MEMPHIS ARCHAEOLOGICAL AND GEOLOGICAL SOCIETY

MAGS ROCKHOUND NEWS

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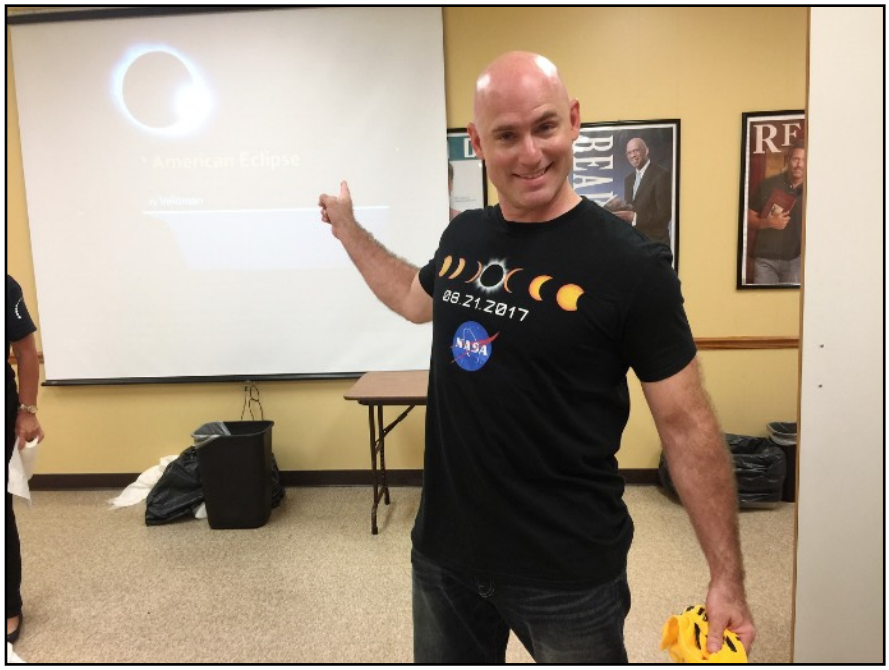
June Program

The Total Solar Eclipse of April 8, 2024 — *Jeremy Veldman*



Jeremy Veldman is President, Memphis Astronomical Society.

A total solar eclipse is coming to the United States on April 8, 2024. This is the second solar eclipse in 7 years (August 21, 2017) and the last one that will be visible in the continental United States for 20 years.

A total solar eclipse is, arguably, the most spectacular natural phenomenon a person can experience. It occurs when the moon comes between the Earth and Sun during a rare alignment

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In this issue

SMALL WONDERS: HORN CORAL

TOM HOWALD

Reprinted with permission from the May 2023 issue of the ***Music City Rockette****, the newsletter of the Middle Tennessee Rockhounds.*

Editor's Note: *The following article adds some important background information to "Ancient Clam Shell," which was published in the July 2020 issue of* ***MAGS Rockhound News****. Both articles describe studies of fossils that provided information about changes in the length of the Earth's day over millions of years, as well as changes in the distance between the Earth and the Moon.*

I recently acquired a small group of Michigan horn corals, of modest size...and indeed modest

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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 Membership Meetings are at 7:00 P. M. on the second Friday of each month May-October, and 10:00 A.M. on Saturday after the second Friday November-April. 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: https://earthwideopen.wixsite.com/rocks

Memphis Archaeological and Geological Society

Find us on Facebook. The Memphis Archaeological And Geological Society Page is where you will see accurate information about MAGS events and about the Memphis Mineral, Fossil, Jewelry Show.

Please contribute articles or pictures on any subject of interest to rockhounds. The 20th of the month is the deadline for next month's issue. Send material to lybanon@earthlink.net.

Go to https://www.southeastfed.org/sfms-field-trips/dmc-field-trip-program for the DMC field trip schedule and other information.

Links to Federation News

- AFMS: www.amfed.org/afms_news.htm
- SFMS: https://www.southeastfed.org/

Small Wonders: Horn Coral
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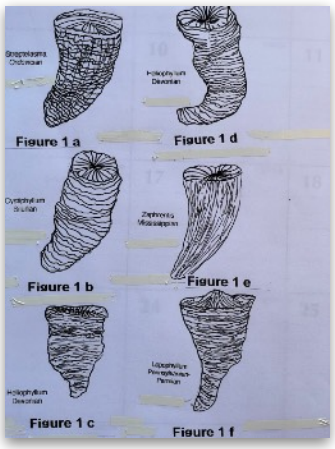
in most respects. Rough in appearance and fairly worn, they were not particularly attractive.

