Daisy Mountain Rockchips

VOLUME 1, ISSUE 2 DECEMBER 2016

WHAT ARE IGNEOUS ROCKS??

By Susan Celestian

All igneous rocks originate as molten rock, or *magma*. As magma cools, crystals form sequentially, and ultimately a solid crystalline rock is formed.

Intrusive (or Plutonic) - form at depth, beneath Earth's surface

Extrusive (Volcanic) - form at the Earth's surface (magma at the surface is called *lava*)

There are two types of igneous rocks:

Intrusive rocks cool very slowly, giving ions enough time to link up, and build visible crystals. These rocks will be coarse-grained — comprised of interlocking crystals of various minerals.

On the other hand, volcanic igneous rocks are obviously extrusive. Extrusive rocks cool fairly quickly, and there is little time for crystals to form, so crystals tend to be very small; and as a result, extrusive rocks are fine-grained. They generally exhibit as one color (black, red, brown…), with few or no visible crystals.

Commonly, in both intrusive and extrusive igneous rocks, there may be distinctive crystals, called *phenocrysts.* Phenocrysts are crystals that form in a period of time during which a magma cools very slowly. Subsequently, the magma cools more quickly. The result, in intrusive igneous rocks, is a rock with very large crystals "floating" among smaller, yet still visible, crystals. In the case of extrusive igneous rocks, visible crystals "floating" throughout the fine-grained background. Igneous rocks that exhibit these two stages of cooling are called *porphyritic*. See Figures 1 and 2.

The minerals within a cooling magma crystallize out in a specific order. This order is depicted by Bowen's Reaction Series (Figure 3). While the composition of magmas differ, the first crystals to form are found toward the top of the diagram. And it is those crystals that are found as phenocrysts. See Figure 3.

Igneous Rocks continued on page 5……

NEW CLUB EMAIL ADDRESS

There is now a club email address: dmrmclub@gmail.com This will make the club more accessible to non-members, as it will be a consistent contact point.

PRESIDENT'S VIEW

Happy New Year,

With the arrival of the New Year we are witnessing a changing of the guard in many positions in our Club's leadership. This is a good and inevitable thing that we all welcome. The fact that we have members who will step up and take responsibility to see that the Daisy Mountain Rock and Mineral Club continues to grow and contribute to the North Valley is a tribute to all of us.

That said it is important to give thanks for those officers who have decided to step aside or move to another position for all they have done. First among them is Bob Salter, who will be moving from vice-president to the board of trustees. Bob is a founding member of the club. He has contributed in so many ways it would take more than this tribute to cover all of them. Bob has led our field trip committee, a vital part of our club, and one of the chief reasons for its success. He has always been available to answer member's questions about rocks, or explain what we are looking at when we are in the field. He has gone out to schools to talk about the wonders of the Earth, and in doing so has sparked

President's View continued on page 19……

INSIDE THIS ISSUE

Meeting Minutes — December 6, 2016

President Ed Winbourne called the meeting to order at 6:50 p.m.

Meeting Speaker:

Gary Carter was introduced as speaker for the meeting. Gary spoke about his efforts to obtain information on the Vulture mine. He received photos from many sources in and out of the State of Arizona and remarked he surprisingly received a quick response with photos of specimens from the Smithsonian Museum. Henry Wickenburg and two others discovered the Vulture mine seeking gold. The Vulture mine property is currently owned by Vulture Peak Gold. He stated they are profitably working the mine and have processed one hundred tons per day.

Door Prizes

Differing rock and mineral specimens were donated by Dave Hanline, Stan Celestian, and Ed Winbourne. Door prize winners were: Tiffany Poetch, Bob Salter, Linda Roose, and Dan Allred.

Executive Board Meeting Minutes

A summary of the meeting and minutes was presented by Board Secretary Victoria Peterson. Following are listed motions made and carried: 1) Bill Smardo named as new Education Coordinator. 2) Cynthia Buckner to provide a $35 honorarium to Club meeting speakers in lieu of providing a dinner. 3) Establish a Show marketing budget of not to exceed $1,400.

Field Trip Committee Report

Bob Salter reported the field trip to Nevada was a great success with everyone obtaining great samples. The field trip Saturday, December 10, will meet at the Civic Center at 7:30 a.m. and a 4 wheel drive or high clearance vehicle will be necessary. (note: this was originally reported as meeting at the Community Center; however, due to a large number of people attending a function there, it was changed to Civic Center)

Saturday, December 17, Bob has planned a field trip to a garden/landscape company at the vicinity of Cave Creek and Happy Valley Roads. This company has a wide variety of rocks, and minerals which the owner has purchased from large collection over the world. It is a very interesting place for everyone to view. Those attending will meet at the Community Center at 9:30 a.m.

2017 Show Report

Ed Winbourne reported on the Show stating that Kathie Marvin will head up the Marketing Committee for the Show. He stated that so far we have received over $3,000 from Vendors and that Vendors are on a waiting list. There will be a Show meeting on Friday, December 9, from 4 to 5 p.m.

Treasurer's Report

Cynthia, Board Treasurer, reported we have $431.31 in the bank which covers the last four quarters report. She will be handling payment at the Show and will deposit same in the bank at the earliest opportunity.

Newsletter

A special thanks was expressed to Susan and Stan Celestian for a wonderful newsletter.

Election of 2017 Officers

Ed Winbourne presented the following slate of Board members for the 2017 year: Bob Evans, Whit Revell, Tiffany Poetch, Jennifer Gecho, Susan Celestian, Stan Celestian, Ed Winbourne, Cynthia Buckner, Victoria Peterson, Jim Reed, and Bob Salter.

Motion made: By acclamation, the above listed people were elected to the 2017 Board of Trustees.

There being no further business, the meeting adjourned at 8:10 p.m.

Respectfully submitted,

Victoria Peterson

Secretary

DMRMC next meeting – Tuesday, January 3, 6:30 p.m., Anthem Civic Center; Wire Wrapping Class – before meeting at 4:30

NOTE FROM THE EDITORS

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). We encourage topic suggestions also.

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

FIELD TO THE PURPLE PASSION MINE

All photos by Susan Celestian

On December 10, 2016 the Daisy Mt Rock and Mineral Club had a great turn-out for a field trip to the Purple Passion Mine, near Wickenburg, Arizona. Also known as the Diamond Joe Mine, this is an abandoned silver-lead-gold-copper-molybdenum mine that was discovered in 1890, and worked intermittently between 1901 and 1926, and again in 1945. It was re-opened in the early years at the turn of the 21st century, and mined for "fuzzy" wulfenite (epitaxial wulfenite on wulfenite) specimens. Additionally, a lot of material sold was as very colorful fluorescent specimens.

