



EARTHQUAKE

e-Newsletter about what's movin' and shakin' at the Earth Science Museum

Earth Science Museum, 3215 W. Bethany Home Rd., Phoenix, AZ 85017
www.earthsciencemuseum.org, scote@earthsciencemuseum.org, 602-973-4291

December 2014
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ESM NEWS and EVENTS

By Shirley Cote, Ray Grant and Harvey Jong

OUTREACH REPORT - November, 2014

By Mardy Zimmermann

The Earth Science Museum's Outreach Volunteers had a very busy and productive November. We served 743 students in classrooms at 4 schools: Cocopah Middle School, Mt. Shadows Elementary, On Track Academy, and Estrella Mt. Elementary. This compares with 629 last Nov.

In addition, our Community Outreach program was very busy for the month. The AZ Science Teachers Association Conference gave us many new contacts and we used our new banners. ESM and the Leaverites participated with Scout Day activities at the Mesa Museum of Natural History with Egg Cartons, Harvey doing mineral identification for kids, and Dick Z handling a hands-on display of rocks, minerals, and fossils. At the same time Lynne Dyers attended the Boy Scout Pow Wow at Gilbert High School. Finally, Dick, Harvey, Alice and I presented hands-on displays at the Cocopah Middle School STEM FEST. Our total for Community Outreach in Nov. was 537.

Thanks to all who are making ESM Outreach a big success and, as reported last month, we were awarded \$5,000 in additional grant money from the Staples Corporation.



2million
&change



Graphic courtesy of the Arizona Museum of Natural History

Family/Scout Geology Day was held at the Arizona Museum of Natural History on November 15, and the ESM participated by providing a number of activities on the museum terrace. These activities included making egg carton rock, mineral, and fossil collections; a mini-museum display of rocks, minerals, and fossils; and a rock identification station. About 100 cub and girl scouts along with their family members enjoyed the fun, action packed morning where they fulfilled the requirements for their scout geology pins or badges. Parents commented that they really appreciated the opportunity for kids to touch and handle specimens.



A group of girl scouts check out the rock & mineral specimens, as Dick Zimmermann stands ready to answer any questions

Photo by Sherman Mohler

Courtesy of the Arizona Museum of Natural History



Harvey Jong explains mineral hardness and the Mohs' scale of hardness to participants

Photo by Sherman Mohler

Courtesy of the Arizona Museum of Natural History

COCOPAH MIDDLE SCHOOL STEM FEST

Cocopah Middle School in Scottsdale hosted *Evening Under The Stars*, an Earth and Space Exploration STEM night on November 21. This inaugural event was an ambitious undertaking where ASU, astronomy clubs, Challenger Space Center, Earth Science Museum, Honeywell, Intel, Musical Instrument Museum, NASA, Orbital Sciences, Phoenix Herpetological Society, and fifteen other groups or individuals set up 100 different activities around the school. 500-600 students and their families enjoyed things such as astronomy viewing, gigantic inflatable models of the planets, glow-in-the-dark concert, and Skype with an astronaut.

Alice LaBonte, Dick and Mardy Zimmermann, and Harvey Jong staffed the ESM display which featured a hands-on collection of rocks, minerals, and fossils. Around 75 students and parents enjoyed examining the different specimens.



Murdy greets visitors to the ESM activities

Photo by Harvey Jong



The ESM display featured tables with different rock, mineral, and fossil specimens that visitors could touch and examine

Photo by Harvey Jong



Upclose at the minerals table

Photo by Alice La Bonte



The “Dino Leg” puzzle was popular with students where they tried to reconstruct the dinosaur fossil.

