

DAISY MOUNTAIN ROCKCHIPS

The purpose of Daisy Mountain Rock & Mineral Club is to promote and further an interest in geology, mineralogy, and lapidary arts, through education, field experiences, public service, and friendship.

VOLUME 5, ISSUE 7

JULY 2020

GASTROPODS OF ROCKY POINT, SONORA, MEXICO



For comments directed at specific shells above, go to page 11. Photo by Stan Celestian

FOSSILS: PART IX

Kingdom: Animalia
 Phylum: Mollusca Class: Gastropoda
 By Susan Celestian

The name gastropod derives from the Greek for "stomach foot", in reference to the position of their foot below their gut. They include snails (shells), limpets (reduced shell), and slugs (no shell) -- and are second only to insects in the number of species (depending on your source, the number of species ranges from 40,000 to over 150,000).

Although many species have no shell, or reduced shell, in general gastropods are characterized by a coiled, unchambered shell. Often there is an *operculum* (trap door) attached to their foot, that they can pull very tightly closed within the *aperture* (shell opening), to protect the animal within the shell.

Gastropod characteristics are as follows:

- ▶ Their geologic record extends from Late Cambrian to Recent.
- ▶ The body plan is complex with nervous system (no brain, but interconnected ganglia), eyes, strong muscles, circulatory system with 2-chambered heart, respiring gills or rudimentary lung, digestive tract and excretory system, olfactory organs (smell), and reproductive organs.
 - One thing gastropods species have in common is *torsion*. This is a 180° twisting of the body, that occurs as the organism develops -- putting the anus above the head.
 - Gastropods have a well-defined head. There you will find 2-4 tentacles. At the tip of, or base of, the tentacles are "eyes". These vary by species, from light/dark sensors -- to kind of pinhole camera eyes, that sense forms and shadows -- to eyes with lenses, with somewhat improved vision of obstacles or prey, but still blurry and without color. See Figure 1.
 - In most gastropods, the *radula* (like a toothed tongue) is the structure used to scrape (as algae off rocks), cut up food, or drill holes in shells.

Gastropoda continued on page 3...



LINARITE

By Susan Celestian

Named in 1822 for the Linares Plateau in Spain, linarite is a favorite among mineral collectors. It is not common, and sports a very refractive bright azure blue color. Linarite is a copper mineral, but even in Arizona -- a state with so many copper deposits -- it is fairly rare.

Linarite occurs with copper and lead minerals (azurite, malachite, cerussite, brochantite, anglesite, smithsonite, and others), and may be confused for azurite. However, linarite will not fizz in hydrochloric acid, as it is not a carbonate (which azurite is).

Chemical Formula - $PbCu(SO_4)(OH)_2$

Crystal System - Monoclinic (3 axes of unequal length, and one 90° angle). Go to [Mindat](#) or [Mineral.net](#), and scroll down to interactive graphic of crystalline linarite.

Growth Forms/Habits - Long, tabular; crusts

Hardness - 2.5

Color - Intense azure blue

Luster - Sub-adamantine, vitreous

Streak - Pale Blue

Specific Gravity - 5.35

Cleavage - perfect in one plane, imperfect in another

Fracture - conchoidal

Famous localities include: In Arizona --- Mammoth -St Anthony Mine (Tiger, Pinal Co.), Grand Reef Mine (Klondyke, Graham Co.), Bisbee Mine (Bisbee, Cochise Co.), and In New Mexico --- the Blanchard Mine (Bingham, Socorro Co.).

Linarite images follow in Figures A-D.

Linarite continued on page 12...

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FIGURE 1 GASTROPOD HEAD Most snails can retract fully into their shell, but when on the prowl, they extend their foot and head. The head has extendable antennae, atop which there is often an eye. *Photo by Susan Celestian*

- As already mentioned, the body is housed in a coiled, unchambered shell (usually). See Figure 2.



FIGURE 2 GASTROPOD SHELL This Tower Shell has been naturally abraded, to expose the internal shell. The living space is a spiraled, open “tube”, without divisions. Think of it like a spiral staircase (in this case ramp), where the stairs wind around a central pole. That pole is called the *columella*, in gastropods. *Photo by Stan Celestian*

- Some gastropods have a siphon, used to ‘smell’ or ‘taste’ water for food. A special case: for freshwater Apple Snails, the siphon is used as a snorkel, to breath air while they lie submerged in low-oxygen water (it is safer than coming to the surface to breath and be exposed to predators). The presence of a siphon is identified in the shell by the siphonal notch or canal. See Figure 3.