Overview of the Purple Passion Mine, from across the valley.

COLLECTING

Dan and Pam LOADED up!

Yellow Velvet Ant (really female wasp) (*Dasymutilla eminentia*)

Pallis-winged Grasshopper (*Trimerotropis pallidipennis*)

Purple Passion continued on page 4.....

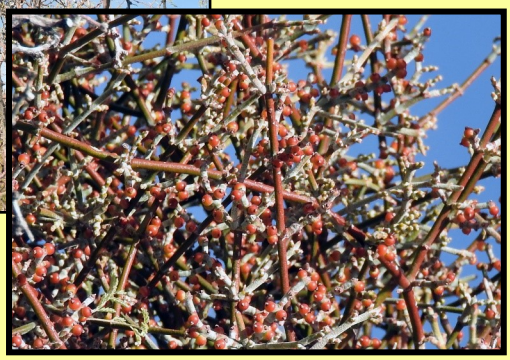
….Purple Passion continued from page 3

Dapper Joe hammers away

Ed Winbourne manages the improvised "dark" room for fluorescent investigations

Dan Allred's bright pink bucket lights the way!

Bruce Courson brought his own portable dark "room"



Mistletoe (*Phoradendron californicum)* or desert mistletoe can be seen as a leafless clump growing on palo verde and mesquite trees, in the Mohave and Sonoran deserts. It is hemi-parasitic, as it takes water and minerals from the host tree, but performs its own photosynthesis. The plant contains toxins that when ingested can cause high blood pressure, slowed heart rate, convulsions, and cardiac arrest.

Fishhook Barrel, Arizona Barrel, or Candy Barrel Cactus (*Ferocactus wislizeni*) It is also called the compass cactus, as it leans south, toward the Sun. It lives 50-100 years.

Purple Passion continued on page 11….

....Igneous Rocks continued from page 1

FIGURE 1 Porphyritic Granite In this intrusive rock you can see extra-large rectangular crystals of pink feldspar, surrounded by visible black and white crystals (quartz, feldspar, biotite). *Photo by Stan Celestian*

FIGURE 2 Porphyritic Basalt - In this extrusive rock, you can see large rectangular crystals of white feldspar, surrounded by a fine-grained black background. *Photo by Stan Celestian*

Igneous Rocks continued on page 6…...

UPCOMING FIELD TRIPS

WHEN: Saturday January 21, 2017

WHERE: DRAGON MINE

WHAT: Muscovite Mica (pink/lilac), Tourmaline, and Quartz Geodes and Thunder Eggs, Agate

MEET: McDonalds in Wickenburg (be ready to go at 9:00 AM sharp!)

WHEN: Saturday February 4, 2017

WHERE: AQUARIUS MOUNTAINS

WHAT: Garnet Crystals in Rhyolite

MEET: McDonalds in Wickenburg (be ready to go at 8:00 AM sharp!)

WHEN: Saturday March 4, 2017

WHERE: PLANET MINE

WHAT: Hematite, Chrysocolla, Malachite

MEET: TBD

WHEN: Saturday April 1, 2017

WHERE: Kohl's Ranch Area

WHAT: Zebra Agate, Peach colored agate, Fossils of the Naco Formation

MEET: TBD

WHEN: Saturday and Sunday, April 8,9, 2017

WHERE: Round Mountain

WHAT: Agate, Geodes, Quartz

MEET: TBD

WHEN: Saturday May 6, 2017 (tentative)

WHERE: Reserve Bank Mine

WHAT: Copper Minerals, Underground Tour

MEET: McDonalds in Wickenburg (Time TBD)

WHEN: Saturday June 3, 2017

WHERE: Lynx Creek

WHAT: Gold

MEET: TBD

Other field trips are being considered and information will be posted in the monthly newsletter and described at meetings, or via email.

DATES SUBJECT TO CHANGE

....Igneous Rocks continued from page 5

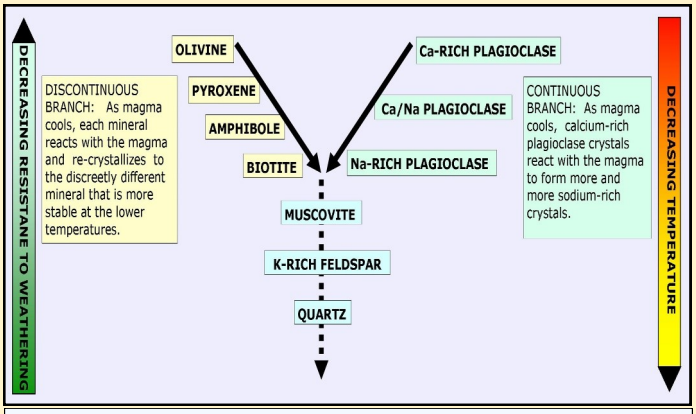


FIGURE 3 *Bowen's Reaction Series* This diagram depicts the order in which minerals crystallize in a cooling magma. (Enlarge for better view.) *Diagram by Susan Celestian*

Igneous rocks are classified on the basis of their composition, and their grain size. See Figure 4.

	Light color	Intermediate	Dark color	Very Dark color
Coarse-grained; intrusive	**GRANITE** *grays, pinks, (red) * visible quartz *K-feldspar, muscovite, biotite, hornblende	**DIORITE** *salt and pepper *no visible quartz *plagioclase, K-feldspar, hornblende, biotite	**GABBRO** *black * no visible quartz, often visible olivine *plagioclase, pyroxene	**DUNITE[1], PERIDOTITE[2], PYROXENITE[3]** *black to olive green * no quartz *[1]mostly olivine, [2]mostlyolivine/ pyroxene, [3]mostly pyroxene
Fine-grained; extrusive	**RHYOLITE** *white, lt gray, pinks * very viscous lava * stratovolcanoes; domes	**ANDESITE** *med-dk gray * very viscous lava * stratovolcanoes	**BASALT** *black, dk gray, rust red * very fluid lava * shield volcanoes	**KOMATIITE** *black to olive green * very very fluid lava *rare outside of the Archean (2.5-4 bya
	FELSIC	INTERMEDIATE	MAFIC	ULTRAMAFIC

OBSIDIAN →
*glassy, black, rust-red, greenish, felsic to mafic, but predominately felsic in composition

PUMICE →
*glassy froth: white, yellow, brown, black; felsic to mafic, predominately felsic

Decreasing % Silica →

Increasing % Iron and Magnesium →

FIGURE 4 Igneous Rock Chart, showing the relative compositions and relationships of the igneous rocks. *Table by Susan Celestian*

As mentioned before, intrusive igneous rocks cool very slowly, giving ions enough time to link up, and build visible crystals. These coarse-grained rocks include granite, diorite, and gabbro. This month we will look at granite.

