, Feb 3, Mar 10, Apr 14, May 12, Sept 8, Oct 13, Nov 10, Dec 1

Stanton meets Thursday after the Wickenburg meetings. Jan 19, Feb 9, Mar 16, Apr 20, May 18, Sept 14, Oct 19, Nov 16, Dec 7 (subject to change)



Ammonites from the White River Badlands. Photos by Stan Celestian

MINERALS IN OUR EVERYDAY LIVES

USES OF HORNFELS

- ◆ Flooring
- ◆ Building Stone
- ◆ Paving Stone, Curbing
- ◆ Cemetary Markers

USES OF MARBLE

- ◆ Flooring, Countertops
- ◆ Building Stone
- ◆ Jewelry
- ◆ Sculpture
- ◆ Cemetary Markers
- ◆ Aquarium rock
- ◆ Whitener in toothpaste, paint, plastic, cosmetics, putty, and paper
- ◆ Mild abrasive in toothpaste
- ◆ Landscaping aggregate
- ◆ Reflective roofing aggregate
- ◆ Filler in pharmeceuticals, antacid (Tums)
- ◆ Acis neutralization in soils & water

USES OF QUARZITE

- ◆ Stairtreads, countertops, floor tiles
- ◆ Aggegate
- ◆ Glass manufacture
- ◆ Manufacture silicon carbide, silicon metal, etc.
- ◆ Jewelry
- ◆ Historically as stone tools

USES OF METACONGLOMERATE

- ◆ Decorative landscape stone
- ◆ Building facade

USES OF SERPENTINITE

- ◆ Building stone (ex. Verd Antique)
 - ◆ Paving stone
 - ◆ Carvings
 - ◆ Inuit lamps, tools
- ◆ "Ovenstones" - stone base for cast iron oven
- ◆ Neutron shield in nuclear reactors: crushed filler in steel jackets or aggregate in concrete of shielding. Water in Serpentinite can slow neutrons
 - ◆ Jewelry
 - ◆ Landscape decorative stone

USES OF ANTHRACITE

- ◆ Fuel
 - ◆ Manufacture of soap
- ◆ Manufacture of plastics, roofing, insecticides, synthetic rubber
 - ◆ Water filtration and treatment
- ◆ Carbon additive in steel smelting and casting
- ◆ Reduction agent: briquetting charcoal, iron ore pellets.....



Underground coal mine in Indiana Co., Pennsylvania
 Photo courtesy of the USGS, Ronald Stanton photographer

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<https://www.facebook.com/pages/Wickenburg-Gem-and-Mineral-Society/111216602326438>

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