But, unimpressive as these specimens were, they exhibited a feature very germane to this article, namely rings. Horn corals come in a variety of shapes, and some of them appear to have growth rings. These fossils can tell a remarkable story to those who know where to look—and one John Wells was such a person. In the 1960s, John Wells of Cornell University undertook to establish whether the rings really are daily growth rings, and whether anything can be learned from them. Wells' work was not limited to fossils of the United States, nor to solitary corals. He recognized that current fossils exhibit growth patterns and wondered whether the lines on fossil corals are also growth rings.

Here (Figure 1), hand drawn from several sources, are some common fossil corals—and by the way, the fact that they are in geological order is not meant to imply any kind of evolutionary trend, merely diversity. Figure 2 is a photo of some of the ones recently



acquired. Clearly some exhibit horizontal layering more than others. Wells' hypothesis was this: Astronomers have argued that in the late pre-Cambrian, the length of an earth day was, by our current measures, twenty-one hours. Assuming that the length of the year then was the same as now, that would imply that there were about 415 days per year. That is, the earth was revolving around the sun at about the same speed as now, but rotating more rapidly on its axis.

Wells wondered whether this could be documented by fossilized horn corals. The fossils which seemed most promising were the solitary ("rugose") corals. "Rugose" means "wrinkled," and at issue was whether the wrinkles represented daily growth patterns, or annual, or neither. And this research had to be done with a group of fossils which had a limited range: the Rugosa are not found in pre-Ordovician rocks, and they became extinct in the "Great Dying" at the end of the Permian.

Imagine a coral growing on a shallow near-shore ocean floor in a temperate climate. These conditions are chosen so as to guarantee that the coral experiences seasonal climate change. This would not be the case for a coral growing in deeper water, and would be less the case under tropical conditions.

Suppose further that one time of year is more favorable for the growth of the coral, due to temperature and food supply.

If it were the case that corals add a single row of cells daily, then in warmer times, the cells might be larger in diameter; in colder times, smaller. Over a year, there would be a bulge in the diameter of the coral formed in the warmer season, and a constriction would represent the colder season.

If a rugose coral existed today (reminder: they don't--extinct now about 250 million years), we would expect the wider parts to be about 365 layers of cells apart, on average. And "on average" is important here, since individual corals experience variation at the microclimate level.

So, I propose (just kidding folks!) that we get a rock saw and cut up a bunch of modern-day corals, put them under a strong microscope, and begin counting. If we find that there are 365 times as many layers of cells as there are "wrinkles" or bulges, we've supported Wells' hypothesis. And this technique is exactly what he did. Mind-numbingly tedious work. Maybe he found some graduate students to do the actual counting! His results are shown below.

The following graph (Figure 3) maps along its bottom edge, to scale, the major geological time divisions since the time of earliest macroscopic fossils. The vertical scale, on both sides,

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June Program Continued from P. 1 (Syzygy, in astronomical terms) and the moon's disk blocks out the Sun's photosphere for a few minutes, causing it to become dark during the day. Not as dark as night, more like a deep twilight 30 minutes after sunset. But, enough for stars to come out; animals, birds, and insects to behave in their nocturnal state; and the Sun's majestic corona to be seen naked eye for a few brief minutes.

Solar Eclipses are rare and fleeting for a few reasons: (1) The plane of the moon's orbit around the Earth is tilted at a 5° angle with respect to the plane of the Earth's orbit around the Sun (the Ecliptic). (2) The moon is very far away from the Earth, hence the shadow is small. (3) The moon's orbit around the Earth isn't a perfect circle.