Photo by Harvey Jong



Harvey overseeing as a student tries her hand at assembling the dinosaur leg bones
Photo by Alice La Bonte



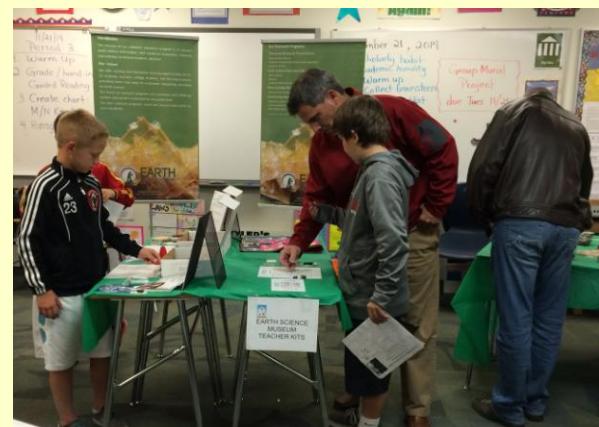
Success!
Photo by Alice La Bonte



The display of fluorescent minerals included posters that explained why minerals fluoresce
Photo by Harvey Jong



Mardy helping a student and parent learn about mineral identification
Photo by Alice La Bonte



Students and parents learning about rocks and minerals
Photo by Alice La Bonte

OUTREACH REPORT - December, 2014

By Mardy Zimmermann

December has usually been a slow month for school presentations, but not this year. We served 568 students at Santa Maria Middle School, Villago Middle School (CG), Boulder Creek Elementary, Skyline Ranch K-8 (FL) and Eduprize Middle School during the first two weeks. Middle schools are requesting service more and more, and many 7th graders report never having an earth science unit in third or fourth grade. As a result, we have both a Properties of Minerals presentation and a newly developed Rocks program, with hands on materials that show sedimentary and igneous rocks and which metamorphic rocks they become. Villago Middle School in Casa Grande had both presentations on different days. Lynne Dyer is noticing an increase in Boy Scout requests since her November event at Gilbert High School. In addition to serving 15 scouts for Lynne, Shirley also did a community presentation to a PetSmart Charities group. At this point, we are well ahead on numbers served compared to last year: Schools--2,237 vs. 1,111, and Community Events-1,044 vs. 788 and Total Served- 3,281 vs. 1,899.



Arizona Rocks 19

Text and photos by Ray Grant

A rock that is very similar to limestone is dolostone. In the past it was called dolomite, but since that is also the name of a mineral; the term dolostone was proposed for the rock. Visually the two rocks cannot be told apart. Limestone is composed mainly of the mineral calcite (CaCO_3) and dolostone is mainly the mineral dolomite ($\text{CaMg}(\text{CO}_3)_2$). The two minerals can be told apart with an acid test. In dilute HCl, calcite reacts vigorously and dolomite will not react unless powdered.

Most dolostone forms from seawater reacting with limestone to replace some of the Ca in the limestone with Mg. There are a few areas of high evaporation where primary dolostone crystallizes out of the sea water.

In Arizona dolostone is not common, and because it looks exactly like limestone it is almost never recognized. One formation that contains a fair amount of dolostone is the Devonian Martin Formation. It is named after Mount Martin that is close to Bisbee. Part of a measured section is given below. Note the ratios of calcite to dolomite for the parts of the formation. There is Martin Formation just east of Superior. I have never stopped there so I am not sure how much is dolostone at the location. Also attached below is a brief description of the Martin rocks east of Superior from the website <http://www.t-rat.com/Pages/WhereToFindFossils.html>.

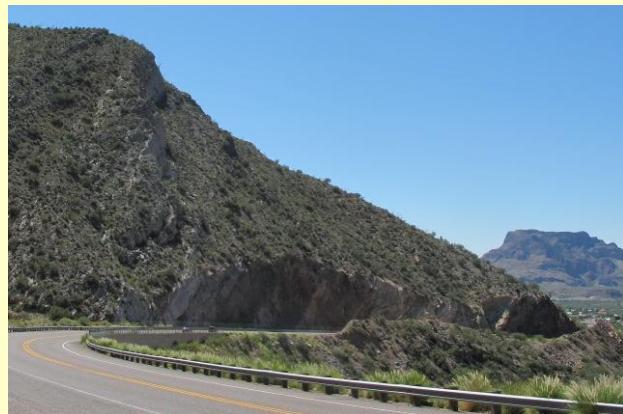


Dolomite crystals on
dolostone
Black Rock, AR
Photo by S. Coté

Martin Limestone on east-facing slope of small hill north of Spring Creek—Con.

