Daisy Mountain Rockchips

VOLUME 2, ISSUE 3 **MARCH 2017**

COOK, EAT, MAKE MERRY!!!

Post-show celebration
at the Anthem Park on
SATURDAY, APRIL 1 at 1:00 pm

Bring a dish or two to share; the club will provide hamburgers and hot dogs.
Don't forget chairs!

BASALT
(the stuff of cinder cones and shield volcanoes)

By Susan Celestian

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

► Basalt is the compositional equivalent of Gabbro. See Figure 1.

	Light color	Intermediate	Dark
Fine-grained;	**RHYOLITE** *white, lt gray, pinks * very viscous lava	**ANDESITE** *med-dk gray * very viscous lava * stratovolcanoes	**BASALT** *black, dk gray, rust red * very fluid lava
Coarse-grained;	**GRANITE** *grays, pinks, (red) * visible quartz	**DIORITE** *salt and pepper * no visible quartz *plagioclase, K-	**GABBRO** *black * no visible, often visible olivine
	OBSIDIAN → *glassy, black, rust-red, greenish, **PUMICE** →		
	Decreasing % Silica →		
	Increasing % Iron and Magnesium →		

FIGURE 1 Igneous Rock Chart, showing the relative compositions and relationships of the igneous rocks. *Table by Susan Celestian*

► Basalt is generally dense and fine-grained, because it cools relatively quickly at the Earth's surface. Cooling occurs on the order of minutes to weeks; one can usually walk on a lava flow within 10-15 minutes! See Figure 2.

Basalt continued on page 5……

4th Annual Gem & Mineral Show a Rousing Success

The club has very successfully hosted its fourth gem and mineral show. There were about 34 vendors. Final attendance figures are not available at this time, but I think it was around 1300 attendees. I know Sunday, a traditionally lightly attended day, was busy -- and that is a good thing for vendors and the club!

By all accounts, participants had a marvelous time. The Kid's Corner has more activities than usual, for a mineral show, and the children all seemed to be having a fabulous time! Our club is unique in the helpfulness of volunteers and the enthusiasm with which members interact with attendees. Photos of the event can be found on pages 6-8.

IT IS OFFICIAL -- WULFENITE IS ARIZONA'S STATE MINERAL

On Wednesday, March 22, 2017, Governor Ducey signed HB2092, amending Section 1, Title 41, chapter 4.1, and article 5 of the Arizona Statutes, by adding section 41-860.04, to read: *Wulfenite is the Official State Mineral*.

Red Cloud Mine Wulfenite
Photo by Stan Celestian

Official Arizona Symbols
State Gemstone - Turquoise
State Fossil - Petrified Wood
State Metal - Copper
State Mineral - Wulfenite

INSIDE THIS ISSUE

Board Meeting Minutes — March 7, 2017

The meeting was called to order by President Ed Winbourne at 5:00 P.M. Those present were: Ed, Jim R., Stan, Susan, Tiffany, Whit, Bob S. Victoria and Cynthia

Gem & Mineral Show Report:

Dave Haneline has offered to let the Club use his fluorescent lamp for the Show and would like to be indemnified for loss or damage to same.

There was discussion as to whether the Club should purchase a fluorescent lamp. The lamps can cost upwards to $2,000; and it would only be used one or two times a year. Discussion will continue over the next few months as to whether the Club should purchase one for future use.

Motion: *Upon motion made by Whit, seconded by Bob, and unanimously carried, the club will indemnify any loss or damage to Dave Haneline's lamp; and the lamp will be used for the upcoming show.*

Marketing Report:

We had a nice article and photos in the 85086 magazine relative to the show and the club in general. There was also the ad placed by Marketing Committee. Discussion ensued relative to a billing for $700 for the magazine ad. The additional cost from what was originally stated was due to the magazine ad being in both the zip codes 85086 and 85085. Cynthia is to research the contract with the magazine to see exactly what our agreement stated.

Financial Report:

Cynthia sent out the financial report via email to all members.

Show Report:

Jim reported the projected attendance for the show is 1400 to 1500 attendees, and the gate receipts should be about $4500. Amount paid out is $6700 and Jim reported we should net about $8,000.

Ticket sales are being handled by Linda and Lavinia and Jim has four additional people volunteering.

Show security volunteers will all wear vests which state "security."

Dave H. mentioned to Ed he needs volunteers to help on the fluorescent display. Ed will ask for volunteers at the Club meeting this evening.

