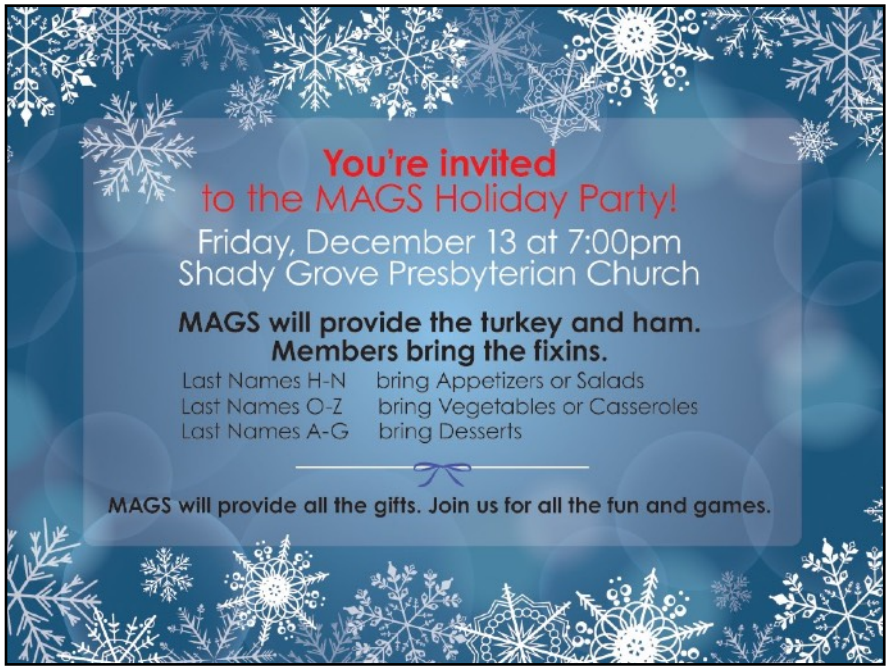
MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS Rockhound News

Volume 65 ◊ Number 12 ◊ December 2019 ◊ A monthly newsletter for and by the members of MAGS

MAGS Holiday Party

Join us. Your friends will be there.



We're looking forward to seeing lots of our Members at our December 13 (our regular meeting date) holiday celebration. Come early to help us set up. And please bring a dish or two to share. It will help if you bring the type of food specified in the invitation above. Doing so will make sure we have good variety.

We will have presents, games, and prizes. The more people who come, the more fun we'll have. Come help us close out the year right.

In this issue

MEMBERSHIP RENEWAL PRIZE

BOB COOPER

As you know, the MAGS 2020 (January 1-December 31) annual membership dues should be paid prior to January 1, 2020. You can accomplish this by paying your renewal dues at any of the Friday night Membership Meetings or by mailing your payment (payable to MAGS) to me at:

Bob Cooper
8695 Baylor Rd.
Arlington, TN 38002

MAGS 2020 membership dues are:

$15 (Individual)
$25 (Family)

The 2020 early renewal

Continued, P. 3

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MAGS AND FEDERATION NOTES

Memphis Archaeological and Geological Society, Memphis, Tennessee

The objectives of this society shall be as set out in the Charter of Incorporation issued by the State of Tennessee on September 29, 1958, as follows: for the purpose of promoting an active interest in the geological finds and data by scientific methods; to offer possible assistance to any archaeologist or geologist in the general area covered by the work and purposes of this society; to discourage commercialization of archaeology and work to its elimination and to assist in the younger members of the society; to publicize and create further public interest in the archaeological and geological field in the general area of the Mid-South and conduct means of displaying, publishing and conducting public forums for scientific and educational purposes.

MAGS General Membership Meetings and MAGS Youth Meetings are held at 7:00 P. M. on the second Friday of every month, year round. The meetings are held in the Fellowship Hall of Shady Grove Presbyterian Church, 5530 Shady Grove Road, Memphis, Tennessee.

MAGS Website: memphisgeology.org

MAGS Show Website: www.theearthwideopen.com

We aren't kidding when we say this is a newsletter for and by the members of MAGS. An article with a byline was written by a MAGS Member, unless explicitly stated otherwise. If there is no byline, the article was written or compiled by the Editor. Please contribute articles or 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.