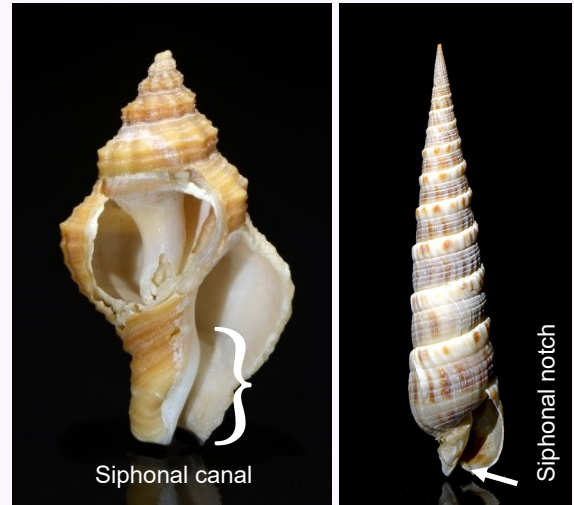


FIGURE 3 CLUES TO SIPHONS Marine gastropods with siphons are largely carnivores or scavengers. The siphon houses chemoreceptors, used to sniff out prey and food. Long siphons are protected by a canal in the shell; short siphons by a notch. *Photo by Stan Celestian*

► Gastropod habitat:

- While the majority are ocean-dwellers, there are many freshwater and terrestrial species.
- They occupy nearly every environment: polar to tropical; freshwater lakes, ponds, streams; hypersaline water; dark caves; land with little water; shallow to deep water; quiet environments to pounding surf; deep hydrothermal vent areas to trees...
 - ◇ The occupation of non-aqueous environments is facilitated by the development of lungs in some species, so they may gulp air.

...Gastropoda continued from page 3

- ◇ For shelled species, exposure to hypersaline waters (such as might be encountered at low tide), and other instances of exposure are made possible by the ability of gastropods to retract into their shell and “close the door”, by pulling the *operculum* tight. This allows the organism to keep from drying out or being exposed to high salt content. *Of course, this also is protection from predation by pecking birds and other predators/scavengers.* See Figure 4.

Strombus sp. (aka Fighting Conch) have a long, narrow, sharp operculum with which they fight, and also use it to pole-vault themselves along or upright. Watch them at YouTube1 or YouTube2.



FIGURE 4 GASTROPOD TRAP DOOR

Many species of gastropods have an *operculum*, or trap door. This is a calcareous or chitinous structure that is attached to the foot, and that can be drawn in to very tightly shut the snail within its shell.

Photos by Stan Celestian

► Gastropod habit: .

- Feeding habits run the gamut -- scavengers, detritus feeders, predators, herbivores, and parasites.

Cone snails have a modified tooth structure they can stab into their prey, and inject venom. The venom of a few large species can kill a human. In fact, I remember an old *Hawaii 5-0* episode in which a man killed his wife with a “Cloth of Gold” *Conus*.

- ◇ Other gastropods, and bivalves make good prey targets for predatory snails, as many of the latter are attached or move slowly. Moon Snails search in the substrate (as deep as 7”), grab a bivalve, and drag it to the surface. The snails climb aboard the shell, and using their *radula* (“teeth”) they drill a hole into the bivalve shell, often near the hingeline (probably a good place to get a good hold). See Figure 5. Once they breach the inside, they extrude their stomachs into the bivalve and digest the contents.

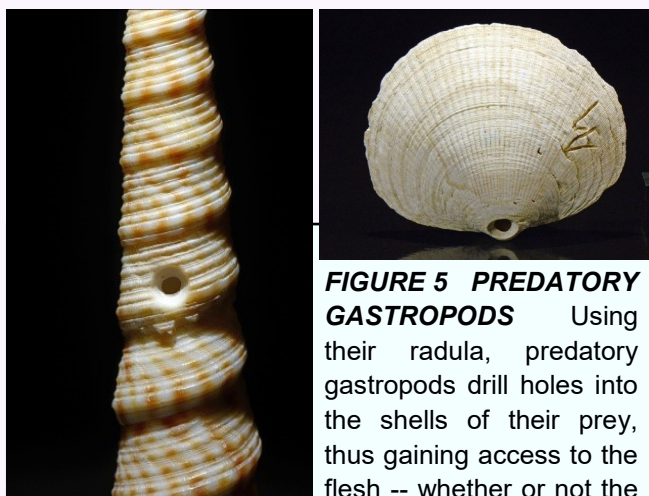


FIGURE 5 PREDATORY GASTROPODS

Using their *radula*, predatory gastropods drill holes into the shells of their prey, thus gaining access to the flesh -- whether or not the

organism is closed up tight.

Photos by Stan Celestian

- ◇ An extinct genus, *Platyceras*, was adapted to live its life attached over the anus of crinoids, feeding on the leftovers. See Figure 6.

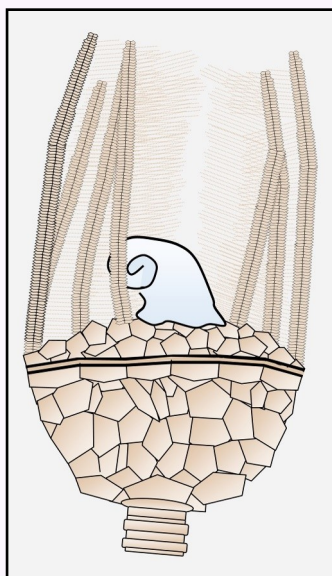


FIGURE 6

PLATYCERAS An unusual lifestyle is practiced by the *coprophagous* (feces eating) gastropod, *Platyceras*. Various species parked themselves over, or near, the anus of a crinoid, where they ingested the very nutritious fecal pellets, as they were excreted. *Illustration by Susan Celestian*