GRANITE is coarse-grained, with visible crystals of quartz, potassium feldspar (K-feldspar or K-spar), plus muscovite, and possible associates — plagioclase, biotite and/or hornblende. (As the percentage of plagioclase feldspar increases, granite grades into a more intermediate composition — grano-diorite — however, this is not a distinction one can make visually. In fact, many rocks we refer to as granite, may in fact be grano-diorites. But at this point, let's not split hairs.)

Granite is common within continental crust, and is the most abundant of rocks comprising the *basement rocks* — those rocks forming the foundations of the continents, and over which sedimentary rocks have been laid.

Most granite probably forms in convergent zones, (or inland from the immediate zone) where two tectonic plates collide. (For example, when an oceanic plate (underlain by basalt), collides with a continental plate (granitic composition), the heavier oceanic plate will dive down (subduct) under the more buoyant continental plate, dragging with it oceanic sediments and water. See Figure 5, on page 7.

At a depth of about 62 miles (100 kilometers), the oceanic plate and sediments begin to melt. Recall, from Bowen's Reaction Series, that the minerals that form at the lowest temperatures, are the first to melt (See Figure 3, page 5). So, the first minerals to melt are those lowest in ferromagnesian minerals (potassium & sodium feldspars, micas, quartz). As these minerals melt, they begin to rise (molten rock being less dense than solid rock), through the continental crust. Magma moves upward by forcing its way into weak areas/cracks (stoping) and melting (assimilating) rocks it encounters. Rocks melted on the way upward, are assimilated into the rising magma, contributing further to the creation of a magma of

Igneous Rocks continued on page 7…...

....Igneous Rocks continued from page 6

granitic composition (See Figure 6).

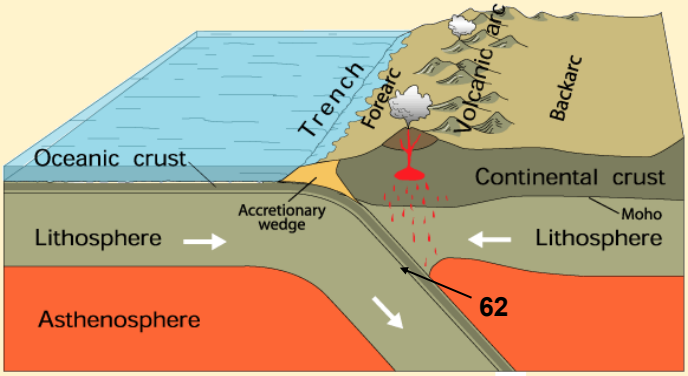


FIGURE 5 Oceanic-Continental Convergence Where an oceanic plate collides with a continental plate, the oceanic plate with subduct. *Graphic courtesy of the USGS*

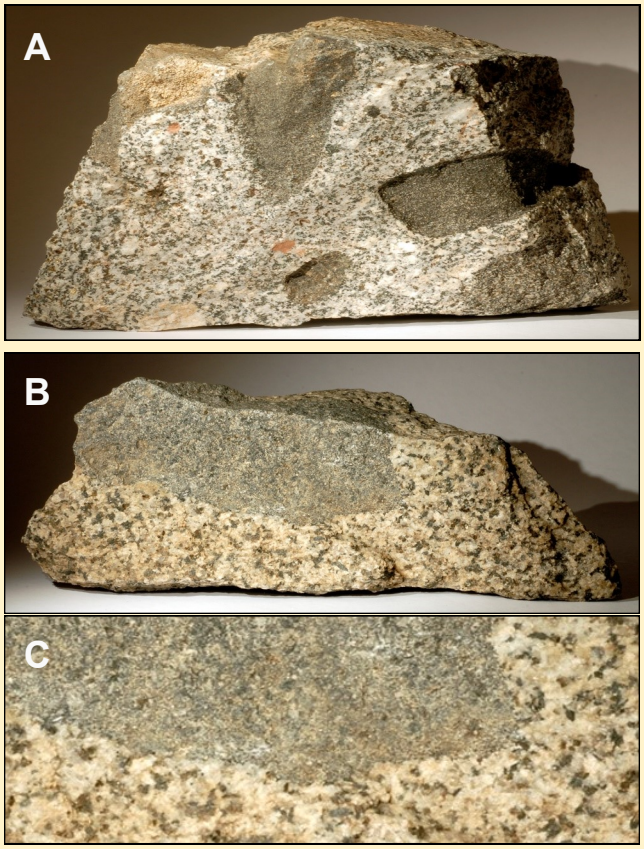


FIGURE 6 Xenoliths in Granite Xenoliths are bits of rock through which a granite has moved. These bits have not melted, although you can see in 'C' that the granite/xenolith boundary is indistinct. The incorporation of the rock of which xenoliths are composed, will alter the composition of the rising magma body. *Photos by Stan Celestian*

At some point (but still miles below Earth's surface), the magma will cool, to form bodies (*plutons*) of granite, often constituting the cores of mountain belts.

Bodies of granite -- plus diorite and gabbro -- (*plutons*) occur as batholiths, stocks, laccoliths, dikes, and sills.

- *Batholiths* are very large bodies, with a surface exposure exceeding 40 square miles.
- *Stocks* are smaller, with a surface exposure less than 40 square miles.
- *Laccoliths* are formed when large bodies of magma intrude between sedimentary layers to form a flat-bottomed, domed bodies.
- *Dikes* are sheet intrusions that cut across sedimentary layers or into a rock mass.
- *Sills* are sheet intrusions that conform to sedimentary layers or metamorphic foliation.

Heat radiating from granitic magma bodies (or any magma body, for that matter) will metamorphose surrounding rocks. As a result, it is very common for large granite bodies to be surrounded by "rings" of metamorphic rock, with the highest-grade metamorphic rocks occurring closest to the granite, and the degree of metamorphism decreasing outward to un-metamorphosed country rock. See Figure 7.