Ed reported we will be selling rocks which were donated to the Club, these will be on display by the Membership table and staffed by volunteers. As these rocks are rough they will not compete with our show vendors. We will also be selling and/or auctioning (silent) rocks at the membership meeting.

Lapidary Equipment:

Ed reported used lapidary equipment is for sale by a private party at very good prices which could be used for a potential club lapidary facility. After discussion it was decided to revisit this issue after the Show is completed.

Post Show Party:

The barbeque/potluck is planned for Saturday, April 1, at the Ramada at Anthem Park. Ed will contact Leslie E. relative to donations and will reserve the Ramada.

Membership Report:

Victoria reported the club has 97 adult members and 7 children.

Approval of February Minutes:

Motion: *Upon motion made by Whit, seconded by Bob S. and unanimously approved the February Executive Board and Membership meeting minutes were approved with the correction of the spelling of Lion Mine.*

There being no further business, the meeting adjourned at 5:45 P.M.

Respectfully submitted, Victoria Peterson

General Meeting Minutes — March 7, 2017

The meeting was called to order by President Ed Winbourne at 6:37 P.M.

Guest Seaker:

Guest speaker Les Presmyk was introduced by Susan Celestian. Les is a long-time Arizona mineral collector, past Chair of the FLAGG Mineral Foundation and is a SRP Chief Mining Engineer. He spoke about Bisbee "The Queen of the Copper Camps" and "King of Arizona's Mineral Localities." He discussed the history of discovering Bisbee's mineral mining. At the height of mining, Bisbee had a population of approximately 22,000 people and today it is around 5,000. The Sacramento Pit was the first open pit mine in Bisbee. Bisbee is one of the world's top areas of mineral specimen production and collection. It has 325 species and is in the top ten of the world.

Les was asked about the status of the Mining and Mineral Museum and said a committee is being formed and he has made application to be on this committee.

Minutes continued on 3….

….Minutes continued from page 2

Donated Rocks Sale and Auction:

Ed informed the membership of the samples of rocks available for purchase. These rocks were donated to the Club and some were for sale at a set price and some were on a silent auction basis. The group enjoyed looking at the rocks and purchasing some during the break.

Raffle Items:

Raffle items were donated by Dave Haneline and some of the Club's donated rocks, and were won by Arabella, Jonathan, Robin, Linda, Mick and Don.

Gem and Mineral Show Update:

Bob Evans discussed the set up for the show on Friday, March 24th which will be held at Boulder Creek High School. Volunteers for set up should arrive at the South end of the school at 4 PM. We will be setting up tables, running electrical cords, and assisting Vendors with their set up. Pizza will be provided for the volunteers.

Club Member Samples for Show:

Bob Salter reported club members should bring their samples for display to the show Friday evening and should have cards stating their names, name of sample, and where they obtained it.

Field Trip:

Stan Celestian, Field Trip Coordinator, talked about this Saturday's field trip to the Peridot Mesa at the San Carlos Indian Reservation. Members attending should meet at 10 A.M. at the Bashas Parking Lot near the Reservation or the Anthem Community Center at 8 AM. It's a two hour trip to the reservation, and the permit to enter the Reservation is $10 per car. There will be an additional charge to be determined payable to the Indian representative. Regular vehicles are fine, no 4-wheel or high clearance vehicles necessary. Note: No alcohol is allowed on the reservation.

Please contact Stan to affirm you are attending. stancelestian@gmail.com.

There being no further business, the meeting was adjourned at 8:47 PM.

Respectfully submitted,

Victoria Peterson, Club Secretary

Executive Committee Meeting Minutes — March 20, 2017

The meeting was called to order by President Ed Winbourne at 6:00 P.M. Those present were Ed W., Cynthia B., Jim R., Victoria P., Jennifer G., and her son Joey, Bob E., Bill S., Tiffany P., and Bob S.

The meeting was called to vote on whether to purchase lapidary equipment for sale by a private party. Discussion ensued as to the merits of each piece of equipment and whether it was advisable to purchase the equipment at this time and store it for future use. Consensus of the group was the price of the items was good, the equipment appeared to be in good condition, the club could store the equipment and lend it to Club members as their particular needs arose. If we find that we do not use the equipment, it could always be sold at a future date; so there would be no financial loss to the club and possibly a small gain.

There are five items for sale, consensus was the Club would not use the Imer saw ($1,000), the Vibro-lap ($600) or the Royal Faceter ($950). The Lortone slab saw ($900) and the American Faceter ($600) would be of use to the Club not only if we ultimately have a Lapidary facility, but also these would be available for Club Members to borrow.