- ◇ *Thyonicola dogieli* is a parasitic gastropod, whose individuals live their entire lives in the gut of a sea cucumber.
- Most gastropods are *vagrant, benthic, epifauna* -- they wander on the surface of the sea floor (or other substrate); although a few are attached. Even so, most have a mobile or planktonic juvenile stage. Quite a few species will burrow a bit to escape the Sun, when they find themselves exposed at low tide. Or, like the aforementioned Moon Snails, they burrow in pursuit of prey.
- ◇ There are a few extant species that are planktonic. A good example is the Violet Snail, that rides the waves via a bubble raft, it creates. (There it preys on other floating creatures, such as the Portuguese-Man-O-War.) See Figure 7.

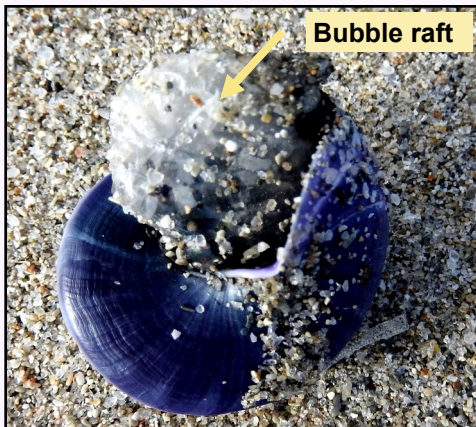


FIGURE 7 PLANKTONIC GASTROPODS

The Common Violet Snail (*Janthina janthina*) floats upside down buoyed by a bubble raft, and moving with the currents.

Photos by Stan Celestian

- **Mobility:** Most snails can retract fully into their shell, but when on the prowl, they have a large muscular foot that extends (see Figure 1). The muscle produces waves of movement (contraction / relaxation) and with the

addition of a slimy layer, they move at a “snail’s pace” (which in the case of land snails is between .05-0.7 inches per second¹).

- **Reproduction:** Most marine gastropods have separate sexes; while most terrestrial gastropods are *hermaphroditic* (i.e. individual organisms can produce both male and female gametes). In the latter case, they still tend to mate with another organism, rather than self-fertilize. Sometimes, like the marine Violet Snail, they start out as male, and change to female to reproduce.
- ▶ **Interesting fact:**
 - Some hermaphroditic snails produce what are called “love darts”. These are needle-like or harpoon-like projectiles that potential mates attempt to shoot into each other. Their purpose seems to be an effort to introduce a hormone, found in the mucus coating, that assures a greater survival rate for sperm.
 - Life expectancy in the wild is 3-7 years².
 - Amazingly, it is estimated that 30% of the erosion along the Sussex coast, in England (where one finds the White Cliffs of Dover), is due to limpets. As they graze on algae growing on the chalk cliffs, they eat some of the chalk -- as much as 0.2 ounces. It doesn’t sound like much, but multiply that by millions of limpets, and the coastline recedes by up to 1.5 mm a year.³
 - What is the biggest gastropod, you ask? Why it is the sea hare, *Aplysia californicus*, that gets up to 15 pounds in weight!

Images of gastropods follow, in Figures 8-23.

¹ <https://www.snail-world.com/>

² <https://www.snail-world.com/>

³ <https://www.bgs.ac.uk/discoveringGeology/time/Fossilfocus/gastropod.html>

...Gastropoda continued from page 5



Pacific Banana Slug (*Ariolimax columbianus*), Crescent Beach Overlook, Crescent City, California. If you enlarge the view, you can see the eyes at the tips of two of the antennae. The other two antennae are chemical receptors.

FIGURE 8 SLUGS Gastropods without shells are called slugs. They are both terrestrial and aquatic. While they are very rarely fossilized (they are too fleshy and watery), they are still a very cool component of the class. Terrestrial and freshwater slugs mostly look like big bird droppings, but marine ones can be very beautiful and balletic. Google “marine slugs” and you will see!
 Photos by Sue & Stan Celestian



Pacific Banana Slug (*Ariolimax columbianus*), Totem Bight, Ketchikan, Alaska



Apricot Slugs (*Berthellina quadridens*), underwater at Rocky Point, Mexico. Each about 1.5 inches long.



Pacific Banana Slug (*Ariolimax columbianus*), Jedediah Smith Redwoods State Park, California About 6 inches long. Have you noticed the color variability evident in this species?



Blue Swallowtail Slug (*Chelidonura hirundinina*), underwater in Kapoho Tidepools, Hawaii It is only about 1 inch long. Many marine slugs have “wings” they can flap and undulate to swim.



Pacific Banana Slug (*Ariolimax columbianus*), Jedediah Smith Redwoods State Park, California. Banana slugs can contract or elongate (about 2 inches to 9 inches). Note the slime trail behind this one. The yellow color led to the common name of “banana” slug.



Black Slug (*Veronicella leydigi*), Pahoia, Hawaii About 3 inches long.

Gastropoda continued on page 7....

