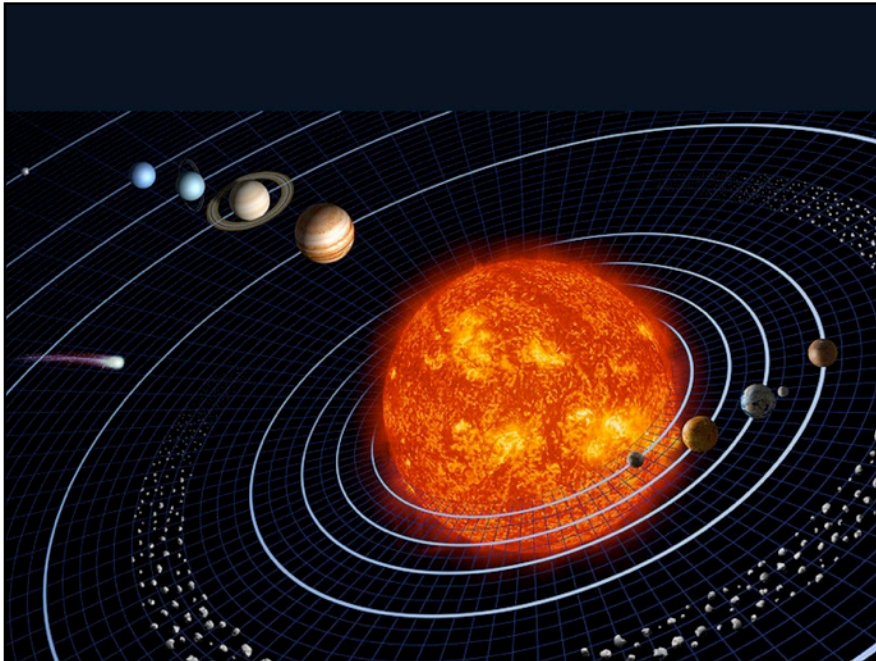




Volume 60 ♦ Number 02 ♦ February 2014 ♦ A monthly newsletter for and by the members of MAGS

The Best Prospects For Life

Mike Baldwin



At the February MAGS meeting, I will be taking you on a journey through our solar system and beyond. The main focus of my presentation, “Hitchhikers Guide to the Solar System”, will be astrogeology—the structure and composition of our closest neighbors in

space. During my research for the presentation, I thought a lot about which members of our space community might harbor some form of life. Not life as we know it [breathing, thinking, intelligent, spirit-filled beings], but the building blocks of life. *Continued, P. 3*

In this issue

The Best Prospects For Life	P. 1
Never Too Soon To Sign Up	P. 1
MAGS And Federation Notes	P. 2
Shop For Chucalissa	P. 3
December Board Minutes	P. 3
MAGS 2014 Dues	P. 4
December Meeting Minutes	P. 5
Massive Ancient Subglacial Trough	P. 5
Upcoming Field Trips	P. 6
Looking For Sponsors	P. 7
Jewelry Bench Tips	P. 8
MAGS At Shelby County Schools Fair	P. 8
Formation Of The Grand Canyon	P. 9
Agates Showcase	P. 10
A Jelly Doughnut On Mars?	P. 10
Bolivian Dinosaur Trackways	P. 12
Calendar	P. 12

NEVER TOO SOON TO SIGN UP

Many volunteers are needed to put on our Show. “How can I help?” is the question to ask yourself. We need our Members to man the information booth, collect admissions, and help in the RockZone (kids area) and other areas. Every Member should contribute some time for the Show, at least one 3-hour

block on Saturday, April 26 (9:00-6:00) or Sunday, April 27 (10:00-5:00).



Look for more information next month. Call Carol Lybanon, (901) 757-2144, or she will call you.

Get involved. It's more fun to be a part of the action.

MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS Rockhound News ♦ A monthly newsletter for and by the members of MAGS