MOTION: Motion made, seconded and unanimously carried to approve the spending of not more than $1,550 to purchase the Lortone slab saw and the American Faceter. Ed Winbourne is to offer less than the asking price; however, if that is not acceptable to the seller, he is authorized to purchase the equipment at no more than $1,550.

There being no further business, the meeting was adjourned at 6:40 P.M.

Respectfully submitted,

Victoria Peterson, Club Secretary

Opuntia basilaris (Beavertail Cactus) *Photo by Susan Celestian*

UPCOMING FIELD TRIPS

WHEN: Saturday, April 8, 2017

WHERE: Payson

WHAT: Zebra Jasper, Peach-colored agate, Naco Formation fossils

MEET: TBD

WHEN: Saturday, April 22, 2017

WHERE: Planet Mine and area

WHAT: Hematite, Copper Minerals

LEADER: Stan Celestian (stancelestian@gmail.com)

MEET: 9:00 am at the Bouse Rest Area, can't miss it (AZ-72) More details as the date approaches.

OTHER: Any vehicle can get into the area, but high clearance, 4WD will be necessary to enter the Planet Mine area. Any other stops in the area will require at least high clearance (4WD preferable). We can ride-share after arriving at the parking area near the mine.

OPTIONAL SIDE SITE: The historic town of Swansea is kind of interesting, with some restored housing, signage, sights. The road gets rough, but is not 4WD.

WHEN: Saturday May 6, 2017

WHERE: Reserve Bank Mine

WHAT: Copper Minerals, Underground Tour (optional)

LEADER: Dave Haneline (dhaneline@cox.net)

MEET: Leaving Anthem at 7:00 am (more details anon)

OTHER: High clearance vehicle, preferably 4WD, FEE: $5 per person includes a 5-gallon bucket of rock (additional rock $1/pound). There will be jewelry made of copper they smelt and make into wire, and small ingots of copper, for sale.

UPCOMING FIELD TRIPS CONTINUED:

WHEN: Saturday June 3, 2017

WHERE: Lynx Creek

WHAT: Gold

MEET: TBD

WHEN: August? TBD 4 days, at least

WHERE: Royal Peacock Opal Mine, Denio, NV

WHAT: Opal, Black Opal, Opalized fossils

MEET: TBD

OTHER: Fee: $190/person; Go to the mine web-site for more information http://royalpeacock.com/fee-digging

Opal from Royal Peacock Mine
Photo by Sheryl, postedhttp://rockhoundblog.com/regular-postings/reader-tells-about-her-trip-to-the-royal-peacock-mine-in-the-virgin-valley/

WHEN: October 14 & 15

WHERE: Gem-o-rama, Trona, CA

WHAT: *Pink* Halite, Hanksite, Sulfohalite, others

MEET: TBD

LEADER: Stan Celestian

OTHER: There is a dry campground of sorts in Trona ($8/night), or motels in Ridgecrest, 24 miles away.

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

….Basalt continued from page 1

FIGURE 2 This is a close-up view of a Hawaiian basalt (porphyritic). Note that you cannot see any crystals in the black, fine-grained rock. The green crystals are olivine phenocrysts. *Photo by Stan Celestian*

► It will be black to charcoal gray, or rust-red.

► Figure 1 illustrates a massive, porphyritic sample of basalt. Other textures often see are illustrated in Figures 3-6.).

- *'a'a* - the surface of the lava flow is jagged and irregular. This occurs when the lava is cooled to the point that it breaks up into blocks, as it flows. Can occur with pahoehoe. See Figure 3.
- *pahoehoe* - the surface of the lava flow is smooth and ropy. This forms when the lava is very hot, and smoothly-flowing. Can occur with 'a'a. See Figure 4.
- *vesicular* - the rock is full of gas bubble holes See Figure 5.
- *amygdaloidal* - gas bubble holes have been filled in with other minerals, long after the rock was formed. See Figure 6.

FIGURE 3 'A'a lavas are jagged and blocky. Blocky Kana'a Flow at Sunset Crater, Arizona; The inset highlights the same flow in profile. *Photos by Stan Celestian*

FIGURE 4 Pahoehoe surface texture on a Hawaiian basalt flow. When a flowing lava is very hot, the surface cools to form a 'skin', that wrinkles and folds. *Photo by Stan Celestian*

Go to https://www.youtube.com/watch?v=lRfZ2q4Jvmo for Stan's first-hand view of flowing lava.