...Gastropoda continued from page 6

FIGURE 9 SEA HARES Another essentially shell-less gastropod group include the sea hares. They do have a much reduced plate-like internal shell, rarely exposed. There are large flaps that enclose the body, and these can be undulated for swimming. Ear-like structures on the head are chemosensory, and make them look like they have rabbit ears -- hence the name, sea hare.

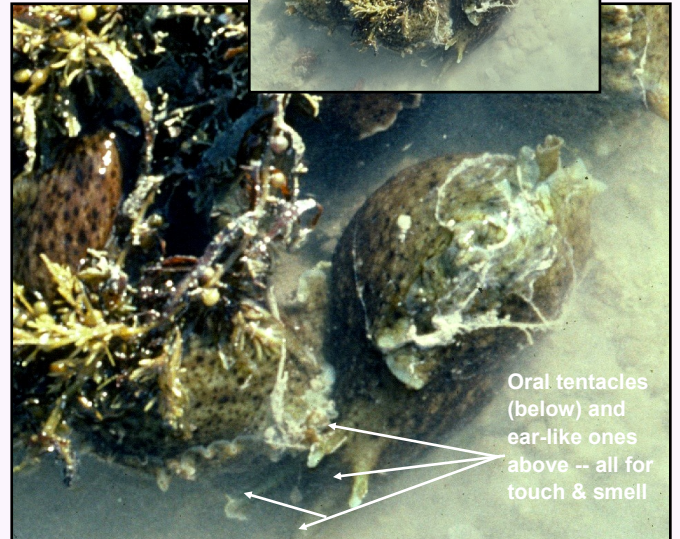
What I find interesting about them is that some species produce a toxic ink they release when under stress. The ink is a royal purple color. Tickle a sea hare between its flaps, and you will cause the release of the ink.

Photos by Sue and Stan Celestian



Sea Hare in Kapoho Tidepools, Hawaii

A warren of sea hares -- perhaps together to mate. The lower photo is a closer view of one. Cholla Bay, Rocky Point, Mexico



Oral tentacles (below) and ear-like ones above -- all for touch & smell



Me harassing a sea hare, causing the release of a beautiful purple ink. Cholla Bay, Sonora, Mexico

My sister encouraging a sea hare to release ink, to dye a T-shirt. Unfortunately, the ink, aka dye, is light sensitive and faded fairly quickly. Plus it is hard to "fix" it -- urine is supposed to do a pretty good job.



Gastropoda continued on page 8....

...Gastropoda continued from page 7



FIGURE 10 INTERNAL MOLD OF GASTROPOD

This is what is left after the shell filled with mud, and then dissolved away. As you can see, the infill is solid, with no divisions. In other words, gastropod shells are basically fancy tubes.

Photo by Stan Celestian



FIGURE 11 Appearing in the newsletter for a second time, this is a plant-eating land snail, the Brown Garden Snail or European Brown Snail (*Cornu asperum*) in Culver City, California. Appetites for escargot led to its 1850s introduction to California, where it is now a pest. Largely nocturnal, they do come out to play during daytime rain. That's why we saw this one (and many of its friends) during the day. Notice the eyes at the ends of the antennae.

Photo by Susan Celestian



FIGURE 12 This is a beautiful gastropod from the Miocene-age Monterey Formation in San Pedro, California. Stan & I collected this over 40 years ago, from an embankment on an empty lot in the middle of town. Of course, there is no such thing as an empty lot now.... Photo by Stan Celestian

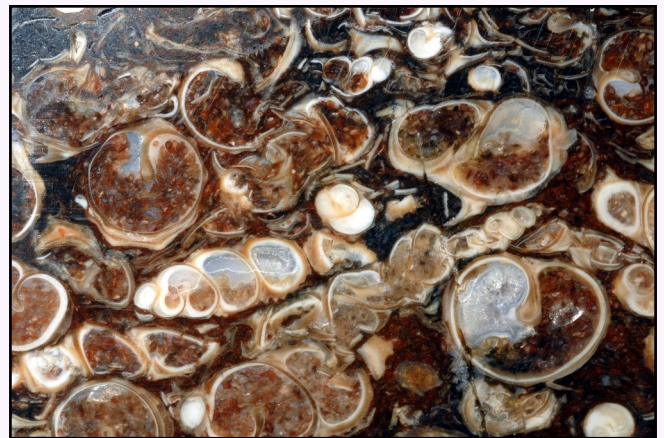


FIGURE 13 TURRITELLA AGATE About 50 million years ago (Eocene) intermontane basins filled with water, creating large lakes. Within these lakes, snail shells accumulated in large quantities, and silica replacement preserved them as an attractive lapidary material. SPOILER ALERT: The predominate snail -- referred to as *Turritella* -- is in fact, *Elimia tenera*.

Photo by Stan Celestian



FIGURE 14 NACO GASTROPOD This is the internal mold of an as yet unidentified gastropod, from the Pennsylvanian-aged Naco Formation, in Gila County, Arizona.

Photo by Stan Celestian

...Gastropoda continued from page 8



FIGURE 15 ANOTHER NACO GASTROPOD

Here is another internal mold -- this time of a high-spired snail, from the Pennsylvanian-aged Naco Formation of Gila County, Arizona.