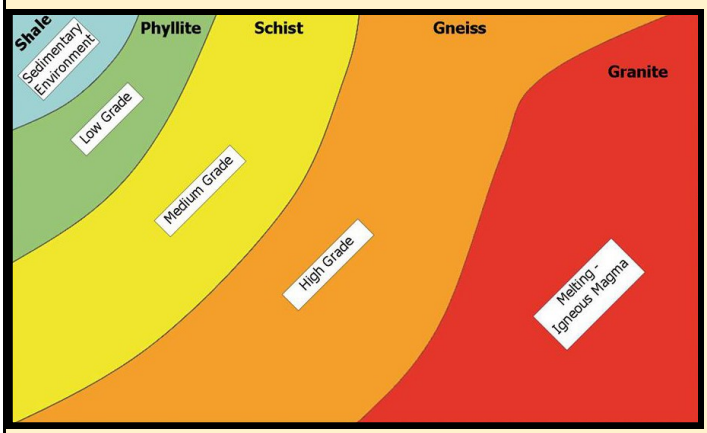


FIGURE 7 Metamorphism Around a Granitic Body As heat radiates outward from a hot magma body, the country rock is metamorphosed, with the grade of metamorphism decreasing with distance from the magma. *Diagram by Stan Celestian*

Igneous Rocks continued on page 8…...

….Igneous Rocks continued from page 7

As previously mentioned, granite forms at great depth. For example, indications are that the rocks forming Piestewa Peak (near Phoenix) crystallized at a depth of over 6 miles (10 km). That means that for us to see them at the Earth's surface, over 6 miles of rocks have been removed by erosion!!!

Some of the oldest rocks on Earth are granites. In Arizona, granite is seen in the mountains and features of central and southern parts of the state, and the Grand Canyon, including the following topographic features:

(by = billions of years, my = millions of years)

White Tank Mts. - 2+ by & 35 my

South Mt. - 25-35 my

Camelback Mt (the hump) - 1.5 by

Granite Dells (Prescott) - 1.4 by

Santa Catalina Mts. - 1.44 by & 72-45 my

Texas Canyon (east of Benson) - technically the rocks are quartz monzonite - 50 my

Inner gorge of Grand Canyon - 1.4-1.7 by

Bagdad Mine (& others) - 1.6 by

Physical and chemical weathering of granite produces some distinctive topographic features.

- As the erosion removes the weight of overlying rocks, granite tends to crack along curved planes, roughly parallel to the surface. These are called exfoliation joints. This produces rounded topography, such as the exfoliation dome, of which Half Dome in Yosemite is a classic example. See Figures 8 & 9.

FIGURE 8 Exfoliation joints Exfoliation joints in granite, resulting from unloading, are exposed along a road in Yosemite National Park. *Photo by Stan Celestian*

FIGURE 9 Exfoliation Dome Half-Dome, in Yosemite National Park, is what remains of an exfoliation dome (the other half was removed by glaciers). *Photo by Stan Celestian*

Igneous Rocks continued on page 9…...

....Igneous Rocks continued from page 8

- Exposure to weak acids at the Earth's surface, cause the chemical breakdown of the feldspars, micas, and ferromagnesian minerals in granite. This may result in fields of rounded boulders (spheroidal weathering (Figure 10) — a topic for another day) and ultimately the rock disintegrates to form *grus* — coarse-grained, angular sediment composed of fragments of granite. Grus is the stuff many of us have purchased and spread on our yards.

FIGURE 10 Spheroidal Weathering of Granite This scene in Texas Canyon, east of Benson, Arizona, is a result of the weathering of granite to produce rounded boulders. *Photo by Stan Celestian*

Granite textures, composition, and colors can vary quite a bit. What all granites have in common are:

- Basic components of quartz and K-feldspar
- Coarse-grained
- Typically light-colored

Figures 11-16 illustrate the variability possible under the umbrella of Granite.

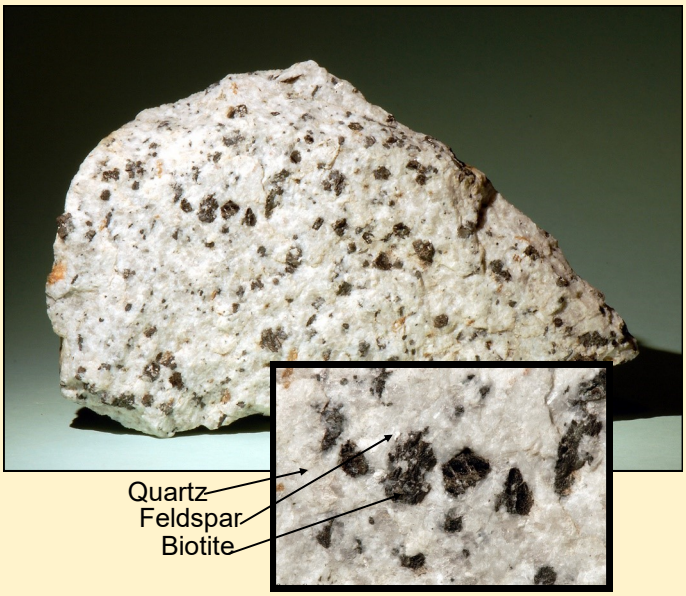


FIGURE 11 Granite from Southern California
Photo by Stan Celestian

FIGURE 12 Fine-grained Granite This granite is of similar color(s), but much finer-gained than that in Figure 11. Minerals visible are muscovite, biotite, K-feldspar, and quartz. *Photo by Stan Celestian*

Igneous Rocks continued on page 10...

....Igneous Rocks continued from page 9

FIGURE 13 Porphyritic Granite This granite is composed of large crystals of quartz, white K-feldspar, biotite — and extra large orange-ish crystals of K-feldspar. The two grain sizes in this rock make it a *porphyry*. There were two stages of cooling — one period of very slow cooling, during which the extra large crystals of K-feldspar formed, followed by a period of slow, but faster, period of cooling, during which the rest of the crystals formed. *Photo by Stan Celestian*

FIGURE 14 Porphyritic Granite This granite, from near Bagdad, Arizona, is composed primarily of quartz and K-feldspar. There two sizes of feldspar crystals, with some very obvious very large K-feldspar crystals. These crystals are easily freed from the host rock, making them very collectable. *Photo by Stan Celestian*

For more pictures of Intrusive Igneous Rocks, check out this link on Stan's Flicker web site:

Intrusive Igneous Rocks: https://www.flickr.com/photos/usageology/albums/72157631516253343

FIGURE 15 Graphic Granite This intergrowth of quartz (gray) and Na-feldspar (milky white) resembles ancient writing - hence the name. Locality - Buckeye Hills near Buckeye, AZ *Photo by Stan Celestian*

FIGURE 16 Coarse Granite This polished fragment of granite countertop clearly reveals fairly large crystals of gray granite, pink feldspar, and black biotite. *Photo by Stan Celestian*

....Purple Passion continued from page 4

Strawberry or Englemen's Hedgehog (*Echinocereus engelmannii*)

Robin Shannon burrows deep into the hillside in pursuit of wulfenite -- one specimen to the left.