Most of the time we don't see eclipses because the plane of the moon's orbit around Earth is tilted with respect to the plane of the Earth's orbit around the Sun. The planes intersect in a line with the points on either end of the line called 'nodes.' During a 'new moon', the moon is between Earth and Sun, but the moon's shadow misses us because the moon is misaligned with the Earth and Sun. Likewise, during a 'full moon', the moon is on the opposite side of Earth than the Sun and we see the full disk of the moon, because the moon is also misaligned with the Earth and Sun. Occasionally, however, the moon will line up with the Sun and Earth (new moon or full moon) on the 'nodes', and when this happens, we see eclipses. For a solar eclipse to occur, the moon needs to be in its new moon phase and lined up with Earth and Sun on one of the nodes.

The moon is very far away from the Earth. The moon is about 10 times further out than the Earth's circumference (30 times further than Earth's diameter). Put another way, imagine holding a golf ball (representing Earth) in one hand and a small marble (representing the moon) in the other. Now, hold them arm's length apart (your full wingspan) and try to align them with the Sun on a sunny day. You'll notice how difficult it is, and how small the shadow of the marble is on the surface of the golf ball. In much the same way, the full shadow of the moon (umbra) during a Total Solar Eclipse is very small compared to the full disk of the Earth. It is in this narrow band called the 'path of totality' where all the action is during a solar eclipse.

The moon's orbit around the Earth isn't a perfect circle, it's an ellipse and sometimes the moon is closer to Earth (Perigee), and sometimes it's further away (Apogee). To get a total solar eclipse, the moon needs to be at Perigee. If the moon is at Apogee, then an 'annular' eclipse will occur – where the moon's disk doesn't completely cover the sun and an 'annulus' (or 'ring') is formed (sometimes called a 'ring of fire'). Dramatic, but not nearly as dramatic as a Total Eclipse.

So, to get a Total Solar Eclipse, 3 events need to occur simultaneously: (1) new moon, (2) moon at Perigee, (3) moon positioned on one of the nodes. How often does this occur? Once every 18 years, 11 days, and 8 hours—known as a 'Saros Cycle.' Fortunately, we don't have to wait that long between solar eclipses, as there are multiple Saros Cycles. In fact, a solar eclipse occurs somewhere on Earth every 18-24 months. The last Solar Eclipse of August 21, 2017, was part of Saros 145, whereas the April 8, 2024, Solar Eclipse is part of Saros 139. But, the Earth, Moon, and Sun align in very similar geometries every Saros Cycle (18 years, 11 days, 8 hours), so the pattern of the April 8, 2024, Eclipse was last seen on March 29, 2006, and will be seen again on April 19, 2042.

A spectacle of nature. During the partial phases, not much is happening. First contact is exhilarating, as the moon takes that first 'bite' out of the Sun's disk and anticipation sets in. The partial phases last about an hour as the moon slowly 'eats' the disk of the Sun. You'll need special eye protection to view the partial phases, you can get eclipse glasses from American Paper Optics at EclipseGlasses.com. I, personally, prefer the Lunt Sunoculars—you can order a pair from GreatAmericanEclipse.com. And a solar filter on a small telescope is also great. You may notice dark spots (like solar acne) on the surface of the sun—these, 'sun spots' are regions of reduced surface temperature caused by concentrations of magnetic flux that inhibit convection. The sun is a ball of plasma, so the magnetic field lines get twisted and tangled like a slinky. It's incredible to think that these 'small' *Continued, P. 5*

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spots (sun spots) are actually much larger than the Earth! Look for sun spots during the partial phases of the eclipse.

When the Sun is 95% eclipsed, things get interesting! The edges of the shadows become sharper and more pronounced as the Sun's rays are more concentrated through a thin crescent Sun. Poke holes in a paper plate (or bring a colander from your kitchen) and you'll notice 'little crescents' on the ground as a crescent sun is projected through the holes. On a hot day, the temperature can drop 20-30 degrees and the light becomes a tired, eerie light. Surreal! At 99% eclipse an effect known as the 'diamond ring' sets in. The last vestiges of sunlight peer through the edge of the moon as the moon's disk now mostly covers the sun. Seconds before totality, Bailey's Beads sets in as the last rays of sunlight peer through mountains on the rugged topography of the moon's limb. If timed just right, you can remove your protective eyewear during Baily's Beads and catch the dramatic transition to Totality, when the Sun's corona first appears! I was able to do this successfully for the August 2017 Total Eclipse, it was quite dramatic to see the 'flecks of light' from the sun's corona burst into view.