Photo by Stan Celestian



FIGURE 16 EVEN MORE NACO GASTROPODS

These Pennsylvanian-aged snails are *Bellerophon (Bellerophon) crassus*, a species of bellerophonitid gastropods. As a group, the bellerophonitids are distinguished from other gastropods, by their symmetry, which is atypical for the class --- they are *planispiral*, i.e. coiled in one plane, so that they are bilaterally symmetrical. No spired snails here!

Photo by Stan Celestian



FIGURE 17 ECPHORA GARDNERAE This Miocene snail has a distinctively ridged shell. Note the siphonal canal at the base of the aperture. *Photo by Stan Celestian*



FIGURE 18 GEODIZED SNAIL

This snail is about 3.2 inches tall. It has been geodized (is that a word?) -- i.e. it has been turned into a geode. Silica has either replaced the shell, or the shell has dissolved leaving an external mold in the sediment, that subsequently was filled with quartz. Unknown locality.

Photo by Stan Celestian

...Gastropoda continued from page 9



FIGURE 19 OPERCULA If you look back at the left image in Figure 4, you will see a round, bumpy, brown and green operculum. Once that snail (*Turbo fluctuosa*) dies and decays, the operculum is released. The left image above is a close-up view. On the right is a shiny, smooth green/white/brown operculum from a different species of *Turbo* (probably from the South Pacific) being used as decoration on a locket.

Photos by Stan Celestian



FIGURE 20 *Vermicularia* species resemble worm tubes; however, you can see that this is a snail -- it starts out tightly coiled, and then just starts going off in all directions. Early on, they cement to a substrate, where they live fixed (except for the meanderings of their host, if it is a living creature).

Photos by Stan Celestian



FIGURE 21 Remember the coprophagous snail, *Platyceras*. These are specimens from the Waldron Shale (Silurian age) in a quarry at St. Paul, Decatur/ Shelby County, Indiana. Some pyrite crystals are embedded in the fossils. Photo by Stan Celestian

...Gastropoda continued from page 10



FIGURE 22 3D FUN
Platystoma niagarensis?, prepared for great exposure. A likely coprophagous gastropod of the Silurian Waldron Shale, St. Paul, Decatur/Shelby County, Indiana. Photo by Stan Celestian

NOTES ON COVER PHOTO

A - Bubble Snail (*Bulla* sp.) - This snail is an example of one that primarily coils in one plane, each subsequent coil overriding the last.

B - Common Atlantic Baby Ear (*Sinum perspectivum*) - I have always called this carnivorous snail the 'bar of soap' and the flesh is white and slimy, like wet soap. [YouTube](#).

C - Chinese Hat Snail (*Calyptrea mamillaris*) - This limpet is a filter feeder. The coiling in limpets is usually not apparent. And they are typically found roaming about on rocks or other shells.

D - Common Slipper Shell (*Crepidula striolata*) - This limpet is a suspension or deposit feeder, and is often found attached to other slipper shells in a stack.

E - Cup & Saucer Shell (*Crucibulum spinosa*) - Living a limpet-like lifestyle, these gastropods are more closely related to cowries and conchs, although it is a filter feeder.

F - Dall's Limpet (*Lottia dalliana*)

G - Rough Limpet (*Lottia scabra*)

H - Fig Shell (*Ficus ventricosa*) - We acquired this shell out of shrimping nets, so it was dredged up offshore in relatively deep water.

I - Fighting Conch (*Strombus gracilior*)

J - Annette's Cowry (*Pseudozonaria annettae annettae*) - Cowry's are another example of gastropods in which coiling covers previous coils, so it is not obvious, nor is there any spire.

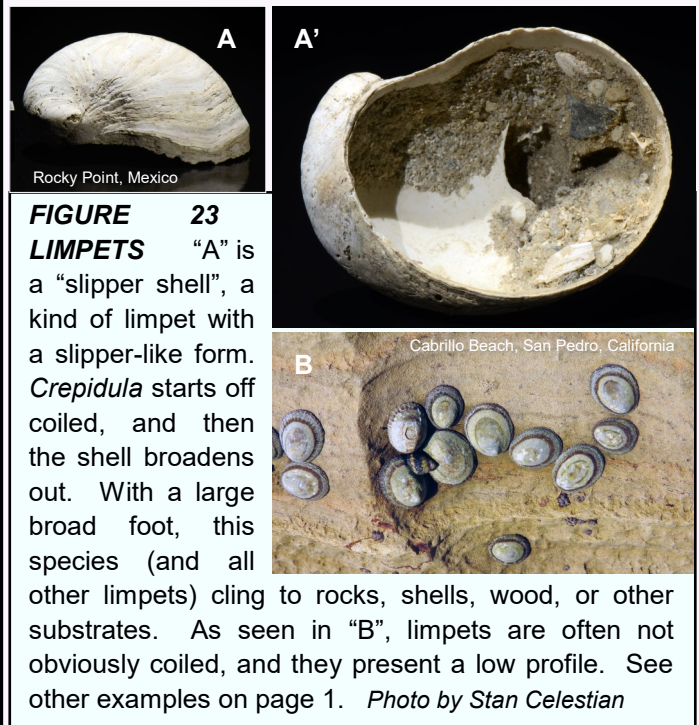


FIGURE 23
LIMPETS "A" is

a "slipper shell", a kind of limpet with a slipper-like form. *Crepidula* starts off coiled, and then the shell broadens out. With a large broad foot, this species (and all other limpets) cling to rocks, shells, wood, or other substrates. As seen in "B", limpets are often not obviously coiled, and they present a low profile. See other examples on page 1. Photo by Stan Celestian