Ocotillo (*Fouquieria splendens*) is also called Jacob's Staff, Candlewood, and Coachwhip. Bathing in water infused with its crushed flowers or roots has been reputed to relieve fatigue.

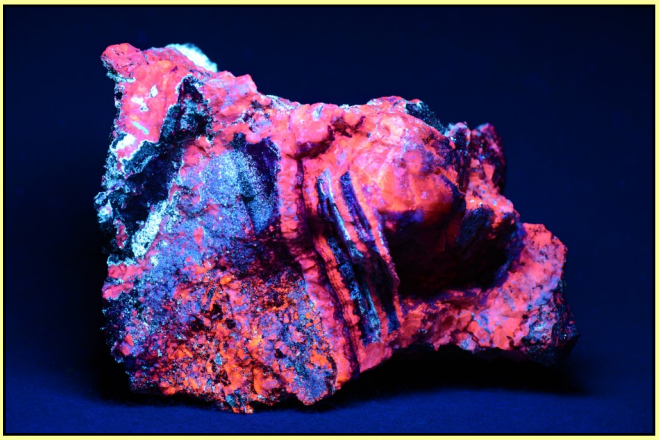
Teddy Bear or Jumping Cholla (*Cylindropuntia bigelovii*) -- carry a comb to relieve your calf of segments of this cactus.

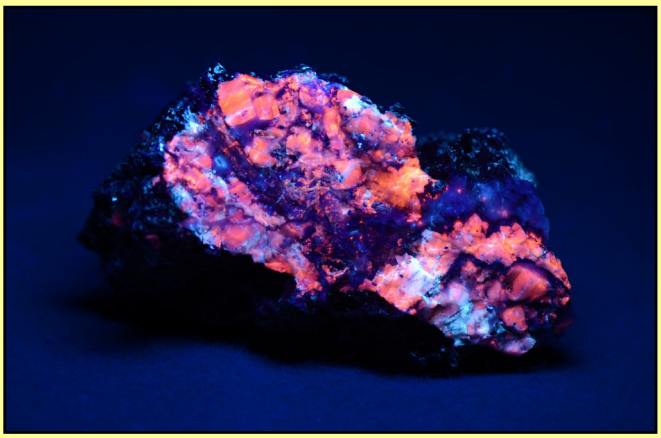
Pencil or Diamond Cholla (*Cylindropuntia ramosissima)*

....Purple Passion continued from page 11

Along the road out to the mine, we passed many interesting features, including these dikes (see arrows). Dikes are igneous bodies of rock formed when magma is injected into host -- previously existing -- bodies of rock. (When the latter is sedimentary, dikes cut across the layers.) Generally, there is a baked zone, within the host rock adjacent to the dike; and a chilled zone, within the dike adjacent to the host (the heat from the dike cooks the host; the dike cools faster adjacent to the cooler host). Since there is often some melting, the contact between the two rocks may be 'blurry'.

Here are some fluorescing samples from Stan Celestian -- nobody else sent me pix 





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=page_internal

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

January 6-8 - Mesa, AZ Flagg Foundation; Mesa Community College, Dobson, north of US 60; Daily 9-5; free.

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; St 9-5, Sun 10-4; $3/adult, $1 students, children under 12 free. http://www.ajrockclub.com/About_Who_We_are_AnnualShow.html

March 25-26 - Anthem, AZ Daisy Mountain Rock and Mineral Club; Boulder Creek High School Gym,

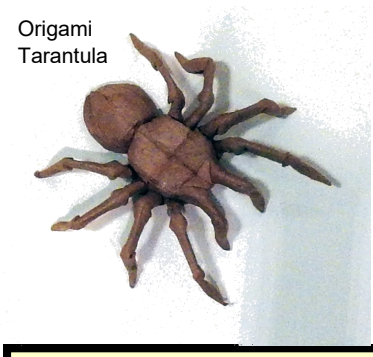
If you are travelling, a good source AND clubs is http://www.the-vug.com/vug/vugshows.html or http://www.rockngem.com/ShowDatesFiles/ShowDatesDisplayAll.php?ShowState=AZ For out-of-the-country shows: http://www.mindat.org/shows.php?current=1 A good source for a list of Arizona Mineral Clubs and contact information is http://whitemountain-azrockclub.org/Public_AZ_Clubs_Links.html

Dues are past due!

MAIL TO: Daisy Mountain Rock and Mineral Club, Post Office Box 74215, Anthem, AZ 85086.

Spectacular desert sunset from Litchfield Park on December. 14th *WOW!* Has there been a volcanic eruption lately? *Photo by Susan Celestian*

Origami Tarantula



Heading to the LA area any time soon? Try to go to Huntington Library and Gardens. This tarantula is part of an exhibit of Robert J Lang's origami, through January 29, 2017. Amazing! *Photo by Susan Celestian*

Officers and Chairpersons

President: Ed Winbourne.....ewinbourne@gmail.com
Vice President: Bob Salter
Secretary: Victoria Peterson
Treasurer: Cynthia Buckner
Publicity: Kathy Marvin
Membership: Victoria Peterson..... g.victoriapeterson@yahoo.com
Editors: Susan & Stan Celestian..... azrocklady@gmail.com
Field Trip: Bob Salter
Show Chair: Ed Winbourne

Meetings are held the **1st Tuesday of the month** at **the Anthem Civic Building**, 3701 W Anthem Way, Anthem, AZ 85086. Business meeting at 6:30 pm. We do not meet in the summer — **no meetings in June, July or August**.

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.

Membership Dues: **$20.00 Adults per Person**
$25.00 Family

Meeting Dates for 2017

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

PEGMATITE MINERALS... What Good are They?

Since the upcoming field trip is to the Dragon Mine, it might be interesting to take a close look at the primary constituent minerals — Quartz, Potassium Feldspar (K-Feldspar), and Mica — most pegmatites being felsic (or having the general composition of granite).

Pegmatites are related to magma bodies. As a large magma mass cools, the components that are not part of the make-up of the primary minerals, are excluded — water, excess silica and basic ions, and exotic elements (such as lithium, beryllium, niobium, tantalum, and rare earths).