FIGURE 5 Vesicular basalt from northern Arizona As gases in lava come out of solution, they form bubbles that are trapped in the cooling lava. The resulting holes are called vesicles. *Photo by Stan Celestian*

Basalt continued on page 11……

.....4th Annual Gem & Mineral Show continued from page 1

Club members pitch in and make this year's show the best ever! Jobs include: scheduling dealers, organizing the venue, general show organization, flyer distribution, floor set-up (tables, chairs, wiring), helping dealers unload/load their wares, greeting, selling raffle tickets, security, kid's activities, selling rocks, set-up and man the fluorescent exhibit, set-up club cases, take down (tables, chairs, wiring), and more! *Photo by Ed Winbourne*

Photo by Ed Winbourne

Photo by Stan Celestian

The show inspired 75 people to join the club! We are going to need a bigger meeting room!!! *Photo by Stan Celestian*

Photo by Stan Celestian

4th Annual Show continued on page 7.....

…..4th Annual Show continued from page 6

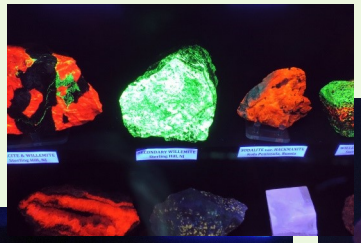
Club members loaned specimens that they had self-collected, And Bob Salter arranged them in the two new cases, built by Howard Roose and his friend, Dale Rawson. Seeing all the cool rocks and minerals we all have collected helped inspire 75 attendees to join the club. *Photos by Stan Celestian*

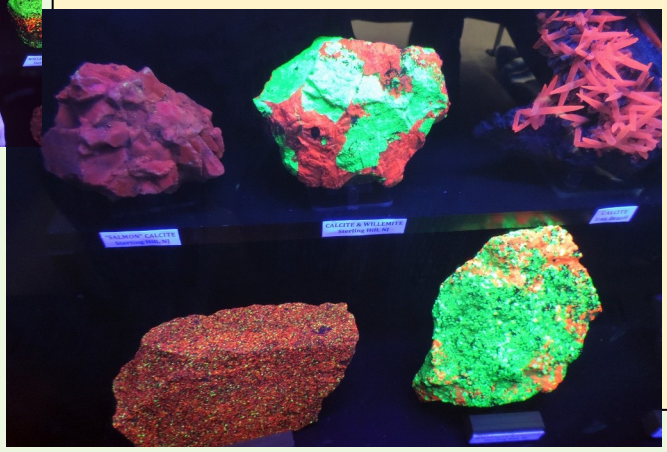
Photos by Stan Celestian

The many activities in the Kid's Corner were a great success! Look at all the rock and mineral samples Bill Smardo prepared!!! Keep collecting those egg cartons!!!!!
Photo by Stan Celestian

4th Annual Show continued on page 8……

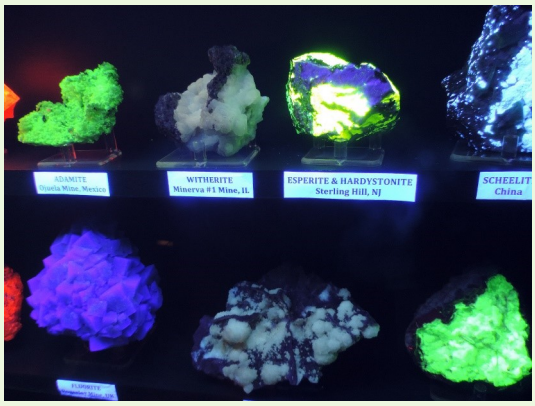
….4th Annual Show continued from page 7

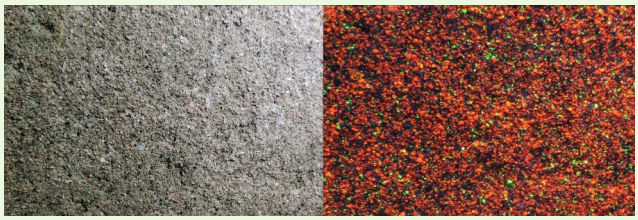




The ever-popular fluorescent display was made possible by the display talents of Dave Haneline; the generosity of Bill Gardner (Way Too Cool) who loaned a 190W SW UV light, and donated 3 display cabinets; and the enthusiastic banter of Dave Haneline and Zack Reed.

Photos by Stan Celestian





Calcite and Willemite Concrete from Trotter Mine in Franklin, NJ. On the left is the concrete in plain light, and on the right, under fluorescent light.