December DMC Field Trip

WHERE: Amos Cunningham Farm, Due West, SC (fee site)

WHEN: Saturday, December 7, 9:00 A. M.-3:00 P. M.

COLLECTING: Green beryl, blue aquamarine, feldspar, more

CONTACT: Marf Shopmyer,marfeena@gmail.com

Links to Federation News

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

Membership Renewal Prize Continued from P. 1 prize is a fabulous specimen of an amethyst crystal (see picture on P. 1). The specimen measures 9 inches across and 6 inches high as shown. When you renew your 2020 MAGS membership, you will be entered into a drawing for this specimen. As an incentive to renew as early as possible, the Members that renew in October or November will receive an extra chance to win the specimen. You have until the end of the January 10, 2020 Membership Meeting to renew your membership in order to be in this drawing. You do not have to be present to win. Also, if you live out of state or do not attend the Membership Meetings and win the drawing, I will mail the prize to you.

Renew early and good luck.

Thanks to all of you who have already renewed for 2020.

Field Trip Report

Kim Hill

Photo Credits: Kim Hill, Renee Lasater

Parsons. The first thing, cold... the second thing (outweighs the first), Fossils—fossils everywhere! The third thing, No Rain !!!

My husband Richard, friend Anne, and I drove up on Friday. I prefer to be there in the morning instead of driving the morning of a hunt. Hate getting up early!

Which reminds me: my dear hubby and friend tricked me so bad Saturday morning, fooled me into believing we got up at 6. Not!! It was 5 A. M.!!! I mean that's just mean. I was already a good girl and went to bed at 11. That's a big deal in my night owl book.

Since we were up we found a little restaurant that was open and with others in the group had a nice breakfast.

Vulcan quarry near Parsons, Tennessee, is a treasure trove of sea life fossils. The only problem hunting there is there are so many awesome specimens you have to decide which to bring home and which to leave. Never an easy thing for a true rockhound.

We had a nice group show up 7 A. M. sharp, got our safety talk , signed in, and followed our guide John to the sites they had picked for us to hunt. I can't say enough about our guide! He showed us several sites we could hunt, letting us move when ready to check out a different area. He even helped find a few plates, like one 20 pound piece he gave my husband.

Every time I have been to Parsons it has rained. This time we had a beautiful cloudless day that, despite starting at a frigid 28 degrees, at least we weren't riding in the back of an open truck–done that–and warmed up to perfect rock hunting temperatures in the 50s . There was another advantage to the sunny day; we were able to see pieces that had pyrite in them . The fossils are awesome but fossils and pyrite together awesomeness!

For once my husband actually brought home more and bigger specimens than I did...That Is Saying A Lot ! Just ask anyone 😁.

If you didn't make this trip and you love fossils, better make sure next time it is planned that you sign up!

We won't have a field trip in December and our location for January will depend on water levels in the creeks around town , but don't worry, I'll let you know where in plenty of time.

Kim Hill

Get up, get out, hunt rocks

P. S.: I better not be the only one to bring a display!!!!

Fabulous Tennessee Fossils

Dr. Michael A. Gibson,
University of Tennessee at Martin

FTF 59

Allosaccus

Kingdom Animalia
Phylum Porifera
Class Demospongiae
Family Anthaspidellidae
Genus *Allosaccus* Raymond & Okulitch, 1940
Species *prolixus* Raymond & Okulitch, 1940
pedunculatus Carrera & Sumrall, 2019

After spending several essays devoted to the centennial of Carl Dunbar's early works in the Devonian of West Tennessee, I wanted to do something different for this essay, so I decided to jump to East Tennessee and drop down to the Ordovician Period. When I came to UT Knoxville to begin my dissertation in 1984, Dr. Ken Walker taught a class in paleoecology, which was my favorite subject and ended up being one of my favorite classes. He took us on a field trip to the classic Thorn Hill stratigraphic section one Saturday, and it was on that trip that I collected my first fossil sponge, *Allosccus prolixus* (Figure 1), from a tilted exposure of Benbolt Formation shaly limestone. I have used these specimens in my invertebrate paleontology classes ever since, but confess that I knew little about the fossil. So, what better time than now to delve into its history?