2013-2014 MAGS BOARD

President—Paul Sides

1062 CR 739, Wynne, AR 72396 ♦ (870) 208-9586

1st VP (Field Trips)—W. C. McDaniel

2038 Central Avenue, Memphis, TN 38104 ♦ (901) 274-7706 ♦ w.c.mcd@att.net

2nd VP (Programs)—Ron Brister

3059 Old Brownsville Road, Bartlett, TN 38134 ♦ (901) 388-1765 ♦ bristerr@bellsouth.net

Secretary—Carol Lybanon

2019 Littlemore Drive, Memphis, TN 38016 ♦ (901) 757-2144 ♦ sgcarol@earthlink.net

Treasurer—Bill Gilbert

8588 Thor Road, Cordova, TN 38018 ♦ (901) 569-1725 ♦ billis4rox@comcast.net

Director (Asst. Field Trips)—Charles Hill

2887 Forest Hill Irene Road, Germantown, TN 38139 ♦ (901) 754-1504 ♦ hunter3006@aol.com

Director (Asst. Programs)—Guy Weaver

2563 Broad Avenue, Memphis, TN 38112 ♦ (901) 452-7554 ♦ gweaver@weaverassociatesllc.com

Director (Youth)—James Butchko

4220 Dunn, Memphis, TN 38111 ♦ (901) 743-0058 ♦ butch513j@yahoo.com

Director (Asst. Youth)—Bonnie Cooper

8695 Baylor Road, Arlington, TN 38002 ♦ (901) 377-0900 ♦ rocks4us@hotmail.com

Director (Librarian)—Ron Brister

3059 Old Brownsville Road, Bartlett, TN 38134 ♦ (901) 388-1765 ♦ bristerr@bellsouth.net

Director (Membership)—Neville Mayfield

3982 Glendale Drive, Memphis, TN 38128 ♦ (901) 386-3006 ♦ enmayfield@gmail.com

Director (Historian)—Nannett McDougal-Dykes

♦ 106 Maple Street, Stanton, TN 38069 ♦ (901) 634-9388 ♦ redchesty@yahoo.com

Newsletter Editor—Matthew Lybanon

2019 Littlemore Drive, Memphis, TN 38016 ♦ (901) 757-2144 ♦ lybanon@earthlink.net

Webmaster—Mike Baldwin

367 North Main Street, Collierville, TN 38017 ♦ (901) 853-3603 ♦ mbaldwin05@gmail.com

Show Chairman—James Butchko

4220 Dunn, Memphis, TN 38111 ♦ (901) 743-0058 ♦ butch513j@yahoo.com

MAGS AND FEDERATION NOTES

MAGS Needs You

This year's Memphis Mineral, Fossil, and Jewelry Show opens in less than 2 months. MAGSters can help in (at least) two ways: by becoming a sponsor (see P. 7) and by volunteering at the Show (see P. 1).

Hospitality Hosting

Needed: Volunteers to help at our Membership Meetings. Please call Carol Lybanon at (901) 757-2144. You only need to volunteer once a year. It is an easy job but it will really help. Thanks.



Upcoming Adult Programs

- ➔ February: Mike Baldwin, Astrogeology
- ➔ March: Robert Connolly, Chucalissa
- ➔ April: MAGS Show

Please contribute articles or pictures (everybody likes pictures) on any subject of interest to rockhounds. If it interests you it probably interests others. The 15th of the month is the deadline for next month's issue. Send material to lybanon@earthlink.net.

February DMC Field Trip

WHERE: Gravel Pit/Coal Mine, Brookwood, AL

WHEN: Saturday, February 15, 9:00 A. M. CST

COLLECTING: Petrified wood, jasper, agate, crazy blue lace, and oolite.

INFORMATION: Reggie and Bunny Bolton, (205) 870-7721 or (205) 410-9455, reggie@newenvirons.net.

March DMC Field Trip

MAGS will host the March DMC field trip. See P. 6 for more information.

Links to Federation News

- ➔ AFMS: www.amfed.org/afms_news.htm
- ➔ SFMS: www.amfed.org/sfms/
- ➔ DMC: www.amfed.org/sfms/_dmc/dmc.htm

The Best Prospects for Life Rudimentary or-
Continued from P. 1 ganisms.

Other than our very own blue marble, Earth, the best prospects for life on other heavenly bodies in our solar system might be Mars, Europa, Titan, Enceladus, Io, and Jupiter. Of course life as we know it cannot exist on any of these bodies. Mars is the most Earth-like of all the planets and it was even more Earth-like eons ago. Recent evidence of water on the red planet indicates that it had a very different past than the images and data we have collected in recent years.

Europa, one of the moons of Jupiter, almost certainly has liquid water beneath its icy surface. I recently watched an interesting and very speculative movie called "The Europa Report" about a team of astronauts whose mission was to explore the surface of Europa. The film was very reminiscent of "2001: A Space Odyssey", evocative of what could be. Who knows what lies beneath the icy surface of Europa?