Photos by Stan Celestian

A Great Variety of Vendors

Photos by Stan Celestian

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

March 31, April 1-2 - Tucson, AZ Flagg Mineral Foundation; Desert Botanical Gardens, 2021 N Kinney Rd; Mineral Sale Friday evening, Program Saturday 8-4, Field Trip Sunday; Registration: $45. More information and registration form -- http://flaggmineralfoundation.org/home/minerals-of-az-symposium/

May 6-7 - Kingman, AZ Mohave Co. Gemstoners; Kingman Academy of Learning, 3420 N Burbank Av.; Sat 9-5, Sun 9-4; Admission: free.

May 27-28 - Pinetop, AZ White Mt. Gem and Mineral Club; Hon-Dah Convention Center, 777 Hwy 260; Sat 9-6, Sun 10-4; Admission: $2/adult, $1/seniors.

May 27-28 - Bisbee, AZ City of Bisbee; Queen Mine, 478 N Dart St.; Sat-Sun 9-5; Admission: free.

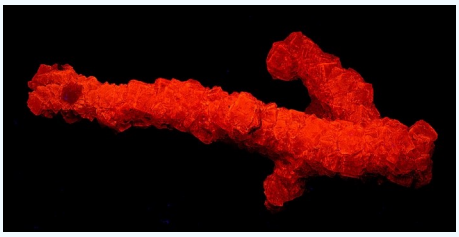
June 2-4 - Flagstaff, AZ Coconino Lapidary Club Gem, Mineral and Jewelry Show, Silver Saddle Outdoor Market, Hwy 89N & Silver Saddle Rd (3.5 mi north of Flagstaff Mall); 9-4 daily; Admission: free.

August 4-6 - Prescott Valley, AZ Prescott Gem and Mineral Club; Prescott Valley Event Center, 1301 Main; Fri-Sat 9-5, Sun 9-4; Admission: $5/adult, $4/seniors, children under 12 free.

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

This Halite precipitated around a plant branch immersed in the Salton Sea. Here it is viewed under plain light.

And here, the Halite from the Salton Sea, is viewed under SW fluorescent light.



Photos by Stan Celestian

www.dmrmc.com

Visit the club website periodically. See what is happening, and boost our visibility on the web.

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). 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

Facebook

Visit the club website periodically. See what is happening, and boost our visibility on the web.

Officers and Chairpersons

President: Ed Winbourne.....ewinbourne@gmail.com
Vice President: Stan Celestian
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: Stan Celestian stancelestian@gmail.com
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

FIELD TRIP TO PERIDOT MESA

SATURDAY, MARCH 11, 2017

Eighteen club members met at Basha's in Peridot, Arizona. Actually this meet took place over a couple of hours, as part of the group was delayed by construction. However, eventually everyone ended up on Steve Joey's peridot claim, on the San Carlos Apache Reservation, and all eyes were on the ground. Twelve of those attendees are depicted in the group photo with Steve. The $35 collecting fee included 7 pounds of rock, and I am certain everyone went home with at least that much. In addition, the hills were abloom with a profusion of California Poppies and, if one looked carefully, many other wildflowers.

Photos by Stan and Sue Celestian

EYES ON THE GROUND

Upper left-Purple Owl's Clover (*Castilleja exserta*), Middle left-Chia (*Salvia columbariae);* Lower left-Esteve's Pincushion or Steve's Dustymaiden *(Chaenactis stevioides)*; Upper right-California Poppy (*Eschscholzia californica*)

Vent of peridot flow covered in poppies

….Basalt continued from page 5

FIGURE 6 Amygdaloidal Basalt The gas bubble holes have been filled in by chalcedony (quartz). — these are called amygdules. The name derives from Latin *amygdala* (almond), as the amygdules are typically almond-shaped. *Photo by Stan Celestian*

►Often, there are phenocrysts of plagioclase feldspar and/or olivine, as in Figure 2. Both of those minerals form at high temperatures, so are the first to form in a slowly-cooling magma chamber, below Earth's surface. When lava erupts, those crystals are "frozen" within the fine-grained rock. For a look at the beautiful result of a lot of olivine phenocrysts, go to https://www.youtube.com/watch?v=xA-6TtxyBfk .

► Being deficient in low-density silica, and enriched in high-density iron and magnesium, basalt is a relatively heavy rock.

► The hottest of the lavas, basaltic lavas extrude onto the surface at about 1832-2192°F, and are very fluid — flowing like rivers of hot tar for distances up to tens of miles, at velocities exceeding 6 mph.