Martin Limestone:	Feet
1. Dolomite (calcite : dolomite=10:90), fine-grained, light-gray, thin-bedded	5
2. Covered	25
3. Dolomite, calcareous (calcite : dolomite=20:80 at 4½ ft from top), fine crystalline, very light gray to pinkish-gray; weathers yellowish gray; forms prominent ledge	5½
4. Dolomite, calcareous (calcite : dolomite=17:83 at 3 ft from top), fine-grained, olive-gray; contains irregularly shaped siliceous nodules; in thin beds having indistinct parting planes	9
5. Dolomite, fine-grained, thin-bedded; mostly covered	5±
6. Slitstone, dolomitic; mostly covered	3±
7. Limestone (calcite : dolomite=95:5 at 10 ft from top), skeletal-micritic, olive-gray; contains some crinoidal debris and scattered silicified horn corals; forms prominent ledge	18
8. Slitstone, dolomitic, poorly exposed	36
9. Dolomite, very fine grained, olive-gray; minor chert; in one bed	2
10. Covered	4
11. Dolomite (calcite : dolomite=7:93), very fine grained, olive-gray; minor chert; in one bed	3
12. Covered	8
13. Dolomite (calcite : dolomite=5:95 at 10 ft from top), very fine grained, olive-gray; silicified fossils (USGS colln. 6366-SD from upper part); in beds 1-4 ft thick; forms ledge	12
14. Slitstone, dolomitic; weathers pale yellowish brown; poorly exposed in slope	9±
15. Dolomite, thin-bedded; poorly exposed in slope	10±
16. Dolomite (calcite : dolomite=6:94 at 5 ft from top), silty, very fine grained; laminated in part; abundant corals in upper part (USGS colln. 6362-SD from top); thin bedded in lower half; one ledge-forming bed in upper half	7

Part of a stratigraphic column for the Martin Formation near Bisbee, from USGS Bulletin 1201-F, Paleozoic Stratigraphy of the Mule Mountains, Arizona



Road cut with Martin Formation east of Superior



Martin Formation
fossils located
north of Payson
Photo by S. Coté

 **Devonian rocks at Superior**, outcrop on the first ridge east of the city. The fossil locality consists of a basal bone breccia in a light, coarse-grained sandstone located above the base of the Martin Formation. Armor plates of scattered teeth comprise approximately twenty percent of the lithologic material of the breccia. The plates average four millimeters in thickness, lie horizontally and represent two distinct kinds of these primitive fish. Fossil fish teeth were also found in the marine limestone between this fossil bed. Conodonts are also common.

Fossil location in Martin Formation east of Superior, not sure if there is dolostone there, from website: <http://www.t-rat.com/Pages/WhereToFindFossils.html>

EXPLORE YOUR WORLD!

BRYCE CANYON NATIONAL PARK

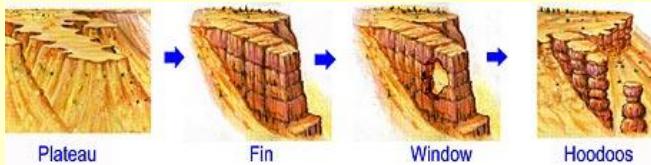
Text & photos from NPS.gov



It is the uniqueness of the rocks that caused Bryce Canyon to be designated as a national park. These famous spires, called "hoodoos," are formed when ice and rainwater wear away the Pink Member of the 50 million year old Claron Formation which is largely composed of easily eroded and relatively soft limestone.

Bryce Canyon is not a "real" canyon as it is not carved by flowing water like the Grand Canyon. Although water is the active ingredient, it is in the form of "frost wedging" and chemical weathering that form the walls, fins, windows and hoodoos of Bryce.