Another moon of Jupiter, Io, has a very complex chemistry, which causes it to be much warmer than most other bodies in the outer solar system. Io is the fourth largest moon in the solar system. With over 400 active volcanoes, it is also the most geologically active object in the solar system. Io's surface is dotted with more than 100 mountains that have been uplifted from the base of its silicate crust. Could there be a unique form of life dwelling on or beneath Io's silicate rocks and sulfur plains?

Jupiter itself might be a long-shot candidate for life. It is a warm planet with plenty of organic material. A thick, hydrogen gas atmosphere makes it difficult to determine where atmosphere ends and planet begins. Composition of 78% of the planet is metallic hydrogen. Sandwiched between the hydrogen atmosphere and this molten surface lies a band of clouds, some composed of ammonia and some composed of water. Amino acids, basic building blocks of life, could be part of this cloud layer.

Titan, the largest moon of Saturn, has been described as a planet-like moon. It is primarily composed of water ice and rocky material. In 2004, the Cassini-Huygens probe discovered hydrocarbon lakes in Titan's polar regions. Climate similar to that on Earth [including wind and rain] create surface features similar to those on our planet, such as dunes, rivers and lakes [although the lakes contain liquid methane and ethane rather than water]. It has been suggested that life on Titan might use liquid hydrocarbon, such as methane or ethane, in much the same way we use liquid water. Perhaps five billion years from now, when our sun becomes a red giant and ultraviolet output decreases, Titan could be transformed into an Earth-like habitat.

Enceladus, the sixth-largest moon of Saturn, seems to have liquid water beneath its icy surface. Cryovolcanoes at the south pole shoot large jets of water vapor and some solid NaCl particles into space. Some of this water falls back to the surface. Some of

it becomes part of the rings of Saturn. Because of this apparent water at or near the surface, Enceladus may be the best place for humans to look for extraterrestrial life.

None of the planets and moons that I have mentioned here are very good prospects for life and there are great arguments that life cannot exist on any of them. Could there be life on other planets, orbiting other suns, in some far distant corner of the galaxy? Your guess is as good as mine. The only things of which we can be certain are that we don't know and we need to seek more evidence.

Shop For Chucalissa

Every purchase you make online can help support the youth programming and the redesign of the Hands-On Archaeology Lab at the C. H. Nash Museum at Chucalissa. Here's how:

- Go to www.ShopforMuseums.com
- Choose the C. H. Nash Museum at Chucalissa as your museum partner.
- Shop any of 500 online stores.

When you check out, a percentage of your purchase amount is automatically donated to the C. H. Nash Museum at Chucalissa. There is no charge to you or the Museum.

December Board Minutes

Carol Lybanon

The MAGS Board of Directors met December 5 at St. Francis Hospital, 5959 Park Avenue. *Continued, P. 5*

MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS Rockhound News ◇ A monthly newsletter for and by the members of MAGS

THANKS FOR DUESING YOUR DUES !!!

We really appreciate those of you who have renewed their memberships on time.

MAGS offers members many opportunities for education, exciting field tips, fellowship, community engagement, and more.

We hope those of you who have not yet renewed will decide that the benefits MAGS provides are valuable enough to warrant your continuing your membership.

Renewal is easy! All you have to do is send in the appropriate dues amount along with the following renewal form so that we can be sure that the roster has your correct contact information, and you're all set.

Memphis Archaeological and Geological Society www.memphisgeology.org

MEMBERSHIP RENEWAL (Membership year: Jan 1st – Dec 31st) **PLEASE PRINT LEGIBLY !!**

CATEGORY (Please check): FAMILY [] - \$25.00; INDIVIDUAL (OVER 18) [] - \$20.00;
JUNIOR (UNDER 18) [] - \$10.00

Please make checks payable to: MAGS - (Mail to: MAGS, 3982 Glendale Dr., Memphis, TN 38128)

MEMBER'S NAME: _____

HOME ADDRESS: _____ HOME PH.: _____

CITY: _____ ST: _____ ZIP CODE: _____

E-MAIL ADDRESS: _____ CELL/WORK PH: _____

You can just print this out from the newsletter (or email), or clip it out if you get a mailed copy of the newsletter, and mail it in with your dues. If you attend a meeting, you can simply check the roster and update with changes.

At the end of February, if we haven't received your renewal, we'll let you know that you've been dropped from the roster. We'll also send out dues reminders in between newsletters.

Thanks for helping us keep our roster squared away!

MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS Rockhound News ♦ A monthly newsletter for and by the members of MAGS

December Board Minutes The meeting was
Continued from P. 3 called to

order at 6:33 P. M. by W. C. McDaniel. President Paul Sides did not attend the meeting because of bad weather. Present were: Mike Baldwin, Ron Brister, James Butchko, Bonnie Cooper, Bill Gilbert, Charles Hill, Carol Lybanon, Matthew Lybanon, Neville Mayfield, W. C. McDaniel, Nannett McDougal-Dykes, Bob Cooper, and Marc Mueller.

Secretary: The minutes were accepted as presented. Bill asked for some clarification about the merging of the Don Green and Roger Van Cleef funds into one fund, called the Don Green/Roger Van Cleef Education and Library Fund.

Treasurer: The November report was accepted as presented, subject to audit. The bank is still sending monthly statements to Doris. Bill will try again to get that corrected.

Membership: Neville reported that renewals are coming in very slowly. He will send out another notice soon.

Field Trips: W. C. reported that the trip to Livingston was very good. About 20 Members attended. They found that there were fewer crinoids at the Dale Hollow site than usual. Mr. Pharris's grandson plans to bulldoze their field. W. C. will check to see if we could go for a day trip to collect afterward. He sent Guy Weaver an email about leading a field trip; as of this this meeting he had not received a response. On January 4 & 5 W. C. will lead a trip to Missouri, to collect druse quartz and other material. He will go up on Friday. The trip will only be canceled if the weather is treacherous. W. C. is also planning our DMC field trip for March, to Sugar Creek. Carol will contact George Phillips and see if he can put together a field trip in February.

Adult Programs: W. C. will present the January program. Mike Baldwin is

scheduled for February and Robert Connolly is scheduled for March.

Junior Programs: It was suggested that Jim contact Amber Dunn to see if she can present a Junior program. Carol offered to do the January program, on gem trees.

Show: Jim reported that the Agri-center contract is done, the notepads are here, and the next Showteam meeting will be on January 6. Jim will check with MLGW on placing an ad on the insert with their bills. Carol will order a few samples of black tablecloths for the demonstrators.

Library: Ron reviewed our library's archaeology collection and said it was in very good shape.

Newsletter: Matthew again asked for pictures and articles. He said it would be very good if all the committees could give him three months of events, to help people plan. W. C. said he would send a January program article. Mike said he would send a February article.

Webmaster: Mike says AT&T is continuing to make changes to web hosting. He will continue to make the necessary changes so that people can get to the website. He has new website software, Dreamweaver. He will put in a blind link to our roster. **Historian/Rock Swap:** Nannett has everything under control for the holiday party. Santa will be there, and there will be door prizes. The Junior gifts are in, and W. C. will take care of the signup sheets. Board Members should bring canned drinks.

Old Business:

▶ Federation papers (membership and insurance) are ready to be mailed. Matthew asked who should write the check. A motion was passed to have the club pay the entire amount. Bill wrote a check and Matthew will mail the paperwork.

▶ W. C. reported that the auction of the thumbnail collections was held at his house.

▶ The Board is still waiting for Paul's expense report for the conferences he attended.

New Business:

▶ Ron reported that the MAGS Archaeology Group did not have a meeting because of the bad weather. Dr. Connolly has a new project, to remodel the hands-on teaching lab, that may be the group's next project. Meeting adjourned at 7:40 P. M.

December Meeting Minutes

Carol Lybanon

The MAGS Membership Meeting was held at Shady Grove Presbyterian Church on December 13. No minutes were taken because it was the holiday party.

Massive Ancient Subglacial Trough



A massive ancient subglacial trough, deeper than the Grand Canyon, has been discovered by a team of UK experts. The research involved scientists from the British Antarctic Survey and several universities. They charted the Ellsworth Subglacial Highlands—an ancient mountain range buried beneath several kilometers of Antarctic ice—by combining data from satellites and ice-penetrating radars towed behind skidoos and on-board small aircraft.

The researchers spent three
Continued, P. 6

MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS Rockhound News ◇ A monthly newsletter for and by the members of MAGS

Experiencing the Earth Wide Open MAGS2014-Upcoming field trips

Dates	Location	Trip status
February 22	Nonconnah Creek Site to be determined	trip bulletin to be published
March 15	MAGS Storage Shed—Show Grab Bag Packing Rain Date 3/22	trip bulletin to be published
March 29	Sugar Creek—MAGS hosts the DMC	trip bulletin to be published
April 5/6	Missouri Druse Quartz	trip bulletin to be published
April 24-27	Memphis Agricenter The Earth Wide Open	trip bulletin to be published
May or June	Vulcan Quarry, Black Rock, Arkansas Date subject to mining conditions and operations	trip bulletin to be published
May 24/25 Memorial Day	Hot Springs/Mt. Ida, Arkansas Quartz Crystal	trip bulletin to be published
June 14	Aggregate to Art Making objects from concrete	trip bulletin to be published
July 12	AC Appreciation Day—Part I Discovery Park of America, Union City, Tennessee	trip bulletin to be published
August 9	AC Appreciation Day—Part II Belz Museum, Memphis	trip bulletin to be published