GENERAL RESOURCES FOR GASTROPODS

<https://ucmp.berkeley.edu/taxa/inverts/mollusca/gastropoda.php>

<https://animaldiversity.org/accounts/Gastropoda/>

<https://en.wikipedia.org/wiki/Gastropoda>

https://en.wikipedia.org/wiki/Love_dart#:~:text=The%20love%20dart%2C%20also%20known,mollusks%20within%20the%20clade%20Stylommatophora.

<https://www.snail-world.com/>

<https://www.bgs.ac.uk/discoveringGeology/time/Fossilfocus/gastropod.html>

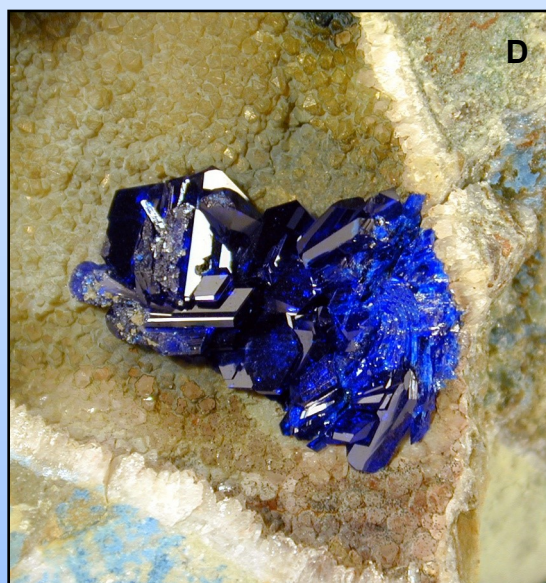
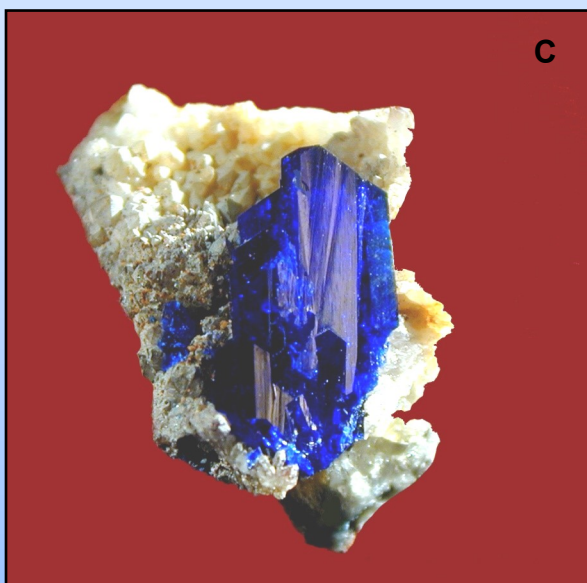
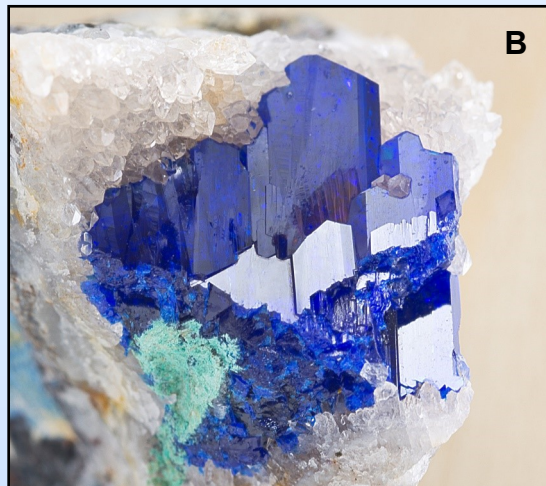
https://en.wikipedia.org/wiki/Thyonicola_dogieli

[https://en.wikipedia.org/wiki/Siphon_\(mollusc\)](https://en.wikipedia.org/wiki/Siphon_(mollusc))

http://entnemdept.ufl.edu/creatures/misc/gastro/brown_garden_snail.htm

http://entnemdept.ufl.edu/creatures/misc/gastro/brown_garden_snail.htm

...Linarite continued from page 2



FIGURES A-D LINARITE All four of these specimens were collected by Stan Celestian at the Grand Reef Mine, near Klondyke, Graham County, Arizona. *Photos by Stan Celestian*

GENERAL RESOURCES FOR LINARITE:

[https://en.wikipedia.org/wiki/Linarite#:~:text=Linarite%20is%20a%20somewhat%20rare,PbCuSO4\(OH\)2](https://en.wikipedia.org/wiki/Linarite#:~:text=Linarite%20is%20a%20somewhat%20rare,PbCuSO4(OH)2).

