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GNEISS TIMES

Wickenburg Gem & Mineral Society, Inc.
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The purpose of this organization shall be to educate and to provide fellowship for people interested in rocks and minerals; to foster love and appreciation of minerals, rocks, gems, and the Earth. Membership shall be open to all interested people.

THE GREAT AMERICAN ECLIPSE - AUGUST 21, 2017

By Stan Celestian

Where were you on Monday morning, August 21, 2017?

Sue and I were in eastern Oregon near a small, abandoned town called Lime. Months before the event, hours of research resulted in picking this area as the place to be to view our first total solar eclipse. We were not disappointed.

We arrived at Lime on Sunday, to pick out what was to be our viewing and camping area. It was a windy and cloudy day. Sunset that evening was very picturesque, but not encouraging for the perfectly clear skies for which we had hoped. We were given hope by a fellow eclipse viewer, who informed us that the weather forecast called for clearing skies overnight, that would produce blue skies for the morning of the eclipse. The wind, however, howled all night long, resulting in only a few hours of sleep.

In the morning we were greeted by blue skies, although still windy. I did park our truck in such a way as to block the wind, as much as possible. Prior to the eclipse, I had constructed mylar filters for our cameras and binoculars. With these filters we photographed the uneclipsed Sun. This was to ensure camera settings and focus were spot-on, and that we were in comfortable positions for the entirety of the eclipse. Sunspots were great targets to confirm accurate focus, as they were small features

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WELCOME BACK!!!!
NEXT MEETING: OCTOBER 13

Sunset and Wind Mills, Sunday Evening 8/20/17
Photo by Stan Celestian

Camping in the hills just east of Lime, Oregon, along the Snake River. *Photo by Stan Celestian*

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on the Sun's surface. Everything was in order. Batteries were fresh, filters were in place, binoculars were at hand, and then we waited, along with dozens of other anxious people in the middle of no-where.

Finally, the first contact of the Moon to the Sun's disk was evident. Our plan was to take pictures about every 10 minutes to obtain the sequence of the Moon covering the Sun. As the Sun's disk became smaller and smaller, temperatures dropped a little. I did put on a jacket, just to be prepared.

Our surroundings also became noticeably darker. I had created a Sun projection screen to watch the progression of the Sun. This wasn't necessary as our cameras had filters to observe the Sun directly, but it was fun. See image on page 3.

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Ready for the Eclipse

Here is Sue, sitting comfortably by her camera mounted on a tripod. To her right, you can see my camera with a telephoto lens, that is capped by a homemade mylar solar filter. Chairs for comfort, along with a cooler for drinks, binoculars fitted with mylar filters, and even the truck is parked strategically to block the wind - we are ready. On the hill behind us is a cluster of cars with about 25 people anxiously awaiting the eclipse.

Photo by Stan Celestian

Solar Disk with Sunspots

Prior to the eclipse I wanted the camera to be as sharply focused as possible. Sunspots were an ideal target for the task. After taking several pictures (with manual focus), I found a focus setting that was the best.

In this view of the Sun, groups of sunspots can be easily seen. Sunspots appear dark on the photosphere simply because of contrast. If you could capture one of the sunspots, remove it from the Sun's surface, and place it out in space, it would glow brightly. They appear dark because they are cooler at about 3800^{o}C, compared to the 6000^{o}C of the photosphere. They are cooler because of magnetic fields. Powerful magnetic fields erupt at the Sun's surface. The gas of the Sun is trapped within these magnetic fields and their movement is restricted. This restriction slows their movement, which means a cooler temperature.