Fossil sponges are often difficult to recognize due to their lack of tissues or integrated skeletons (see FTF 3 for a more detailed discussion of the Phylum Porifera). The only real mineralized features are microscopic spicules (tiny spikes that resemble toothpicks or "jacks" from our youth). Sponges are mostly a series of cells loosely held together in life. Upon death they quickly decay. Preservation of intact sponges usually depends upon mud entering the porous structure of the living sponge to produces an internal mold, followed by decay of the sponge itself and infill by another generation of mud to occupy the voids left by the decaying sponge cells. What results is a "mud-mud cast" that has the shape of the sponge. At the outcrop of Moccasin, sponges were recognized as small rounded clumps of slightly harder mudstone eroding out in relief within the shale. Often there was a slight indention in one side of the clump, which turned out to be the opening in the sponge that led to the central cavity (osculum). The two generations of mud were slightly different variations of the color gray, so they stood out to the observant collector. Once I found my first *Allosaccus*, my eyes were attuned to the shape and color variation, and soon I had collected about six specimens, and over the years that I have revisited the site, I have collected many more specimens.

The genus *Allosaccus* was erected by Percy Raymond and Vladimir Okulitch in the *Bulletin of the Museum of Comparative Zoology* at Harvard College in 1940 for specimens collected in the Ordovician Ottosee Formation near Mendota, Virginia, but also occurring in exposures near Knoxville, Tennessee, of the Ottosee. The authors noted that it was rare in the Ottosee, but much more common in the Lenoir Formation, and has been identified in several other Tennessee Ordovician formations, including the Benbolt Formation where I found my specimen. Percy Raymond (1879-1952) was a Yale graduate (1904) who served as the assistant curator of invertebrate paleontology at the Carnegie Museum (Pittsburgh), and then became paleontologist for the Geological Survey of Canada (1910) for a short time. In 1912 he moved to the Museum of Comparative Zoology at Harvard University. Raymond became a colleague of Vladimir Okulitch (1906-1995) while serving with the GSC and later while Okulitch was a research fellow in paleontology at Harvard (1934-1936), where he worked with Percy Raymond. Raymond and Okulitch became best friends. Later, while still at Harvard, Okulitch would do groundbreaking work on Archaeocyathids and determine that they were closely related to sponges. Raymond and Okulitch named *A. prolixus* as the type species, which

Continued, P. 5

Fabulous Tennessee Fossils Continued from P. 4 is the one we find most commonly in Tennessee.

The specimen I collected in 1984 (Figure 1) is also significant in that it has an impression of the aboral surface, that part that would have been attached to the substrate. It shows a distinct bumpy pattern that is probably an impression of the original sponge surface. This type of preservation is called bioimmuration.

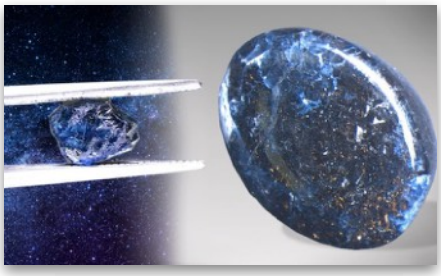
As I began writing the above about *Allosaccus*, I did the usual Google Scholar search to see if any newer papers existed on the animal I was to write about for you, and serendipity strikes! Up pops a reference for a new paper about to be published by my colleague Colin Sumrall at UT Knoxville (who normally only works on echinoderms) dealing specifically with sponges in the Ordovician of East Tennessee. According to the abstract of the paper (I have not gotten the actual paper yet), Colin and co-author Marcello Carrera (an Argentine paleontologist) have erected a new species of *Allosaccus*, *Allosacus pedunculatus*, from the Lenoir Formation. Interestingly, you will note the change in spelling of the genus (dropping one "c" in the name). I am not sure why the spelling changed at this point. Sumrall and Carrera outline the paleobiogeography of the Ordovician sponges that occur in East Tennessee to make the argument that all but one of the fossils sponges were endemic (meaning that they only lived in the eastern part of the Middle Ordovician sea that occupied North America during this time and did not have much genetic interaction with sponges on the western areas of the paleocontinent). So far, I have only been able to read the abstract of the article, but I look forward to receiving my copy of the journal soon! I will let you know what other findings they have and what makes this new species distinct from *A. prolixus* next issue. It appears that this once little known sponge fossil may have new significance.