Reminder: MAGS field trip rules:

1. Field trips are open only to current MAGS members. Exception: if MAGS participates in any field trip sharing program with other clubs their members may participate if it is a shared trip
2. MAGS members will not contact private landowners to obtain permission to collect on sites where the owner has granted the club permission to collect. A member who is unsure of the location will seek a decision by the Board of Directors.
3. MAGS members will not visit (prior to) a collecting site once it is scheduled and published as a club field trip. Exceptions are to public and/or fee places or locations with multiple collecting sites. A member who is unsure of the location will seek a decision by the Board of Directors.

*Massive Ancient Subglacial Trough
Continued from P. 5*

seasons investigating and mapping the region in West Antarctica, uncovering a massive subglacial valley up to 3 km. deep, more than 300 km. long, and up to 25 km. across. In places, the floor of this valley is more than 2000 m. below sea level. The mountain range and deep valley were carved millions of

years ago by a small icefield similar to those of the present-day Antarctic Peninsula, or those of Arctic Canada and Alaska.

Professor Martin Siegert, Professor of Geosciences at the University of Bristol, said: "While the idea of West Antarctic Ice Sheet growth and decay over the past few million years has been discussed for decades, the precise

location where the ice sheet may originate from in growth phases, and decay back to in periods of decay, has not been known.

"By looking at the topography beneath the ice sheet using a combination of ice-penetrating radio-echo sounding and satellite imagery, we have revealed a region which possesses classic glacial geomorphic land-

Continued, P. 8

LOOKING FOR SPONSORS

Member Sponsors, \$25 or more

Business Sponsors, \$100 or more

Benefactors, \$1,000 or more

On April 26 and 27 MAGS will again present the top-rated gem, mineral, fossil, and jewelry show in the Mid-South. The Show is our biggest source of income to support projects that benefit MAGS and the community, but it costs a lot of money to put it on. We ask our Members to donate time, materials, soft drinks and water, but that doesn't cover all the minor things the Show needs.

Members, you can show your support by helping us pay for snack bags for the dealers, bottled water and sodas for dealers and volunteers, advertising flyers and postcards, banners and signs, tickets, bags, wristbands, and other similar expenses. It won't be a surprise to anyone that the prices for these things have gone up.

Your donation would go a long way toward helping us meet our goal of putting on a Show that you would be proud of. MAGS is a 501(c)(3) organization, so your donation may be tax-deductible. You or your business will receive recognition at the Show, on the website, and in *MAGS Rockhound News*.

Please consider helping us. Fill out the form below, and return it to the Show Treasurer with your check made out to "MAGS Show."

.....

Name _____

Business Name _____

Address _____

Phone _____ Email _____

Member _____ Business _____ Benefactor _____

Return this form with a check made out to "MAGS Show" to

Matthew Lybanon, Show Treasurer
2019 Littlemore Drive
Memphis, TN 38016

For more information,
call (901) 757-2144
or email lybanon@earthlink.net

*Massive Ancient Subglacial Trough
Continued from P. 6*

forms, such as u-shaped valleys and cirques, that could only have been formed by a small ice cap, similar to those seen at present in the Canadian and Russian High Arctic. The region uncovered is, therefore, the site of ice sheet genesis in West Antarctica."

The team's analysis has provided an unprecedented insight into the extent, thickness and behavior of this ancient icefield, and the configuration and behavior of the early West Antarctic Ice Sheet. The subglacial landscape shows where and how the West Antarctic Ice Sheet originated and grew. It also provides important clues about the size and shape of the ice sheet in West Antarctica in a warmer global climate.