► Because basaltic lava is so fluid (non-viscous), the eruptions tend to be quiet; and the volcanoes built up are large with shallow slopes (*shield volcanoes* -- see Figures 7-9). These mountains can be very large (Mauna Loa is 60 miles wide at its base), and have very low profiles, with slopes of 1°-2° at their bases, steepening to 10° toward the peak.

► Besides shield volcanoes, another topographic feature associated with the gassy late-stages of basaltic eruptions is the *cinder cone*. Cinder cones are composed of volcanic fragments — cinders and other debris — that are thrown into the air, and accumulate around the vent. They are irregular and rough, so can pile up at steeper angles than in shield volcanoes. Cinder cones tend to be roughly circular, no more than about 1000 feet tall, with slopes of about 30°-40°, and with a central crater. Figures 10-14 illustrate the classic cinder cone, Strawberry Crater.

► Basaltic volcanoes are found at hot spots (stationary mantle plumes of rising magma, such as below Hawaii), and at spreading centers (such as the mid-ocean rifts, and continental Basin and Range faulting). In Arizona, basaltic volcanoes occur on the Colorado Plateau (San Francisco, Springerville (White Mts), and Uinkaret (NW corner of Arizona) Volcanic Fields, and throughout southern Arizona's Basin and Range Province (Sentinel, San Bernadino, Pinacate, and San Carlos). The Plateau volcanoes are thought to be associated with a hot spot, across which Arizona moved, creating volcanoes that, in each field, decrease in age to the east. The southern volcanoes are probably largely associated with Basin and Range faulting. ***

*** Why is basalt generated under these circumstances? Earth's mantle material is very high in iron and magnesium (higher than basalt), and is under such high pressure that it remains solid, at temperatures exceeding its melting point. Once the crust is fractured — by faults associated with mantle plumes or mountain-building — the pressure is released, the rock partially melts, and basaltic magma flows

FIGURE 7 House Mountain House Mountain, in the Verde Valley, is a shield volcano that erupted about 13-15 million years ago. At the time, the volcano sat at the Mogollon Rim, that has since eroded northward several miles. *Photo by Susan Celestian*

Basalt continued on page 12….

….Basalt continued from page 11

FIGURE 8 Pinacates Located just south of the U.S./ Mexico border, Cerro del Pinacate, is a shield volcano, that has arisen during the last 4 million years, with the last eruption occurring about 11,000 years ago. *Photo by Susan Celestian*

Continue the story with Strawberry Crater below.

FIGURE 9 Mauna Kea Mauna Kea is a huge shield volcano sitting atop a hot spot. It rises over 33,000' above the sea floor, has an exposed elevation of 13,796', and a base diameter (when combined with Mauna Loa) of over 100 miles. Mauna Kea and Mauna Loa have merged, and their mass is such that the ocean floor is depressed 4 miles! That is a lot of basalt!!!! *Photo by Susan Celestian*

STRAWBERRY CRATER

By Susan Celestian

As mentioned in the preceding article on basalt, cinder cones are one of the topographic features formed during basaltic volcanic eruptions. Strawberry is one such cinder cone, and it serves well as an example of basaltic volcanic features.

WHAT: Cinder Cone and Lava Flow — part of the San Francisco Volcanic Field. See Figures 10-14.

WHEN: It has been hard to establish a firm and reliable date on the crater's rocks. Estimated ages have ranged from 50,000 +/- 46,000 years (Damon et.al. 1974), to 3000 years (between 800 and 1604 BC), to 130,000 +/- 40,000 years (Morgan et. al. 2003).

One of the nearly 600 cinder cones identified in the San Francisco Volcanic Field, Strawberry Crater is about 1000 feet high, and one half mile in diameter. The name derives from the reddish color and the strawberry-like profile (Figure 14). The basaltic andesite (black volcanic rock, about 55% silica) cinders and debris were produced in mildly explosive eruptions (*strombolian*). During the later stages, with the loss of volatiles (water, carbon dioxide, hydrogen sulfide, sulfur dioxide), the eruption style switched to quieter lava flows, alternating with sputtering that dropped hot plastic (deformable) bombs near the rim where they welded to each other to form a resistant cover (Figure 13).