Pegmatites essentially form out of hydrothermal water, rather than magma. As such, the atoms are very free to move about, and thus very large crystals may form. The crystal size is a diagnostic property of pegmatites. And their unique chemical concentrations make them a frequent source of gemstone minerals — except in Arizona ☺

K-FELDSPAR

Composition - $KAlSi_3O_8$
System - *Monoclinic (Orthoclase); Triclinic (Microcline)*
Color - *Clear, white, pink to flesh, greyish, blue-green (Microcline)*
Luster - *Vitreous to pearly*
Streak - *White*
Hardness - *6-6.5*
Density - *2.55*
Fracture/Cleavage - *2 directions of cleavage, at 90° to each other*

Feldspar is really a group of twenty mineral species (potassium-K, sodium-Na and calcium-Ca silicates), that make up to 60% of Earth's crust. The most common feldspars in pegmatites are Orthoclase and Microcline. Usually found as large masses, crystals tend to be rectangular and lath-like, and the two perpendicular cleavages give feldspars a blocky appearance. See Figures 17 and 18.

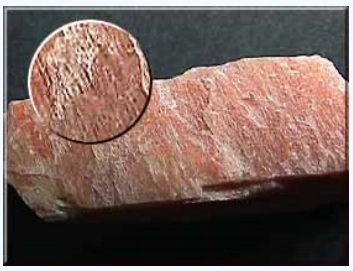


FIGURE 17 Upper Left - Orthoclase crystals from near Bagdad, Arizona *Photo by Stan Celestian ;* FIGURE 18 *Lower Left* - Cleavage fragment of orthoclase -- note right angles and blocky look. *Photo courtesy of the USGS*

USES of K-Feldspar

- flux in glass and ceramic making (accounts for 70% of feldspar mined)
- bathroom appliances, building tiles, electrical insulators
- poultry grit
- filler/extender in paint
- minor aggregate in concrete
- gemstones (moonstone & amazonite)

QUARTZ

Composition - *SiO_2*
System - *Trigonal*
Color - *Clear, white, pink, purple, green, yellow, brown, black*
Luster - *Vitreous*
Streak - *White*
Hardness - *7*
Density - *2.65*
Fracture/Cleavage - *No cleavage, conchoidal to subconchoidal fracture*

The second most abundant mineral in the Earth's crust is Quartz (or the most abundant discreet mineral species). It is a quite variable mineral, occurring from coarse-grained to microcrystalline (chert, agate); and the color may vary, depending on impurities or disruptions of the atomic structure. See Figures 19 & 20.

Though generally massive, distinct crystals of quartz are fairly common in pegmatites. They have a distinctive form — tall, six-sided prisms terminated by six faces coming to a point. Varieties most often encountered in pegmatites are:

Pegmatites continued on page 15...

...Pegmatites continued from page 14

- ◊ Rock Crystal — this quartz is clear
- ◊ Milky — white, due to fluid inclusions of gas and/or liquid
- ◊ Rose — pink, due to iron, titanium or manganese as impurities, though may be due to micro-fibers of a mineral, such as dumortierite
- ◊ Amethyst — purple, due to disruptions of the atomic structure (color centers), caused by gamma radiation changing the oxidation state of iron impurities
- ◊ Citrine — yellow to yellow-brown, due to iron as an impurity. May be related to radiation, as most commercial citrine is created by heat-treating amethyst or smoky
- ◊ Smoky — brown to black, due to irradiation and trace aluminum: (i.e. *color centers -- a topic for a future newsletter*)

FIGURE 19 Typical milky quartz from a pegmatite near Cleator, AZ. Note the lack of cleavage and distinct vitreous luster. The silver-colored mineral is molybdenite. *Photo by Stan Celestian*

FIGURE 20 Typical Rock Crystal Quartz crystals from Arkansas pegmatite. *Photo by Stan Celestian*

USES of Quartz

- ♦ glass - quartz is the primary component
- ♦ abrasives (sand blasting, sandpaper)
- ♦ filter for liquids
- ♦ aggregate in cement/mortar
- ♦ watches/clocks - quartz is piezoelectric, meaning that it will generate an electric current when stressed. The current of a battery provides the stress, and the deformed quartz wafer will vibrate imperturbably at a rate suitable for powering accurate time pieces
- ♦ gemstones
- ♦ flame-resistant bricks in the ceramics industry
- ♦ sand — as quartz is chemically stable and physically durable, it persists at the Earth's surface
- ♦ source of silicon, used in the electronic circuit industry, solar cells, and more

MICA

Composition - $KAl_2(AlSi_3O_{10})(F,OH)$ - Muscovite; $K(Li,Al,Rb)_3(Al,Si)_4O_{10}(F,OH)_2$ - Lepidolite
System - *Monoclinic*
Color - *Clear, white, gray, silvery (Muscovite); lilac, pink, rose, yellowish (Lepidolite)*
Luster - *Vitreous*
Streak - *White*
Hardness - *2-2.5*
Density - *2.76-3*
Fracture/Cleavage - *1 direction of perfect cleavage*

Mica constitutes a large group of 47 minerals, although there are about 8 common ones, including Biotite, Lepidolite, Muscovite, and Phlogopite. Muscovite is the most common mica in pegmatites, with Lepidolite a less common second.

The atomic structure is layered or sheeted, with each layer weakly bonded to the next. As a result, micas easily separate (cleave) along those weak bonds, into elastic and flexible sheets or flakes. Mica is reflective, elastic, easily cut, lightweight, electrically resistant, insulating, and chemically inert — all properties that are industrially useful. See Figures 21& 22.

Pegmatites continued on page 16

...Pegmatites continued from page 15

FIGURE 21 Typical muscovite with feldspar and quartz.. Note the sheet-like cleavage. *Photo by Stan Celestian*

FIGURE 22 Star mica, formed by twinning, from a Brazilian pegmatite. *Photo by Stan Celestian*

USES of Muscovite

- **HISTORICAL**: *Isinglass* — sheets of mica used as window panes, windows in ovens, kilns, lanterns, heaters; dial covers in fighter planes during WWII
- **SHEET**: electrical insulators, supports for heating wire, optical filters, windows in radiation detectors, dial covers, diaphragms in oxygen-breathing equipment, capacitors (high frequency & radio)
- **GROUND**: filler/extender in joint compound, in paint to enhance resistance to water penetration and prevent shrinking, sealant in well-drilling muds, coating between asphalt shingles to prevent sticking, decorative sparkle in stucco, paint & pottery, asbestos substitute in brakes and clutches, reflective component in cosmetics, abrasive in some toothpastes, durability additive to axle grease, soil conditioner
- **COMPOSITE**: sheets of compressed and bonded mica flakes are used as electrical insulation (look behind the wires in your toaster) and in kiln, smelters, and furnaces

LARGE CRYSTALS

(note that most occur in pegmatites!)