The landforms of Bryce are formed by two weathering processes that continuously work together in eroding the edges of the Paunsaugunt Plateau. The primary weathering force at Bryce Canyon is frost wedging. Over 200 freeze/thaw cycles occur each year in Bryce Canyon. In the winter, melting snow seeps into cracks and joints. At night, when the water freezes, it expands by almost 10%, prying open cracks and breaking the rock into smaller pieces. The force of the expanding ice is called frost wedging and helps to erode the rock. The frequency of frost wedging in this region makes it the most important type of weathering in the canyon.

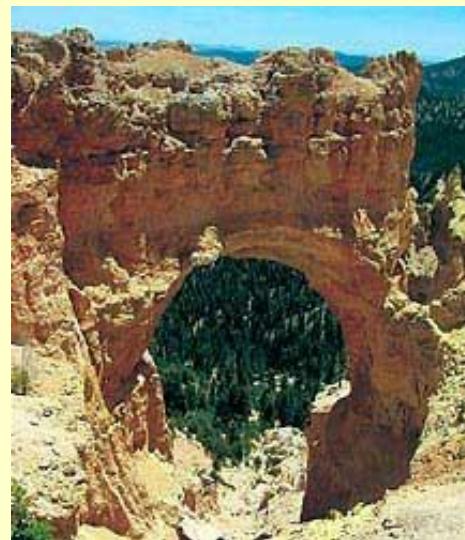


In addition to frost wedging, what little rain Bryce gets during the summer monsoons also sculpts the landforms. When rain combines with carbon dioxide it forms a weak solution of carbonic acid. This weak carbonic acid slowly dissolves the limestone. It is this process of

chemical weathering that rounds the edges of hoodoos and gives them their lumpy and bulging profiles. Where internal mudstone and siltstone layers interrupt the limestone, you can expect the rock to be more resistant to the chemical weathering. These layers are more resistant to attack by carbonic acid and they can therefore act as protective capstones of fins, windows and hoodoos. Many of the more durable hoodoos are capped with a type of magnesium-rich limestone called dolostone. Dolostone dissolves at a much slower rate, and consequently protects the weaker limestone underneath.



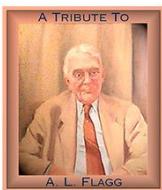
Looking down into Wall Street from Sunset Point
NPS photo



Natural Bridge - NPS photo

Bryce Canyon National Park offers a wide variety of activities during the year. In winter, there is cross-country skiing and snowshoeing (check with rangers at the visitor center). Along with camping and hiking during the summer there are weekly astronomy programs plus an annual astronomy festival in June. Also, there are daily geology talks and an annual geology festival in July.

The tailgate show tradition continues!



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ESM's Upcoming Meeting

The Earth Science Museum's next scheduled Board meeting on January 21, 2015, at the Burton Barr Library, located near Central Ave. and McDowell in Phoenix at 6:30 p.m. in Rm. B. Everyone is welcome to attend.

BECOME A MEMBER!
Join the Earth Science Museum's



----- *cut here* -----
**ESM Earth Science Investigation
Team Membership Form**
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Membership benefits:

- ◆ Monthly e-newsletter *Earthquake*
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We're on the Web!

Visit us on  and at:
www.earthsciencemuseum.org

Mission

Establish an innovative, world-class destination museum in the Phoenix area dedicated to inspiring all generations about earth sciences.

Vision

We envision a community where students and the general public have curiosity about, passion for, and understanding of the underlying principles of earth sciences.

For more information about the ESM,
how to become a member or how to
arrange for a school visit or
Community function, go to:
www.earthsciencemuseum.org.

Please join us at the next ESM Board meeting
Wednesday, January 21, 2015, at the Burton
Barr Library in Phoenix at 6:30 p.m. Rm. B.

THANK YOU FOR YOUR CONTINUING INTEREST & SUPPORT!!!

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