Ref: Neil Ross, Tom A. Jordan, Robert G. Bingham, Hugh F.J. Corr, Fausto Ferraccioli, Anne Le Brocq, David M. Rippin, Andrew P. Wright, and Martin J. Siegert. "The Ellsworth Subglacial Highlands: Inception and retreat of the West Antarctic Ice Sheet." *Geological Society of America Bulletin*, January 2014, v. 126, no. 1-2, p. 3-15, first published on September 19, 2013, DOI: 10.1130/B30794.1

Jewelry Bench Tips by
Brad Smith

MODIFYING PLIERS

Sometimes a few changes to your tools can significantly improve productivity and quality at the same time. Stock tools can be customized and improved using standard jewelry skills. Here's an example:



Making jump rings and weaving them into chainmaile designs involves a lot of opening and closing of the rings. I typically use two square jaw pliers to do this, one for each hand. But sometimes the rings would slip out of the pliers, getting scratched, and requiring extra cleanup time.

I solved the problem by forming a groove at the end of the jaw that would grasp the ring gently without scratching it. Use a triangular file or cutoff disk to cut the grooves about 1.5 mm back from the tip. Then to make the grooves round so they grasp the wire without distorting it, close the jaws and run a drill through the opening formed by the two rough grooves. Start with a small drill and follow up with a drill just slightly smaller than the wire size you want to grip. In my case that was 14 gauge wire, so I chose a #53 drill. Finally, polish the grooves with a rubberized disk.

More pictures and details, if needed, are available in the bench tips book.

MANAGING PRODUCTION

Many readers of these Bench Tips sell their jewelry at shows, in galleries or online. They are sole proprietors and constantly under pressure to design new pieces and make enough product to keep up with demand. So their options are few when a large order comes in.

They can burn the midnight oil themselves, or they can be smart and get some temporary help. But you need good help, and you often need it fast.

Jewelry assemblers are skilled, trustworthy and reliable craftsmen who make it their business to help others handle overloads and meet deadlines. Flexible arrangements are possible, working by the job, by the hour or by the piece. Each has a different mix of skills, from fabrication to enameling, casting, stonsetting, lapidary and others.

Assemblers are known to the trade, so you may have to ask around to find some references. But some assemblers advertise on the Net. For instance, a good friend of mine, Janice Metz <JenFT4@aol.com>, has been working with designers and fabricators in the West Los Angeles area since 1997. She specializes in silversmithing, wire-wrapping, beading and stringing.

More BenchTips by Brad Smith are at [facebook.com/BenchTips/](https://www.facebook.com/BenchTips/) or see the book *Bench Tips for Jewelry Making* on Amazon.

**MAGS At Shelby
County Schools Fair**

James Butchko

On Saturday, January 25, MAGS participated in the Shelby County Schools Family and Com- *Continued, P. 9*

MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS Rockhound News ♦ A monthly newsletter for and by the members of MAGS

*MAGS At Shelby County Schools Fair
Continued from P. 8*

munity Resource Fair. Parents and students learned about educational resources available to them outside of the classroom. The Pink Palace Museum, The Science Lady, and most of the local colleges were represented. W. C. McDaniel demonstrated how to make a living in the different areas of Earth Science. Angelina and



Hongbing Wang showed how much fun you can have learning. This event was a big success for promoting interest in science.



MAGS's next big appearance is at Elvis's pad, Graceland, on March 29 for Scout Day. Or join us in Millington on that same day for a trip to Sugar Creek.



Couldn't find a lampshade?

Formation Of The Grand Canyon

The geology of the Grand Canyon Area exposes one of the most complete and studied sequences of rock on Earth. The nearly 40 major sedimentary rock layers exposed in the Grand Canyon and in the Grand Canyon National Park area range in age from about 200 million to nearly 2 billion years old.

But the Grand Canyon itself is much younger. The National Park Service's Grand Canyon website page on geology says that "The Grand Canyon itself is a late Cenozoic feature, characteristic of renewed erosion during this time.

Vigorous cutting by the snow-fed Colorado River carved the Canyon's depth." But the timing of the canyon's formation has been vigorously debated. In one view, most of the canyon was carved by the Colorado River relatively recently, in the past 5-6 million years. Alternatively, the Grand Canyon could have been cut by precursors in the same location and to within about 200 m of its modern depth as early as 70-55 million years ago.



"I think we've resolved the 140-year-long debate about the age of the Grand Canyon," says Karl Karlstrom, a geologist at the University of New Mexico in Albuquerque. He and his colleagues described the findings in a paper in *Nature Geoscience*.

The debate focuses on when exactly the Colorado River began cutting through those layered rocks, forming the 3-dimensional

chasm that tourists swarm to today. Canyon experts had generally thought that the chasm formed around 5-6 million years ago. But over the past few years, several studies have marshalled a range of geologic evidence to suggest that the canyon could be tens of millions of years old. Karlstrom and his team find that parts of the canyon could be tens of millions of years old, but that the canyon as a whole is much younger.