Photo by Stan Celestian

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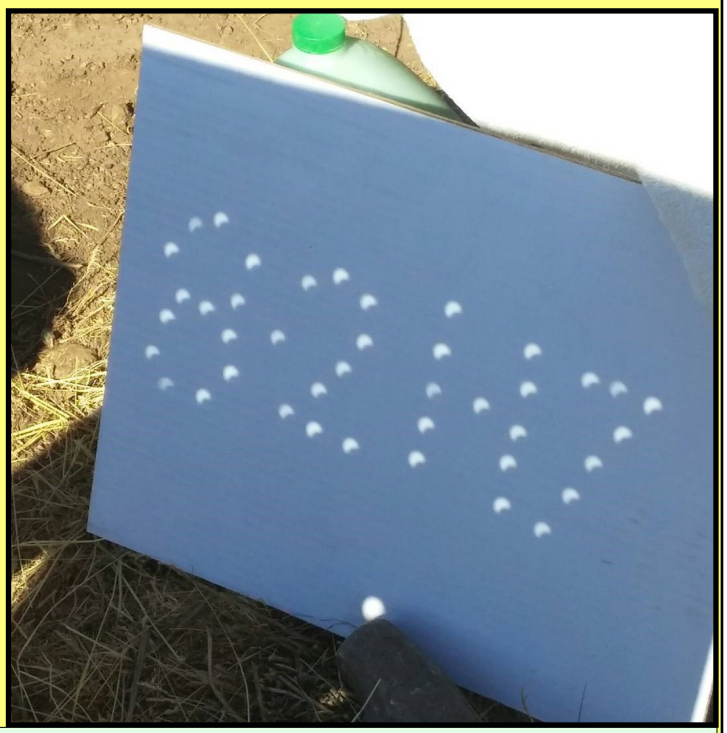
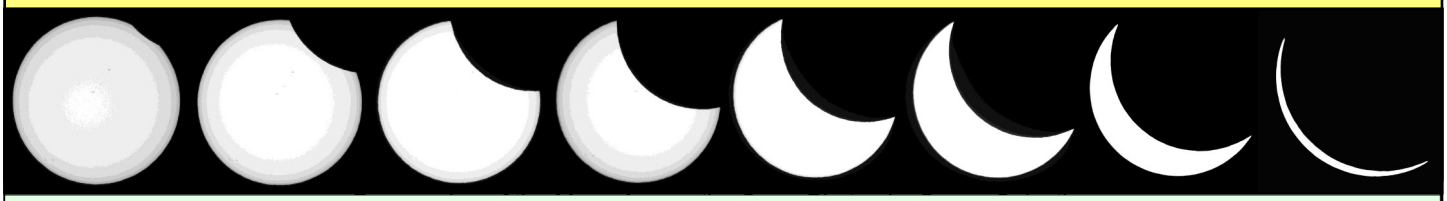


Cardboard Pin-Hole Projection Screen - Each of the holes projects a partially eclipsed image of the Sun, conveniently spelling out the date of the eclipse. *Photos by Susan Celestian*



Progression of the Moon Across the Sun. *Photos by Susan Celestian*

Within seconds, the sky darkened. A few last glimmers of the Sun, and the total eclipse had arrived in all of its glory. The Sun's corona appeared in an instant. The ghostly gray streamers were clearly visible to the unaided eye. This feature of the eclipse is, without a doubt, the most spectacular. I was able to get 11 shots of the eclipse. I told myself to be sure and just take some time to absorb and enjoy the phenomenon, and to pull myself away from the camera's viewfinder. I also was able to view the corona, and portions of the Sun's lower atmosphere (the chromosphere), with binoculars. During the eclipse, no special filter was needed. The coronal streams of plasma, and the bright pinkish red of the chromosphere, were fascinating objects that I could have looked

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The Solar Corona - Visible only during a total eclipse. *Photo by Stan Celestian*