Glorious Totality! In a second, the landscape is transformed into a deep twilight as the Sun's disk is fully eclipsed. At this point, you can take off your protective eyewear and look at the Sun naked eye. In fact, I highly recommend that you do so,—it's the only time in your life that you can view the Sun's corona. Not only that, but bright stars and planets become visible. For the August 21, 2017, eclipse, I was able to see Venus and Jupiter and the star Regulus next to the eclipsed sun. I even took a pair of unfiltered binoculars and viewed the Sun, up close. I was able to see solar prominences (plasma eruptions) on the edge of the Sun's disk and coronal 'streamers' as the Sun's corona is not a static thing! It was quite dramatic. Also, observe the 360 sunset around the horizon as you're standing in the shadow of the moon. If you're in a rural spot, you may hear crickets chirping, birds and animals settling down for the night, and even a rooster crowing! If you're in a crowd of people, endless cheers and emotions dominate—even tears, as the experience can be quite overwhelming. Mabel Loomis Todd, 19th century author, described Totality during the 1896 eclipse:

Then an instantaneous darkness leaped upon the world. Unearthly night enveloped all.

With an indescribable outflashing at the same instant the corona burst forth in mysterious radiance. But dimly seen through thin cloud. It was nevertheless beautiful beyond description, a celestial flame from some unimaginable heaven. Simultaneously, the whole northwestern sky, nearly to the zenith, was flooded with lurid and startlingly brilliant orange, across which drifted clouds slightly darker, like flecks of liquid flame or huge ejecta from some vast volcanic Hades. The west and southwest gleamed in shining lemon yellow.

Least like a sunset, it was too somber and terrible. The pale, broken circle of coronal light still glowed on with thrilling peacefulness, while nature held her breath for another stage in this majestic spectacle.

Suddenly, it's over. Near the end of totality you can see the moon's shadow retreating and daylight approaching. An effect called 'shadow bands' can also be observed with a white sheet or shower curtain as the moon's shadow races across the horizon (notice 'shadow bands' streaking across the sheet). Then the moon's disk retreats, and sunlight reappears. In an instant, it's over. However, bright planets can still be seen minutes after Totality. For the August 2017 eclipse, I was able to view Venus for about 5 minutes after totality, an effect I wasn't expecting. People, move on quickly, as the back end partial phases are anticlimactic compared to the experience of totality. It's all about time under the moon's umbra.

Solar eclipses are fleeting. When totality occurs, you only have a few minutes under the umbral shadow of the moon to observe and enjoy the dramatic effects. It may not seem like we are moving very fast, but the Earth rotates at 1,000 miles per hour and the shadow of the moon races across Earth's surface at 1,700 miles per hour! The length of time under the umbral shadow during totality is

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June Program Continued from P. 5 called 'duration', and the longer the duration, the better. For the August 21, 2017, Solar Eclipse, maximum duration was about 2 minutes and 40 seconds (I experienced 2:32 in Lebanon, Tennessee. Not bad!). For the April 8, 2024, Solar Eclipse, maximum duration will be about 4 and a half minutes. But, you need to be near the centerline in the Path of Totality to experience longer duration. Spots like Little Rock, Arkansas, and Dallas, Texas, are in the Path of Totality. But Little Rock will only experience about 2 minutes and 36 seconds of duration, Dallas a little better at close to 4 minutes in some spots. So, if you want more time under the moon's shadow, plan to travel as close to the centerline as possible.

It's an 'all, or nothing' proposition. A 99% is a high-A in school, but a failing grade for eclipses. Even a 99% eclipsed sun is bright enough to be the difference between day and night. So, you've got to travel into the Path of Totality to see the eclipse. Sure, partial eclipses are great too (I saw my first partial solar eclipse when I was 10 years old). But, on a scale of 1-10, a partial solar eclipse would be a 3, while a total solar eclipse would be a 10 million! Is it worth it to travel a few hundred miles to see it? I certainly think so. Veteran eclipse chasers (sometimes called 'umbraphiles') travel all around the globe to chase the moon's shadow. How rare is it for the shadow to come to us! Make the effort to close the gap and drive to the Path of Totality. In that way, a solar eclipse is really an alignment of the sun, moon, and you!