62' Microcline (Devil's Hole Beryl Mine, CO)
59' Beryl (Bumpus Quarry, ME) FIGURE 23
47' Spodumene (Etta mine, SD)
39' Gypsum (Naica, Mexico)
33' Phlogopite (Lacey Mine, Ontario)
Almost 33' Orthoclase (Urals, Russia)
23' Calcite (Kramer, CA)
20' Quartz (Itapore, Goiaz, Brazil)
15' Muscovite (Inikurti Mine, India)
Almost 10' Biotite (Rosas, Norway)
10' diameter, 15' thick Muscovite (Holland)
7.5' diameter Garnet (Kristiansand, Norway)

EDITOR'S NOTE: My college mineralogy professor told of a single Spodumene(?) crystal, in New England, that he followed for over 1/4 mile.

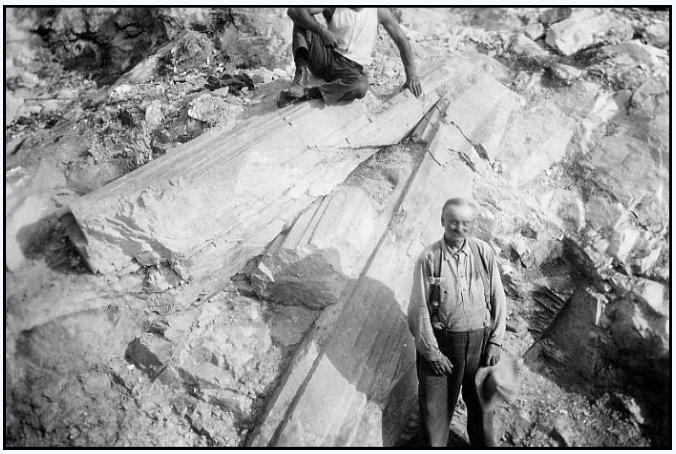


FIGURE 23 Extremely large beryl crystals in the Bumpus Quarry, Albany, Oxford Co., ME *Photo from http://www.maine.gov/dacf/mgs/explore/minerals/sites/may06.pdf*

Sources: Wikipedia, Answers.com, Minerals Information Coalition, Mineral Information Institute, HowStuffWorks.com, Ask.com, Industrial Minerals Association

References: The Largest Crystals by Peter C Rickwood, American Mineralogist, Vol 66, pp 885-907, 1981 and http://en.wikipedia.org/wiki/Cave_of_the_Crystals

January's Collecting Trip

Dragon Mine

Tourmaline, Mica, and Thunder eggs/Geodes

by Stan Celestian

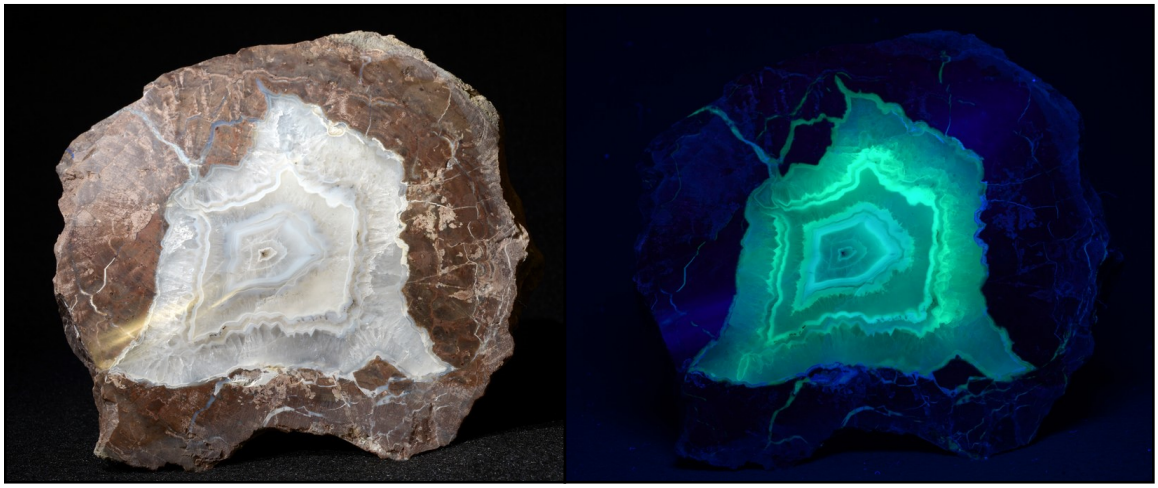
From the Arizona Geological Survey:

http://docs.azgs.az.gov/OnlineAccessMineFiles/C-F/DragonMaricopa331.pdf

The Dragon Mine is within the San Domingo Mining District and gold was the primary commodity of interest. Also found in and around the mine are vanadium, lead, and lithium-bearing muscovite.

On the field trip you can expect to find abundant books of light pink/lavender colored muscovite in a pegmatite exposed near the mine. Additionally, a few small crystals of pink tourmaline (rubellite) were collected by the Arizona Department of Mines and Mineral Resources staff in the 1980's. On a previous collecting trip to the mine, I did find two small abraded rubellite crystals, in the wash near the mine. I also found several black to brown to green-colored tourmaline crystals, in quartz veins near the mine. With some searching, more can be found. (I have seen people panning for gold in the wash, near the mine. They did not share with me information about their findings.)

A few hundred yards to the east of the mine, Precambrian schists contain abundant black tourmaline crystals (schorl). Most are small size (pin to small nail), but are still lustrous and worthy of a rock/mineral collection. A few hundred yards further east again, along the slopes of a hill, can be found geodes and thunder eggs. The geodes contain quartz crystals. Occasionally hematite can be found in the geodes. The thunder eggs are simply geodes that have been completely filled with quartz. The geodes and thunder eggs are found weathering out of volcanic rhyolite and ash deposits. They range in size from marbles to 2 or 3 feet in diameter. These large ones (that I have seen) were badly broken by natural processes. Many of the thunder eggs fluoresce green, and they do polish nicely.



A thunder egg from near the Dragon Mine. This specimen has been polished. The right image shows the fluorescence of the quartz. *Photo by Stan Celestian*

BLM CHANGING RULES

https://www.federalregister.gov/documents/2016/12/07/2016-29244/paleontological-resources-preservation

To: ROCKHOUNDING COLLEAGUES IN THE ROCKY MOUNTAIN FEDERATION OF MINERALOGICAL SOCIETIES
From: Mike Nelson, Colorado Springs Mineralogical Society, RMFMS PLAC Chairman

Re: Proposed collecting rules for invertebrate fossils on BLM land

On March 30, 2009, the Paleontological Resources Preservation Act (PPRA) became law on lands managed by various agencies of the federal government. Although the Senate Interior Appropriation Subcommittee in 1999 asked federal agencies to prepare a report on fossil resource management, most rockhounds and many professional paleontologists believed any new regulations (in my opinion) would be written to protect vertebrate fossils. However, unbeknownst to most fossil collectors, the United States Forest Service (USFS) published (May 23, 2013) draft regulations concerning the collection of invertebrate fossils on land managed by the agency. The comment period was 60 days and the Agency received few legitimate (non-form letters) concerns. Candidly, the proposal caught many rockhounds “off guard” and it was tough to organize informational responses. In my opinion, rockhounds lost many, many collecting privileges associated with invertebrate fossils. However, in defense of the USFS, the Agency was simply interpreting tenants of the PPRA, and that is the magic word---interpretation .