Figure 1. *Allosaccus prolixus* from the Benbolt Formation, Thorn Hill, Tennessee. **A.** Oral surface showing osculum sponge entrance. **B.** Aboral surface showing attachment point to the substrate. The pattern in the depression may be an impression of the actual surface features of *Allosaccus* prior to its decay. This type of preservation is called bioimmuration.

Rejoin MAGS now to be eligible to win the membership renewal prize–a fabulous specimen of an amethyst crystal. See P. 1 for more details.

The Extraterrestrial Mineral

Matthew Lybanon, Editor



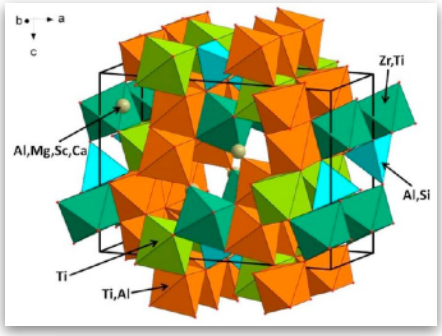
Gentlemen, looking for the perfect gift for that special lady? How about a piece of Carmel Sapphire jewelry?

An Israeli mining company has announced that a new type of mineral it found in the country's northern Carmel mountain range, and which has a chemical composition previously only found in outer space, was formally recognized by the International Mineralogical Association in January. Israeli mining company Shefa Yamim unearthed the new material in the Zevulun Valley in northern Israel in 2014.

The company has acquired a trademark from Israel's government to market the stones under the name "Carmel Sapphire." The new mineral was found embedded inside the sapphires and is a milky mix of dark and light blues. The company CEO, Abraham Taub, called the mineral *carmeltazite*, after the mountain near where it was found and the three metals it contains: **t**itanium, **a**luminum, and **z**irconium.

Carmeltazite was also found to resemble another, rarer mineral of extraterrestrial origin, *allendeite*, which was only seen on the Allende Meteorite that struck Earth on February 8, 1969. This made the discovery a significant geological event.

There is an official list of new minerals that are discovered and documented, with up to 100 new substances added each year. They are recognized and recorded by the International Mineralogical Association. Most of these new substances are less than noteworthy in terms of spectacle, supply, and market value. Carmeltazite is said to possess spectacular commercial potential, resembling other gemstones such as sapphires used in the jewelry industry. The material has a higher density than diamond and is far rarer.



Carmeltazite is found in corundum, an aluminum-oxide, embedded in volcanic rocks mined in the Haifa District in northern Israel. It's a complex zirconium-aluminum-titanium-oxide, with traces of scandium, calcium and magnesium to be found in its crystalline structure. The theoretical density (calculated from the crystal structure) is 4.12 g/cm^3, higher than diamond with 3.52 g/cm^3.

Carmeltazite and its hosting corundum most likely formed near the crust-mantle boundary of Earth, at a depth of almost 18 miles. Under high pressure and temperatures, the partially molten rocks released fluids, which reacted to form new minerals. The corundum crystals, containing the carmeltazite, were then transported through volcanic vents into the upper crust. Sixty-five million years ago volcanoes flooded the area with lava and steam-blast eruptions that produced thick deposits of volcanic breccia and tuff. Carmeltazite is found as veins almost black to dark green in color with a metallic luster in the larger blue sapphire-like crystals, embedded in the volcanic rocks. The largest stone discovered so far has 33.3 carats.

As gemstone prices are usually based on their rarity, this newly-discovered mineral has the potential to be more valuable than diamonds.