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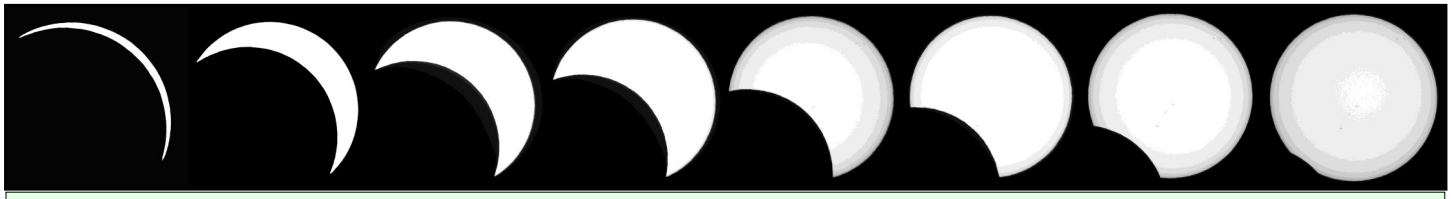
at for many more minutes. But we only had about 2 minutes. After soaking in as much of this astronomical wonder as we could, totality ended.

The Moon did not linger, and began moving away from the Sun. At this time we could see the Moon's shadow racing away from us. We were just about a mile from the Snake River in eastern Oregon. On the other side of the river was Idaho. We were in sunlight, but across the river in Idaho, the eclipse was still taking place - providing a tremendous spectacle for those who had to wait a few minutes longer.



Progression of the Moon Across the Sun. *Photos by Susan Celestian*

We stayed and photographed the retreat of the Moon until the last little bit of the Sun was uncovered. From there, it was back to Arizona to share our adventure with everyone.

So what is the spectacular solar corona you ask? Well I am glad you asked that question. One of the astronomical studies I pursued at ASU was solar astrophysics, specifically the Sun's surface, magnetic fields, and atmosphere. So, instead of just providing a simple, disconnected answer, I prefer to give you a bit more information about our home star, the Sun.

The Sun is a bit bigger, brighter and hotter than the average star in the Milky Way. It was created about 5 billion years ago when a supernova explosion created a shock wave in our small section of Orion's Arm of our Galaxy. That supernova-generated shock wave did a couple of important things -- it enriched our small area of the Galaxy with heavy elements (to an astronomer that is everything heavier than helium), and it caused clouds of dust and gas to condense. After that shock wave passed, dozens and perhaps hundreds, of stars were created. The Sun had many siblings about 5 billion years ago that have since wandered off into the Milky Way.

As the cloud of dust and gas condensed, it began to spin and collapse. Areas became "knotted" with higher concentrations of matter. Those areas eventually became stars, and most likely, planetary systems like our own. With the collapse came higher temperatures and faster spins. Eventually the collapse became so intense that the gravitational pull, created by the mass, caused hydrogen atoms to fuse to create helium atoms. That took place at the center of the "pre-Sun". This process, called hydrogen fusion, creates a tremendous amount of energy. It halted the Sun's collapse and actually caused it to expand a little. After a period of adjustment of a few million years, the Sun, powered by hydrogen fusion, settled in for the long run of shining as our star. Currently it has "burned" though about half of its hydrogen fuel in its core. As hard as it is to believe, It consumes about 600 million tons of hydrogen every second! At that rate, it has another 5 billion years of fuel left.

The Great Orion Nebula - This NASA image shows the "stellar nursery" where condensations of matter are being created and will form future stars and planetary systems.

The Sun has an intensely hot core of about 15 million degrees Celsius. It is within the core that temperatures and pressures

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are high enough for nuclear fusion to take place. In fact, 600 million tons of hydrogen are fused to make 596 million tons of helium. You may ask: "What happened to the other 4 million tons?" Thanks to Albert Einstein we have an answer. That matter is transferred into energy according to the famous equation **$E=mc^2$**.

In that famous equation: E = energy in joules
m = mass in Kg (4 million tons is about 3,630,000,000 Kg)
c = the speed of light (300,000km/s)

The math is straightforward enough:

E = m (3,630,000,000Kg) x c^2 (300,000km/s x 300,000km/s)

E = 326,700,000,000,000 joules (That is 326,700,000,000,000,000,000 joules, a pretty meaningless number.)