This week in December 2016 proposed regulations for lands under the jurisdiction of the Department of Interior (Bureau of Land Management [BLM]; National Park Service [NPS]; Fish and Wildlife Service [FWS]; Bureau of Reclamation [BR]) were published in the Federal Register and became available for comments. I would request that rockhounds and clubs interested in collecting invertebrate fossils from Interior lands examine these proposed rules and offer comments. As with USFS regulations, the proposed Interior rules are quite restrictive and will involve virtually any rockhound or collector of invertebrate fossils. In addition, Interior interpretations of PPRA rules differ somewhat from those of the USFS. The Federal Register is not easy bedtime reading; however, this new proposal is critical to future collecting. If you observe sections or rules that are disagreeable, please construct reasonable responses and send comments to the appropriate address. Your comments should be personal (individual or club) as form letters are not really successful.

December and January are holiday seasons for many rockhounds and many club newsletters are taking time off from publishing. Therefore, the RMFMS Board thought it imperative that clubs/members receive this “call for action” via e-mail.

You may find the proposed rules at: https://www.federalregister.gov/documents/2016/12/07/2016-29244/paleontological-resources-preservation

Please remember as you comment: Provide first and last name, city, state, & country. All other fields of information are optional. Keep in mind that much of this information is publicly viewable.

Comments may be typed in the box provided or they may be uploaded as attachments (Word docs or PDFs only).

Comments may be brief or in-depth/well-researched. Comments with facts to support them are much more useful (e.g., examples of overlooked scenarios). Keep comments civil and straightforward. Comments using offensive terms, threats, or other inappropriate language will be disregarded.

…. President's View continued from page 1

the imaginations of countless kids. Bob has contributed to every decision that has brought us to where we are today. We are lucky he will continue to work for the club as a Trustee.

Robin Shannon has declined to run for another term as trustee. Robin's contributions to the club go way beyond her work on the board. She took the initiative to start the wire wrapping class that has become so successful. Robin has been one of our most enthusiastic officers in calling for more and better field trips. She has worked tirelessly at our three shows at the vital job as vendor coordinator. She has run the raffle at the show and then brought it to our membership meetings, adding to meeting entertainment and interest. We all owe a special thanks to Robin.

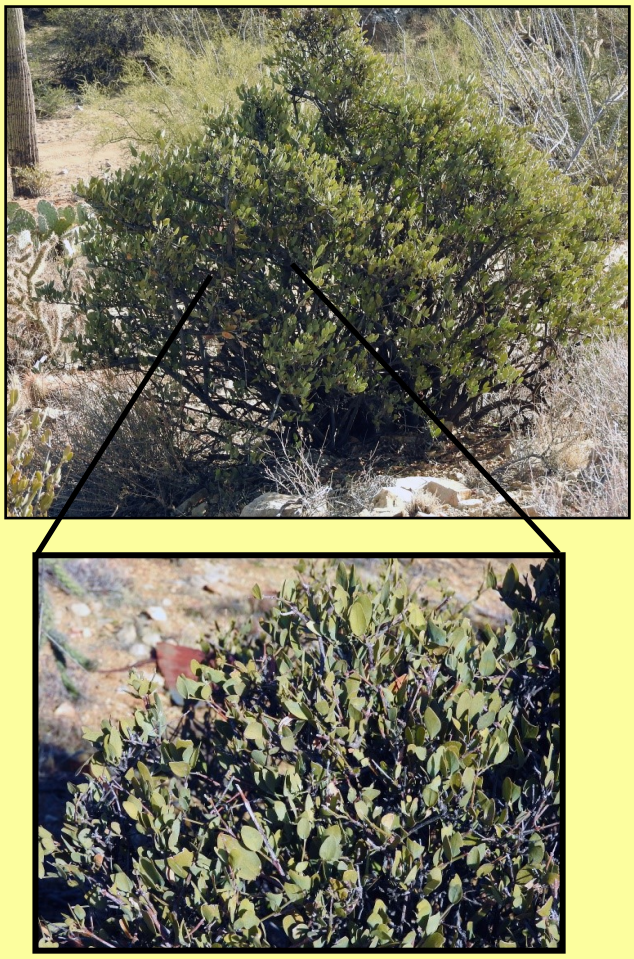
Dave Favaro has served as our Club Secretary, Treasurer, and as market committee chairman for our show. Dave has worn all these hats with efficiency and professionalism. He got us involved with the State Fair, where we won ribbons for our displays. He has stepped forward whenever there was a need for his talents. Dave has a deep interest in seeing the club succeed despite his health concerns. Thank you, Dave, for all your hard work and efforts on our behalf.

Bill Smardo has served as a Trustee since the inception of the post. He has never limited himself to working on that Board. Bill has been a jack of all things geological, and Jonny on the spot when there is a need for someone to help out. He came to the club with an interest in gold prospecting, exploring our surroundings, getting young people involved in the club, and lapidary work. In addition to serving on the Board he has worked on the State Fair exhibit, represented the club at schools in Anthem as well as the Phoenix area, and was there whenever he was called on. He and his wife Jeanne are responsible for our show's Kids corner that has become talked about and imitated by shows all around Arizona.

We say thanks for all that Bob, Robin, Dave, and Bill have done and wish them well. We know we will be working with them in the years to come.

Ed Winbourne, president

…. Purple Passion continued from page 4



Jojoba, Goat Nut, Pignut, Quinine Nut, or Coffeeberry (*Simmondsia chinensis*) has separate male and female plants. Many animals graze on the leaves, but the seeds can be toxic, due to simmondsin, which inhibits hunger. Historically, a salve made from the seeds was used to heal skin and burns, and to condition animal hides. During modern times, jojoba oil -- with no odor, and temperature-independent viscosity -- is used to lubricate engines and for cooking oil. Jojoba wax is used in skin products, and after processing can be used in rubber production. More and more, it is becoming important as biodiesel.