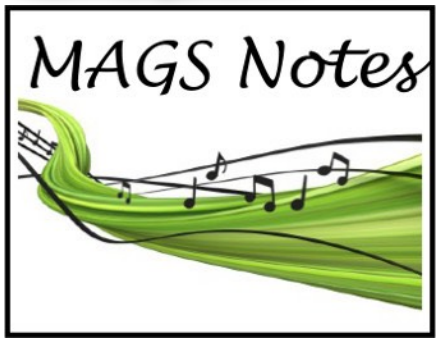
Are you Show ready? April 25-26, 2019

Grand Door Prize—Agate Wings

Federation Tidbit

The Newsletter Articles page on the AFMS website (http://amfed.org/narticle.htm) has links to articles in other newsletter as well as to AFMS newsletter material.

Thanks, Marc Mueller, for this picture from the November Membership Meeting



🎵 Adult Programs

December: Holiday Party

January 2020: Julie Morrow, subject TBD

February: Michael Gibson, subject TBD

🎵 Junior Programs

December: Holiday Party

January 2020: Mike Baldwin, "The Art of Collecting"

February: Mike Baldwin, "Lunar Geology"

🎵 Field Trips

December: No field trip

January 18, 2020: Local day trip

February 22: Pickwick

🎵 December Birthdays

4 Ethan Davis
6 David McAlister
7 Mitchell Childress
Juliette Browning
8 Tina Wallace
Alan Schaeffer
10 Chuck Reed
11 Jared Robbins
12 Viva Carnahan
Marc Mueller
13 Hongbing Wang
15 Kathy Baker
Jerry Seamans
19 Paula Gunter
23 Jim McNeil
24 Jocelyn Ashurst
Michael Browning
Allen Grewe
29 Bebe Buck
Brandon Mayer
31 Lynn Reed

🎵 New Members

Leigh and Greg Bartram
Sara Carter
John and Cate Cloer
Arlene Kowalski
Renee Lasater
Candia Ludy and Gawang Lama
Michael and Rebecca Luman
Deborah and Dennis McGraw

🎵 Want to Be a Member?

To become a MAGS Member, just go to our website at www.memphisgeology.org and print out an application form. There is a prorated fee schedule for new Members only. Mail the completed application along with the dues payment to the Membership Director shown on the form. If you are unable to print the application, you can pick one up at the sign-in desk at any of our Friday night Membership Meetings, or simply join at the meeting. Visitors are always welcome at our Membership Meetings but membership is required to attend our field trips.

The most important benefit of being a MAGS Member is getting to know and make friends with other Members who have similar interest in rocks, minerals, fossils, and archaeology. All new Members will receive a New Member Packet, a MAGS ID card, and a monthly newsletter via email. Members are entitled to go on our monthly field trips and get free admission to our annual Show.

Jewelry Bench Tips by *Brad Smith*

DIVIDERS

A set of dividers is a tool I find very useful in laying out the geometry of a piece I'm making. It has two needle-like tips with an adjustment to set the spacing between them.

They can be used to transfer a measurement. Let's say you need a 7mm wide strip of sheet metal. Set the spacing between the divider tips to 7 mm on the ruler. Then lay the sheet on the bench, put one tip against the edge, and run the dividers down the edge scribing a line parallel to the edge.

Dividers can be used to mark equal segments of a line or arc. For instance, assume a line between A and B that might be straight or curved, and you want to divide it into 5 equal lengths. Set the dividers to an estimate of the distance. Starting at point A, use the dividers to mark off five lengths along the line. If you end up short of point B, lengthen the distance on the *Continued, P. 8*

Jewelry Bench Tips Continued from P. 7

dividers. If you end up overshooting Point B, shorten the length of your dividers. After a few tries, the length on the dividers will be the exact distance you need to mark the 5 segments.

Dividers can let you quickly find the center of a circular disk. With one tip of the dividers at the edge of the disk, set the other tip to an estimate of where the center might be. Fix one tip of the dividers at the 3 o'clock position and scribe an arc with the other tip near the center. Do this again from the 6 o'clock, 9 o'clock, and 12 o'clock positions. The arcs at the center will form a small four-sided box, and the center of the box is at the center of the disk.