As a simpler example, take the energy of 1 gram of hydrogen being converted to 0.993 grams of helium. In this case only 0.007 grams (0.000007 kg) are converted to energy. So,

E = 0.000007kg x (300,000km/s x 300,000km/s) so, E = 630,000 joules

That is about the same amount of energy in 2/3 of a common stick of TNT or about 1/3 of a pound of TNT. That would be quite a blast from only 0.007 gram of matter converted into energy. And, the Sun is converting **4 million tons** of matter into energy every second!

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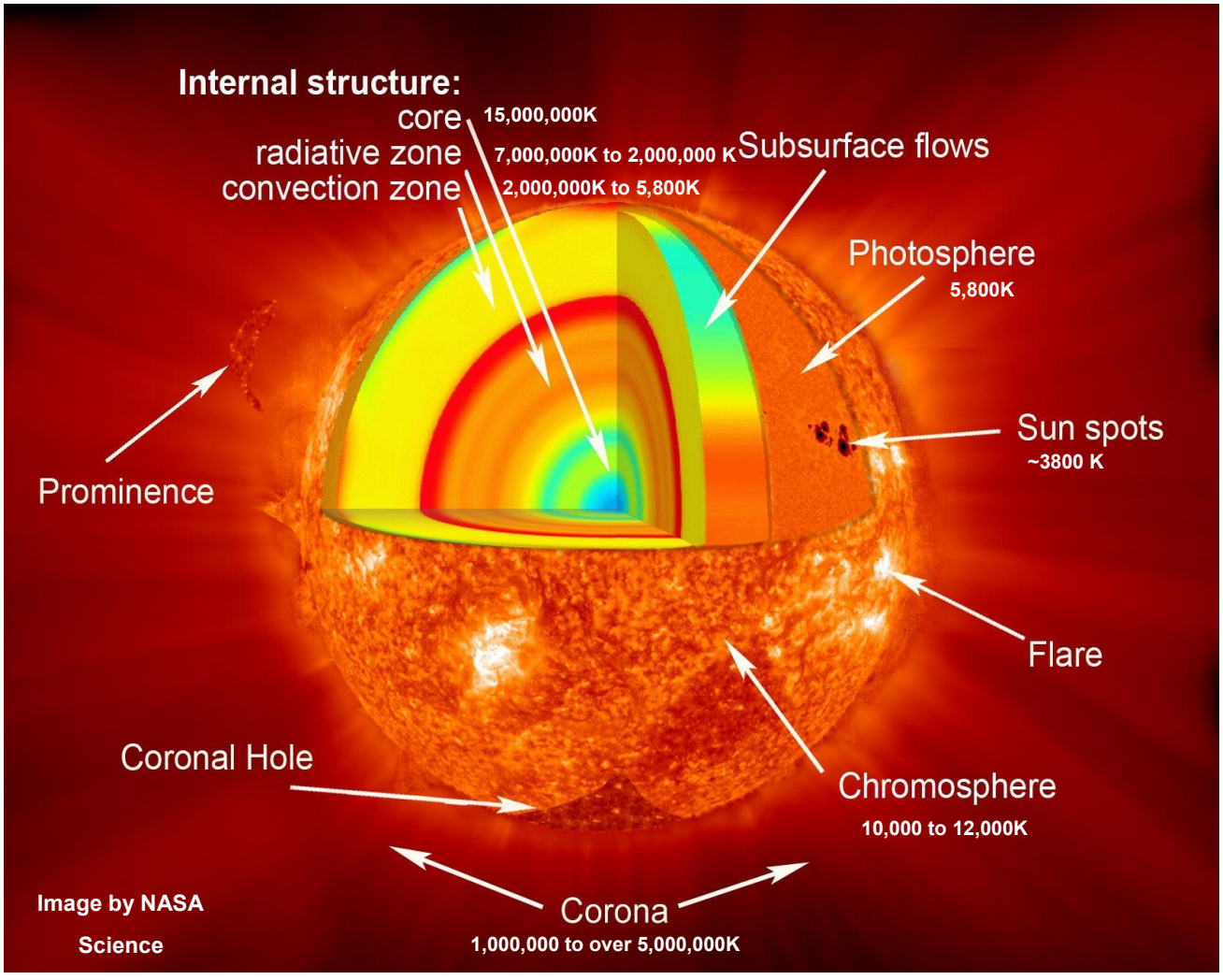