Scientists can date a canyon's formation with geochemical techniques that measure the temperature of rocks over time. The deeper a rock is buried, the warmer it is. When erosion removes the overlying rocks, as when a canyon forms, the rock is moved closer to the surface and cools down.

Grains of the mineral apatite contain several lines of evidence that can be used to trace a rock's temperature history. For instance, the decay of radioactive uranium within the apatite produces helium atoms, which diffuse out of the mineral depending on how warm the rock is. In 2012, geologists Rebecca Flowers of the

Continued, P. 10

Agates Showcase by Daryl Wallace

Alan Parks, (member of MAGS) introduced my wife and me to agates about 7 years ago at a birthday party for his son, Harrison Parks. The party was located at Memphis Stone and Gravel. Alan showed us many specimens that could be found in gravel beds and let us know that Nonconnah Creek was a great place to look. Most of our agates came from either Nonconnah or Memphis Stone and Gravel. These agates are some of the better ones that made my display case.

Editor's note: The top right photo shows Daryl's "Tree of Life" agate.



*Formation Of The Grand Canyon
Continued from P. 9*

University of Colorado Boulder and Kenneth Farley of the California Institute of Technology in Pasadena used this technique, among others, to conclude that some now-exposed rocks in parts of the canyon must have been cool for as long as 70 million years.

In their study, Karlstrom and his colleagues used apatite fission-track dating, track-length measurements, and apatite helium dating to study rocks from the length of the Grand Canyon. The team found that two stretches near the canyon's middle are indeed quite ancient: the eastern Grand Canyon is 15–25 million years old, and another stretch downriver is 50–70 million years old.

But the researchers also found that two other segments—Marble

Canyon, the farthest stretch upriver studied, plus the westernmost Grand Canyon—were carved far more recently. “Different segments of the canyon have different histories and different ages, but they didn’t get linked together to form the Grand Canyon with the Colorado River running through it until 5 to 6 million years ago,” says Karlstrom.

Karlstrom and his colleagues argue that while the Hurricane and Eastern Grand Canyon segments were originally sculpted by different rivers, the Colorado took over the job in the past six million years, joining the disparate canyons and carving them wider and deeper.

The debate is not settled. Brian Wernicke, a geoscientist at the California Institute of Technology, points out that interpret-

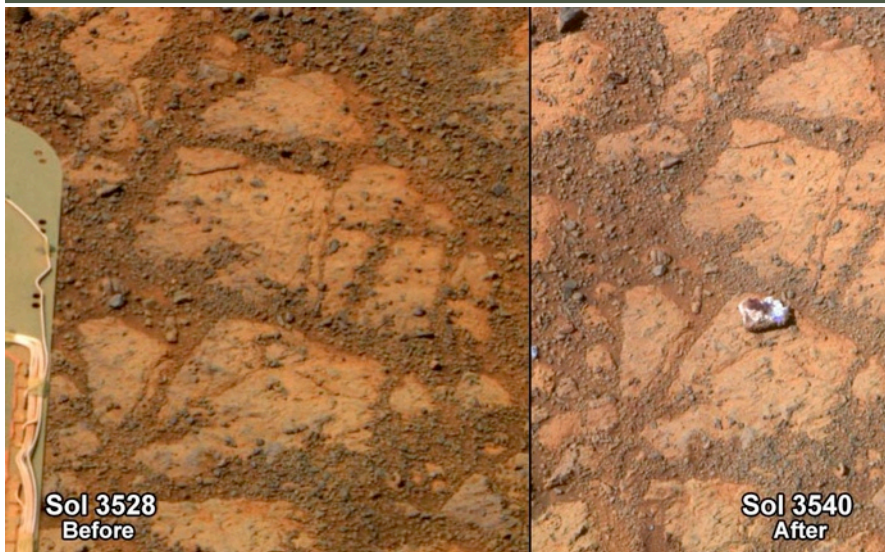
ing thermochronology data, especially fission-track data in terrain where erosion carves downward as well as sideways, is notoriously difficult. We’ll look for more on this.

Ref: Nature Geoscience (2014)
doi:10.1038/ngeo2065

**A Jelly Doughnut
On Mars?**

After a decade of exploring the Martian surface, the scientists overseeing veteran rover Opportunity thought they’d seen it all. That was until a rock mysteriously “appeared” a few feet in front of the six wheeled rover.