With the holidays coming up soon, one of Brad's "How To" jewelry books is a great way to help a friend learn a few new skills. See all the books at amazon.com/author/bradfordsmith.

October Board Minutes

Mike Coulson

Called to order 6:33. Present: W. C. McDaniel, Mike Baldwin, Kim Hill, Carol Lybanon, Matthew Lybanon, Bonnie Cooper, Bob Cooper, Kay MacLaughlin, Mike Coulson, Jane Coop.

Secretary: September minutes were distributed, reviewed, and approved.

Treasurer: Treasury report was reviewed and approved.

Membership: 2 new Members added since last meeting.Bob has come up with some new incentives for paying 2020 dues early.: Member's name is added to a drawing for an amethyst geode. Discussion to raise dues but a decision was made to keep them the same as the previous year.

Field Trips: Six Members made interesting trip to Geode Fest. Upcoming field trips: October 12–DMC trip to Memphis Stone and Gravel, Perry Plant, Senatobia, Mississippi. Info sent out to other clubs. Cookout will be provided, food and drinks will be available. MS&G will provide meat; club will provide buns, condiments, plates, and napkins. Kim will get ice. Bob and Bonnie will pick up waters and drinks from base. November–Parsons, Vulcan Quarry. December–No trip, holiday party. January 18, 2020–Local day trip (Petrified Forest?). February 22–Pickwick. March 21–Mozarkite. April–Local day trip. May 16-18–Gainesville, Florida. June 20–Local day trip July 18–Malvern, Magnet Cove. August 22–Flora, Mississippi, Petrified Forest (museum if we go there in January). September 19–Arkansas Diamond Mine. October 17, 2020: Local day trip. November 21–Hot Springs Phantom Mine. December–No outing.

Adult Programs: October 11–Bill Prior (Arkansas Geological Survey) will do a program about sinkholes, particularly the one in Arkansas that was in the news recently. November 8–Dave Lumsden, Petrified Wood. December 13–Holiday Party. January 2020–Julie Morrow. February–Michael Gibson.

Junior Programs: October 11–"Everyday Uses of Minerals" with W. C. McDaniel. Nov 8–Ancient Civilizations of North America w/Mike Baldwin. Dec 13–Holiday Party w/adults. Jan 10, 2020–The Art of Collecting w/Mike Baldwin. Feb 14–Lunar Geology w/Mike Baldwin. Mar 13–Geology Along I-40 w/Mike Baldwin. Apr 10–Preparations for the Rock Show w/adults. May 08–Making Paint from Minerals w/Mike Baldwin. Jun 12–How Caves Form w/Mike Baldwin. Jul 10–MOHS Hardness Scale w/Mike Baldwin. Aug 14–Indoor Rock Swap w/adults. Sep 11–Making Crystals w/Mike Baldwin. Oct 9–Fluorescent Minerals w/Mike Baldwin. Nov 13–Native Peoples of North America w/Mike Baldwin. Dec 11–Holiday Party w/adults. Jan 8, 2021–first youth program with the next director.

Library: No report.

Show: Send out separate information to demonstrators and vendors. If sales benefits club, it's okay but if for self, they should be in vendor area.

Rock Swaps: Saturday, October 19: Rock Swap at Freeman Smith Park 11-3, in Bartlett. Food will be potluck.

Editor: Get those articles and schedules to Matthew. "Fossils of Florida" article has been offered to Matthew. He suggests it be posted to the website. Bob will send info on membership renewals.

Web: Oct. newsletter has been added to the website. Mike will add "Fossils of Florida."

Old Business:

1. Rock talk with Scouts pack 1, then a fluorescent talk, talking with U of M Geology club, Lichterman nature, West Collierville Middle 6 classes 30 min each. Collierville Library signed up for their STEM team 3-5 graders in November. Spoke to 17 schools last year and this year looks similar.
2. Carol will be out of town in December so she will not be able to cook the turkey for the Christmas party or prepare for table decorations.

New Business: Bi-fold business card with club info on inside. Discussed using *Continued, P. 9*

October Board Minutes Continued from P. 8

name tags to aid in getting to know each other's names. Several alternatives discussed.