<https://www.mindat.org/min-2403.html>

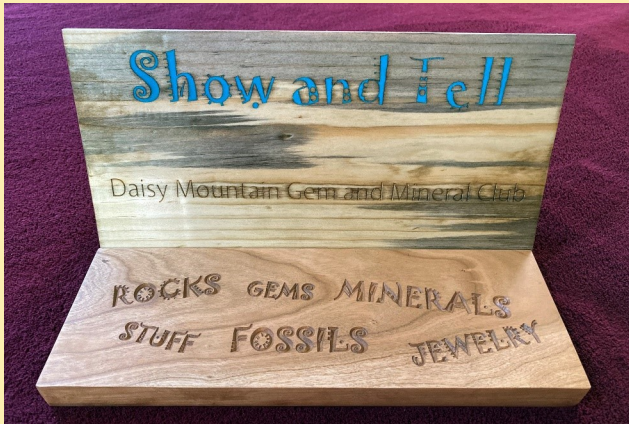
<https://www.minerals.net/mineral/linarite.aspx>

UPCOMING FIELD TRIPS & MEETINGS

Nothing planned for sure at press time, but watch your email for announcements.

DATES SUBJECT TO CHANGE

Bill and the field trip committee will be actively looking for productive spots for field trips. If you have any suggestions, you are encouraged to contact him at bfreese77@cox.net



Share!

Part of the fun of being in a rock club is sharing with members. Have you found a cool rock -- recently or in the past? Have you made something out of a rock or mineral?

Bring an item in to the monthly and tell its story.

Everyone who brings in something for Show & Tell will get an extra ticket for the attendance/nametag raffle.

Words of Wisdom

passed along by our own

Bob Evans



I'm on two diets now... I wasn't getting nearly enough food on just one.

FACEBOOK



Visit and join the club page periodically. See what is happening, and boost our visibility on the web. Go to: [The Daisy Mountain Rock and Mineral Club.](https://www.facebook.com/DaisyMountainRockandMineralClub/) It is set up so you can post photos of outings or related items. Share with friends!

AWARD-WINNING WEBSITE

<http://www.dmrmc.com/>

If you have comments, contact Nancy Gallagher.

INSTAGRAM



Follow the club on Instagram. Go to <https://www.instagram.com/daisymountainrockclub/> and follow today. Share with friends!

Officers, Chairpersons, & Trustees

- President:** Ed Winbourne.... ewinbourne@gmail.com
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- Editors:** Susan & Stan Celestian..... azrocklady@gmail.com
- Field Trip:** Bill Freese ... bfreese77@cox.net
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| Don R | Howard R |
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| Johnaton M | Joe G |
| Clark L | |

Meetings are held the **1st Tuesday of the month** at the **Anthem Civic Building**, 3701 W Anthem Way, Anthem, AZ 85086. General meeting at 6:30 pm. We **do not meet in July or August.**

DMRMCLUB@GMAIL.COM

Membership Dues:
 First year \$30, then \$20.00 Adults per Person
 First year \$45, then \$25.00 Family (2 people)

Meeting Dates for 2020

Jan 7, Feb 4, Mar 3, Apr 7, May 5, June 2, Sept 1, Oct 6, Nov 3, Dec 1

MEETINGS CANCELLED UNTIL FURTHER NOTICE DUE TO COVID-19 RESTRICTIONS

WIRE-WRAPPING CLASS

4:30-6:30 pm

Prior to the meeting

Bring: cab or stone, about quarter-sized or larger; 26 and 18 or 20 gauge copper-based wire; round nose pliers and flush wire cutter, beads (optional), little clamps, masking tape, E6000 jewelry glue.

Free, but donations are appreciated.

Questions? Contact Jennifer at

Jennifer@eliteshuttersandblinds.com

MEETINGS ARE ON HIATUS FOR THE SUMMER NOW. HOPEFULLY, WE WILL BE ABLE TO RESUME IN THE FALL

BRING PAPER & A PEN TOO!

Looking for something to practice while you hunker down at home? Browse YouTube and Pinterest for tutorials. They are great resources -- no substitute for the personal attention of Jennifer, of course.

NEEDED: QUALITY MINERAL (or OTHER) DONATIONS WITH LABELS -- for monthly raffle prizes; and for raffle, door prizes, and sales tables at the annual show. If you have specimens to donate, please see Robin Shannon. The Daisy Mountain Rock and Mineral Club is a 501(c)(3) non-profit organization, and will gratefully acknowledge your donation with a Tax Deduction Letter. Thank You!

NOTE FROM THE EDITORS

Have a geological interest? Been somewhere interesting? Have pictures from a club trip? Collected some great material? Send us pictures -- or write a short story (pictures would be great).

Deadline for the newsletter is the 22nd of the month.