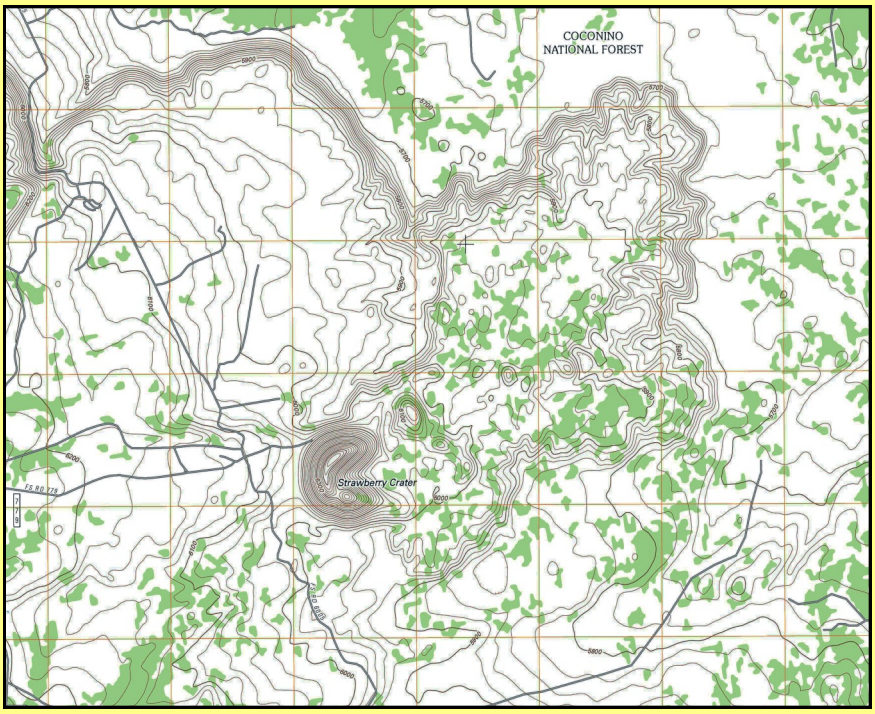


FIGURE 10 — Topographic map of Strawberry Crater, Coconino County, Arizona This is a portion of the USGS Strawberry Crater, AZ 7.5' Quadrangle map. Note how close the lines are to each other around the crater — indicating very steep slopes. The lava flow is outlined by sinuous, closely-spaced lines.

This is a high resolution image, so you may zoom in to see a closer, clear, easily-read image. (TO ZOOM: Either hit Ctrl +, or go to the top of the page and use the +, -, or drop down menu.) *Image courtesy of the USGS*

Strawberry Crater continued on page 13……

...Strawberry Crater continued from page 12

FIGURE 11 Aerial view of Strawberry Crater, Coconino County, Arizona *Photo by Stan Celestian*

The flows breached the eastern side of the cone, carrying away large and small rafts of cone material, and causing the current C-shape of the cone. Flows turned to the northeast, and continued for about 2.39 miles. Eventually, there was a small breach on the southwest side, which can be seen as a small saddle along that slope (Figure 14).

In 1984, the cone and surrounding area was designated a wilderness area, with a total of 10,141 acres. As a result, you can no longer drive up to the base of the cone. The road dead-ends at a small parking area, and from there a 0.3 mile walk gets you to the base. There is a 1.1 mile trail around the cone, and it apparently passes some archaeological sites, where gardens with cinder mulch have been found. However if you climb the slopes of the crater, you may discover some very interesting features — *volcanic bombs.* The debris comprising Strawberry Crater's slopes contain a lot of these.

FIGURE 12 Profile view of Strawberry Crater, highlighting the color and shape, that lend the cone its name. *Photo by Stan Celestian*

FIGURE 13 A view of the rim around Strawberry Crater. Note how the rampart of welded spatter protects the integrity of the narrow rim. Weathering and erosion will impact unprotected slopes more quickly than shielded rim. (Although both will proceed very slowly, as cinders and other volcanic debris is typically full of gas holes (*vesicular*), and precipitation does not flow, so much as soak into the slopes. *Photo by Stan Celestian*

FIGURE 14 A view of the small breach of the southwest-facing slope of Strawberry Crater. There a small flow ripped away the cone's wall. *Photo by Stan Celestian*

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……Strawberry Crater continued from page 13

VOLCANIC BOMBS are small-to-large bits (technically larger than 2.5 inches diameter) of once-hot and plastic volcanic debris (ejecta) that are thrown into the air, during an eruption. During their flight, they cool, and are generally solid rock by the time they land. Often, they are shaped by rotation, before they cool — and that creates the novel shapes, that I will now describe. Based on their characteristics, there are: fusiform, squeeze-out, ribbon, inclusion, bread crust, explosion, and cow pie bombs. See Figures 15-23.