News of the errant rock was announced by NASA Mars Exploration Rover (MER) lead scientist Steve Squyres of Cornell University at a special NASA Jet Propul- *Continued, P. 11*



A Jelly Doughnut On Mars?
Continued from P. 10

sion Laboratory “10 years of roving Mars” event at the California Institute of Technology recently. The science star-studded public event was held in celebration of the decade since twin rovers Spirit and Opportunity landed on the Red Planet in January 2004.

While chronicling the scientific discoveries made by both rovers over the years, Squyres discussed the recent finding of suspected gypsum near the rim of Endeavour Crater—a region of Meridiani Planum that Opportunity has been studying since 2011—and the discovery of clays that likely formed in a pH-neutral wet environment in Mars past. While these discoveries have been nothing short of groundbreaking, Squyres shared the Mars rover’s team’s excitement for that one strange rock, exclaiming: “Mars keeps throwing new stuff at us!”

In a comparison of recent photographs captured by the rover’s panoramic camera, or Pancam, on sol 3528 of the mission,

only bare bedrock can be seen. But on sol 3540, a fist-sized rock had appeared. MER scientists promptly nicknamed the object “Pinnacle Island.”

Squyres described the rock as “white around the outside, in the middle there’s low spot that is dark red. It looks like a jelly donut,” he said. “And it appeared. It just plain appeared and we haven’t driven over that spot.” Squyres said the center of the rock is “like nothing we’ve ever seen before. It’s very high in sulfur, it’s very high in magnesium, it’s got twice as much manganese as we’ve ever seen in anything on Mars.”

Only two options have so far been identified as the rock’s source: 1) The rover either “flipped” the object as it maneuvered or, 2) it landed there, right in front of the rover, after a nearby meteorite impact event. The impact ejecta theory, however, is the less likely of the two.

“So my best guess for this rock ... is that it’s something that was nearby,” said Squyres. “I must stress that I’m guessing now, but I

think it happened when the rover did a turn in place a meter or two from where this rock now lies.”

Opportunity’s front right steering actuator has stopped working, so Squyres identified that as the possible culprit behind the whole mystery.

Each wheel on the rover has its own actuator. Should an actuator jam or otherwise fail, the robot’s mobility can suffer. In the case of this wheel, it can no longer turn left or right. “So if you do a turn in place on bedrock,” continued Squyres, “as you turn that wheel across the rock, it’s gonna kinda ‘chatter.’” This jittery motion across the bedrock may have propelled the rock out of place, “tiddlywinking” the object from its location and flipping it a few feet away from the rover.

Never missing a scientific opportunity, Opportunity scientists hope to study the bright rock. “It obligingly turned upside down, so we’re seeing a side that hasn’t seen the Martian atmosphere in billions of years and there it is for us to investigate. It’s just a stroke of luck,” he said.

“You think of Mars as being a very static place and I don’t think there’s a smoking hole nearby so it’s not a bit of crater ejecta, I think it’s something that we did ... we flung it.”

Although this is the leading theory behind the case of the random rock, Squyres pointed out that the investigation is still under way and it will be a few days before his team can definitively say where Pinnacle Island came from. At least.

Bolivian Dinosaur Trackways



Located 5 km. from downtown Sucre, Bolivia, is Cal Orck'o, an amazing limestone slab 1.2 km. long and 80 meters high, with a 73° inclination.. On this steep face, visitors can peer through time to when dinosaurs roamed the Earth in the Late Cretaceous, over 68 million years ago. At Cal Orck'o

you will find 462 distinct dinosaur tracks from at least 8 different species, totaling an incredible 5,055 individual dinosaur footprints.

Cal Orck'o is situated entirely within a limestone quarry, located in the 'El Molino' formation, owned by FANCESA, Bolivia's National Cement Factory. Further up the hill is Parque Cretácico. Opened in 2006, the dinosaur museum features 24 life-sized dinosaur replicas, various exhibitions, and a viewing platform 150 meters from the rock face. It's from this vantage point that you truly grasp the sheer scale and magnitude of Cal Orck'o.

Calendar

February 6, 2014

Board Meeting, St. Francis Hospital, 6:30 P.M.

February 14, 2014

Membership Meeting, Shady Grove Presbyterian Church, 7:30 P.M.

February 15, 2014

DMC Field Trip, Brookwood, AL

February 22, 2014

MAGS Field Trip, Nonconnah Creek

March 29, 2014

MAGS-Sponsored DMC Field Trip, Sugar Creek

Memphis Archaeological and Geological Society
2019 Littlemore Drive
Memphis, TN 38016