Mail or Email submissions to:

Susan Celestian

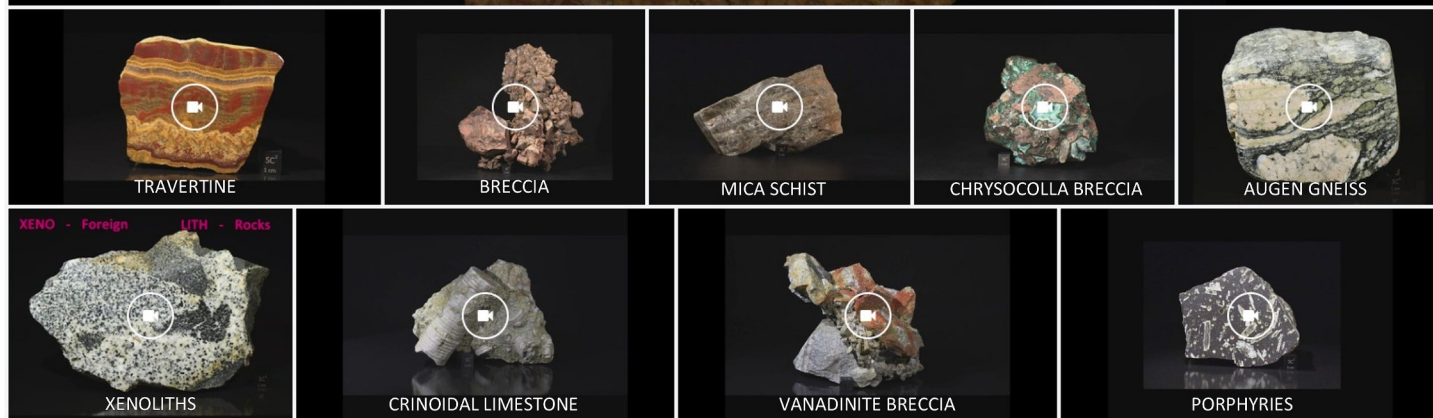
6415 N 183rd Av

Waddell, AZ 85355

azrocklady@gmail.com



Visit <http://rmfms.org/> for news about conventions, events, and associated clubs. If you are travelling, you might want to contact a club local to your destination. Maybe they have a field trip you could join, while in town.



Stan Celestian has been busy cutting and polishing cool rock specimens. Then he has created -- and continues to create -- a series of short educational videos about those rocks.

<https://www.flickr.com/photos/usageology/albums/72157715046432652>

UPCOMING AZ MINERAL SHOWS

July 31-August 2 - Prescott Valley, AZ Prescott Gem & Mineral Club; Findley Toyota Center, 3201 N Main St; Fri-Sat 9-5, Sun 9-4; Admission: adults \$5, seniors, vets, students \$4, children under 12 free.

CANCELLED

September 25-27 - Clarkdale, AZ Mingus Gem & Mineral Club; Clark Memorial Clubhouse Auditorium, 19 North St; Fri-Sat 9-5, Sun 10-5; Admission: free.

October 9-11 - Buckeye, AZ West Valley Rock & Mineral Club; Buckeye Arena, 802 N 1st St; Fri-Sat 9-5, Sun 9-2; Admission: adults \$3, children under 13 free. See Poster on page 16.

October 10-11 - Sierra Vista, AZ Huachuca Mineral & Gem Club; Cochise College, 901 N Colombo Av; Sat 9-5, Sun 10-4; Admission: free.

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

This schedule could change due to pandemic-driven policies. Check The Vug (URL above) for announcements, phone numbers, or club websites to confirm that a show will go on.



A woman with three men panning for gold during the California Gold Rush. Credit: By Unknown - <http://www.neatorama.com/2013/11/05/Gold-Rush-Girls/>, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=52272060> (Public domain.)

INTERESTED IN PHOTOS OF OLD MINES & MINING IN ARIZONA?

<https://azmemory.azlibrary.gov/digital/collection/shmining>

http://repository.azgs.az.gov/uri_qin/azgs/dlio/1428

<https://azmemory.azlibrary.gov/digital/custom/photographs>

<https://bisbeemuseum.org/bm-photo-archive.aspx>

<https://arizonahistoricalociety.org/research/library-archives/>
(OR Visit the museum in Tucson)

Visit the Jerome Historical Society

<http://www.azarchivesonline.org/xtf/search>

<https://westernmininghistory.com/1328/a-collection-of-arizona-mining-photos/>

https://tucson.com/news/local/photos-san-manuel-mine-smelter-and-town-in-1950s-70s/collection_b0312336-d14a-5359-8f30-78973fdb0f5b.html#2

<https://www.archives.gov/research/american-west>

<https://www.mininghistoryassociation.org/links.htm>

IN MANY CASES, YOU WILL HAVE A WIDER SELECTION OF PHOTOS IF YOU GO IN PERSON TO THE MUSEUM, UNIVERSITY, LIBRARY OR OTHER FACILITY.



Helzarockin' Gem & Mineral Show



Oct 9-11 2020
Buckeye Arena 802 N 1st Street



9 a.m. - 5 p.m. Friday & Saturday
9 a.m. - 2 p.m. Sunday

Arizona Early Days Gas Engine & Tractor Association
Saturday Only

Adults \$3 kids under 13 Free
Free Scavenger Hunt for the kids!