FIGURE 15 FUSIFORM (aka SPINDLE or ALMOND) BOMB This is a fusiform, or spindle-shaped, bombs — a very recognizable form, with spindling at opposite ends. As a hot, plastic blob of lava rotates through the air it becomes shaped aerodynamically — fatter in the middle, tapering toward the ends. Probably the spindles are originally very long; however, they are very thin and glassy (the latter due to speedy cooling), and easily break off upon landing. *Photo by Stan Celestian*

FIGURE 16 **This FUSIFORM BOMB** must have experienced an extra twist. *Photo by Stan Celestian*

FIGURE 17 **This FUSIFORM BOMB** was still hot and gooey when it landed, and it became fused, or welded, to cinders. *Photo by Stan Celestian*

FIGURE 18 SQUEEZE-OUT BOMB Sometimes the crust of a bomb cools, leaving the inside soft and plastic. Expanding gases may cause the crust to crack, allowing some lava to ooze out. Note the 'ooze' on the left end of this bomb. *Photo by Stan Celestian*

FIGURE 19 RIBBON (aka CYLINDRICAL) BOMB Very fluid lava will form as strings, or flattened ribbons, as they soar on high. These will fragment in the air, or upon landing. The ribbon shown here welded to cinders on impact.

Photo by Stan Celestian

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….Strawberry Crater continued from page 14

FIGURE 19 INCLUSION (aka CORE) BOMB Often a volcanic bomb will encase a fragment of previously erupted basalt, or a fragment of the country rock (previously existing rock, through which the volcano is erupting). If broken, a bomb's innards are revealed. The bomb, in the upper photo, includes both a fragment of basalt (denser, rectangular bit), and of the country rock (dark gray granite — or other coarse-grained igneous rock, probably from relatively great depth). The one in the lower photo holds a fragment of the Coconino Sandstone, found closer to the surface.

Note the gas bubble holes (*vesicles*) in the upper bomb. These are due to expanding gases trapped by the cooling lava. If you enlarge the image, you can also see numerous crystals (*xenoliths*) of plagioclase feldspar, that formed early in the magma chamber.
Photos by Stan Celestian

FIGURE 20 BREAD CRUST BOMB Similar to explosion bombs, bread crust bombs form when the cooled-and-rigid outer shell of a bomb is cracked by the pressures of expanding gases. *Photo by Stan Celestian*

FIGURE 21 EXPLOSION BOMB The upper photo is a classic explosion bomb. As gas bubbles expand in the still soft interior, they may break through the harder crust. Pffffft — and with a pop, explode out of the bomb. The lower photo is a combination of inclusion bomb and explosion bomb — and that one must have been very gassy, as it is nearly hollow!
Photos by Stan Celestian

FIGURE 22 COW PIE BOMB Cow pie bombs form when globs of lava ejected to low heights, and are still liquid when they impact the ground. Upon impact they splash, to form flattened disks. The above photo is of the underside of a "cow pie" — fragments of volcanic debris have embedded and fused into the bomb, as it cooled on the ground (enlarge the view for a closer look.
Photo by Stan Celestian

MINERALS IN OUR EVERYDAY LIVES

USES OF BASALT

Basalt is used "as is" — slabbed or shaped, as a powder, and can be melted and blown into fibers that may be woven into fabric. It is heavy, hard, heat/cold resistant, radiation resistant, UV resistant, electrically resistance, acid/alkaline resistant, rust resistant, low water absorption, easily recyclable, high wet-ability. I think you will find some of the applications surprising!

- Cobblestones, building blocks
- Asphalt pavement aggregate; concrete aggregate
- Flooring tiles — either residential, or in industrial situations (such as foundry floors, where molten metal or slag may 'hit the floor')
- Railroad ballast
- Filter stone in drain fields
- Stone (or rock) wool (fibers may be woven into fabric): —
  - Car and motorcycle exhaust systems
  - Oven insulation
  - Heat insulation of gas turbines (inc. those of nuclear power plants)
  - Insulation of liquid nitrogen tanks and pipes
  - Components of composite materials: tripods, fishing poles — fiber reinforced plastic **rebar** is 25% lighter, and has over twice the tensile strength, than steel
  - Fabric used as reinforcement in concrete, allows for thin walls
  - Fabric bound with resins can make a very light-weight, but flexible, strong, and resistant yacht, canoe, snowboard, skis, or other similar vehicle
- Statuary
- Countertops
- Ground up basalt is bound by various products and used as a substitute for concrete
- Sound-proofing
- Filtering material
- Rip rap
- Soil/hydroponic additive: crushed or coarse to serve as root support and slow-release nutrient source
- Jewelry