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This energy starts within the core as gamma radiation. As it makes its way to the surface, it cools. Finally, at the photosphere (the Sun's visible surface), it has cooled to 5800°C and creates the visible light, that heats and illuminates the Earth, 93,000,000 miles away.

Above the photosphere, temperatures begin to rise. The next layer up is the chromosphere. It was named for the reddish-pink color seen around the Moon during eclipses. It has a temperature of 10,000° to 12,000°C. It is also the region of solar flares. The final layer of the Sun is the corona. In this region temperatures soar to over 1,000,000°C. The corona is the thin outer atmosphere of the Sun. It consists primarily of particles of hydrogen (protons), helium (alpha particles) and electrons that are streaming out away from the Sun. It extends to, and merges with, the coronas of nearby stars. So, Earth and the other planets, orbit within the Sun's extended corona.

Compared to the Sun's enormous output of light, the corona is quite dim. It is there all of the time, but visible only on the special occasions when the Sun's extremely bright photosphere is blocked from our view, by the Moon, i.e. during a total eclipse. On these special occasions, astronomers who specialize in solar astrophysics, make great efforts to place their instruments in the path of totality, to observe the corona. The streamers are confined and thus defined by the magnetic fields of the Sun. Unlike Earth with only two magnetic poles, the Sun has many poles. And these magnetic fields change in strength and positon, and indicate the shape and position of the corona's streamers (technically called filaments).

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Photo by Stan Celestian

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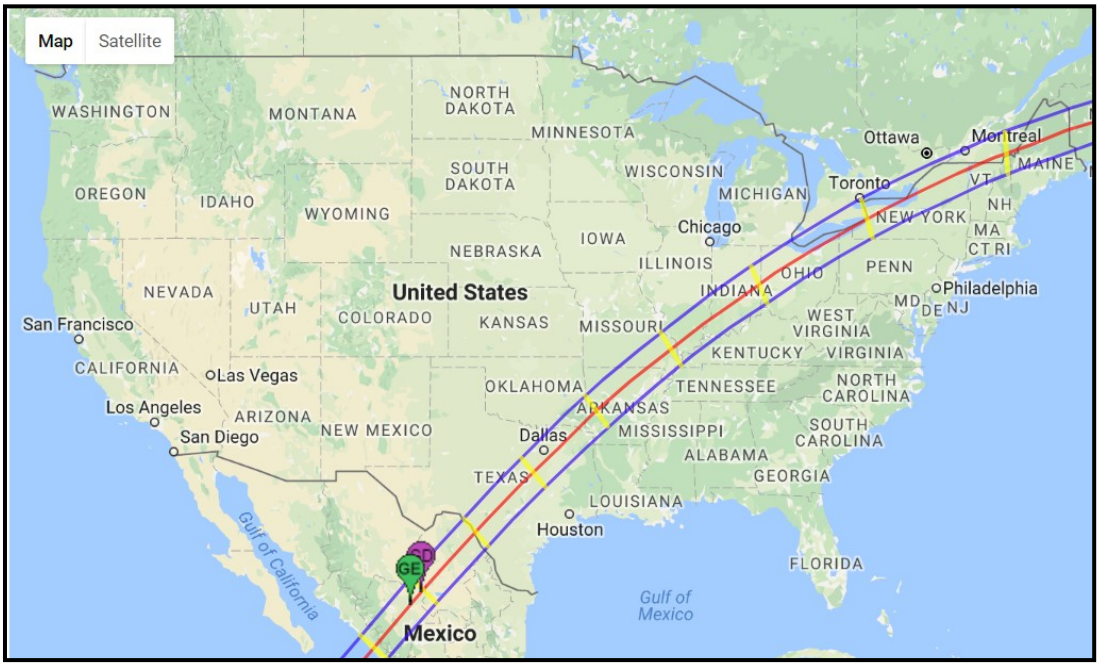
The amazing corona is a constant stream of matter, moving out, away from the Sun. That stream of material, called the solar wind, results in the Sun losing about 1.5 million tons of mass per second. A insignificant drop-in-the-bucket for the Sun.