Adjourned at 7:40, followed by tour of Jane's house.

October Meeting Minutes,

Mike Coulson

Called to order 7:08. One visitor.

Membership: Membership renewal was available for those who want to renew early to be eligible to have names in a drawing for an amethyst geode.

Web: No report.

News: Paul Sides estate sale in Wynne, AR. Good place to pick up petrified wood, some agatized. More info to come.

Field Trips: Six members showed up for Geode Fest. Kim is displaying some of her finds. October 12–MAGS is hosting the DMC trip to Memphis Stone and Gravel in Senatobia. We are asking for help with the food and drinks. Sign up at the front table and be sure to follow safety rules when onsite. November–Vulcan Quarry, Parsons, TN. December–no trip. Keep in mind May 2020 for Gainesville, Florida, trip hunting for Megalodon teeth and other shark teeth.

Junior Program: W. C. McDaniel talked to the youth tonight about "Everyday Uses of Minerals".

Adult Programs: Bill Prior (Arkansas Geological Survey)–sinkholes, particularly the one in Arkansas that was in the news recently. Next (Nov. 8) program–Dave Lumsden, Petrified Wood.

Displays: Kim Hill: Geodes and rocks found in Missouri at the Geode Fest. Dan Baker: Agates

Adjourned 8:20.

First Day Of The Cenozoic

Matthew Lybanon, Editor

Thanks to a new analysis of core samples taken from the buried crater where a massive asteroid struck the planet 66 million years ago , geologists can create a detailed timeline of what happened on the day after impact. The immense (over 140 km in diameter) Chicxulub crater, hidden beneath the Yucatán Peninsula and the Gulf of Mexico, is a remnant of one of the most consequential days in the history of life on Earth. The asteroid strike triggered the Cretaceous-Paleogene, or K- Pg (formerly called KT), mass extinction. About 75% of all species went extinct.

Using a core sample collected in 2016, University of Texas at Austin geologist Sean Gulick and a team of dozens of other researchers have further pieced together the story of the Cretaceous-Paleogene extinction. The drill site was selected to investigate the series of events that followed the impact. When an asteroid the size of the Chicxulub impactor, estimated to be more than 10 km wide, strikes a planet, material is ripped up from below the surface and tossed into the air, collapsing in a circular mountain range within the crater. Such a devastating upheaval triggers a cascading sequence of natural disasters, sending tsunamis rolling across the oceans and ejecting an immense amount of debris into the atmosphere.

The core sample stretches hundreds of feet long. Under a thin ring of overlying material is over 400 feet of melt rock that was laid down during the day following the impact. "What we have from drilling at ground zero is a fairly complete picture of how the crater formed and what the processes were within the crater on the first day of the Cenozoic," Gulick says.

The impact affected life far from the site. The heat pulse would have raised temperatures over 900 miles away, Gulick says, and "at farther distances the ejecta could also have caused fires by frictional heating as it rained down in the atmosphere." The rocks that the asteroid struck were rich in sulfur, which was ejected and vaporized, mixing with water vapor and creating what Gulick calls a sulfate aerosol haze. Geologists had detected and studied this effect before, but the new research reinforces the role this atmospheric disruption played in the extinction that followed.

Cores from Chicxulub crater reveal the planet-wide devastation that the large impactor caused, but the timing of these events will likely spur debate and discussion See "Finding the KT Boundary" in the May 2019 issue of *MAGS Rockhound News* for related research.

***Ref**.: Sean P. S. Gulick et al, The first day of the Cenozoic,Proceedings of the National Academy of Sciences Sep 2019, 116 (39) 19342-19351; DOI: 10.1073/pnas.1909479116*

MAGS At A Glance

December 2019

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	2	3	4	5 Board Meeting, St. Francis Hospital, 6:30 pm	6	7 DMC Field Trip, Amos Cunningham Farm, Due West, SC, 9:00-3:00
8	9	10	11	12	13 Membership Meeting, 7:00 pm, Holiday Party	14
15	16	17	18	19	20	21
22 	23	24	25 	26	27	28
29	30	31	1 	2	3	4

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