WHAT'S NEXT??????????

The next total eclipse is only 7 years away. It will take place April 8, 2024, and it will last about twice as long as the "Great American Eclipse of 2017", a bit over 4 minutes. It is time to start planning your trip. Here is a NASA-generated map showing where the path of totality will go across the United States.

Where will you be on Monday morning, April 8, 2024?



This is a NASA map of the path of totality across North America for the April 8, 2024 eclipse.

(There will be a quiz over all of this information at the next meeting. You must score at least an 80% to continue to be a member of the club.)

Meeting Minutes — May 12, 2017

No minutes available.

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

October 6-8 - Buckeye, AZ Helzarockin' Gem & Mineral Show, Helzapoppin' Arena, 802 N 1st St (Miller Rd); Fri-Sat 9-4, Sun 9-2; Admission: $3/adult; children under 12 free.

October 14-15 - Sierra Vista, AZ Huachuca Mineral and Gem Club; Cochise College, 901 Colombo Av; Sat 9-5, Sun 10-4; Admission: Free.

October 21-22 - Sedona, AZ Sedona Gem and Mineral Club; Sedona Red Rock High School, Hwy 89A & Red Rock Loop Rd; Sat 10-5, Sun 10-4; Admission: $3; children under 12 free.

November 3-5 - Black Canyon City, AZ High Desert Helpers Rock-a-Rama Gem and Mineral Show; High Desert Park, 19001 E Jacie Ln; Fri 9-4, Sat 9-5, Sun 9-4; Admission: free.

November 18-19 - Payson, AZ Payson Rimstones Rock Club, Inc.; Payson H.S./Longhorn Gym, west of Longhorn Rd., east of McLane; Sat 9-5, Sun 10-4; Admission: $2, children 12 and under free.

November 25-26 - Wickenburg, AZ Wickenburg Gem and Mineral Club; Wrangler Event Center, 251 S. Tegner St.; Sat 9-5, Sun 10-4; Admission: free.

If you are travelling, a good source of shows AND clubs is http://www.the-vug.com/vug/vugshows.html or http://www.rockngem.com/ShowDatesFiles/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

UPCOMING WGMS FIELD TRIPS

NO FIELD TRIPS SCHEDULED AT THIS TIME

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

If you all have some place that you would like to go, let Craig J. 208-681-4770 or Mel C. 502-641-3118 know. This is your club. Let's go out and have some fun.

Officers and Chairperson

President: Craig Jones.....208-523-9355
Vice President: Mel Canter 502-641-3118
Secretary: Judy Zimmerlee..... 517-652-1355
Treasurer: Debra Keiser..... 928-684-1013
Program Director: Dale Keiser..... 928-684-1013
Publicity: currently open position
Membership: Roma Hagan 602-469-7662
Editor: Susan Celestian 602-361-0739
Field Trip: Craig J, Bob B, Mel C
Show Chair: Beth Myerson.....480-540-2318
Scholarship Chair: Steve Hill..... 928-533-3825
Historian: Jeanine Brown..... 928-684-0489

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

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

Meeting Dates for 2017

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

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

http://www.wickenburggms.org/

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

NOTES FROM THE EDITOR

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

I would love to have some pictures from field trips! Snap a couple and send them to me.

Deadline for the newsletter is the 27th of the month.

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