Clouds rule. We can talk about timing and location to our heart's content, but traveling into the Path of Totality won't matter if it isn't clear. It's a cruel irony that we can predict thousands of years in advance where and when (to the second) a solar eclipse will occur, but we may not know until seconds before, where the clouds will be. It was heartbreaking to see large crowds gather for the August 21, 2017, eclipse, only to be disappointed by overcast skies. And there will certainly be a lot more broken hearts for the April 8, 2024, eclipse, especially given how volatile the weather can be in the south in April! Jay Anderson has a website called eclipsophile.com, which is a good resource for analyzing weather and climate data in the eclipse path. Weather apps like ventusky.com are also good resources. Texas seems to have the best weather odds, going back 20 years (many of the veteran eclipse chasers are targeting south Texas as their viewing spots). But, Arkansas was more favorable on April 8, 2023—one year to the day before. So, at best, it's a crapshoot. Plan ahead but build in enough flexibility so that you can roam/drive a day before the eclipse to dodge the clouds. Get a 10 day forecast, 3 day forecast, 1 day forecast, then take your best shot. It's all you can do!

So, mark your calendars for April 8, 2024. And make plans to travel into the Path of Totality for the Solar Eclipse. For more information, visit: MrEclipse.com, GreatAmericanEclipse.com, eclipse2024.org, and EclipseGlasses.com. We're less than a year away from nature's greatest spectacle!

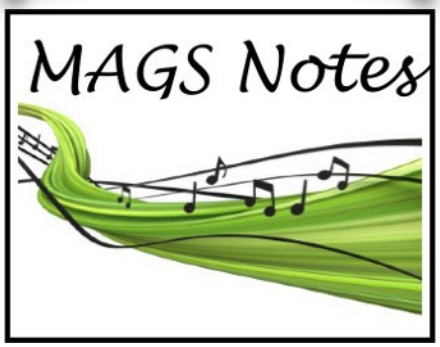
Let's hope for clear skies on April 8, 2024.

Book Review

Nannett McDougal-Dykes

Title: *Far-Out-Facts*

Amazing book from National Geography Society. From odd-jobs in London cleaning rocks and minerals in the British Museum, to anicient valuables like Sea Silk and Pen Shell...



🎵 Adult Programs

June 9: Jeremy Veldman, "Solar Eclipses."

July 14: Memphis Metal Museum

August 11: TBD

🎵 Junior Programs

June-August: TBD

🎵 Field Trips

June 3: 20 Mile Creek<—— SOON

July 22: Ornamental Metal Museum

August 19: Discovery Park of America

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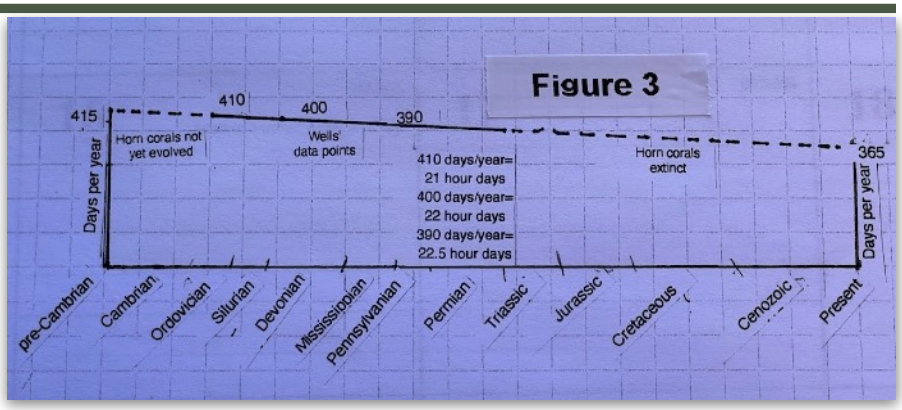
Small Wonders: Horn Coral Continued from P. 3

indicates days per year. At the left, 415 is the number of days that would occur in a year of 21-hour days; and on the right, 365 corresponds to our familiar 24-hour day. The data from Wells' research (only a few of his points are shown) form a line which, extended, confirms, at left, the astronomers' estimate of 21-hour days, and, at right, correctly predicts our current 24-hour day. It also gives us every reason to believe that the process giving us fewer and longer days will continue.



Since it seems clear that, very gradually, the earth's spin has been slowing, we must ask what could cause this, and how did the astronomers get involved in the first place?

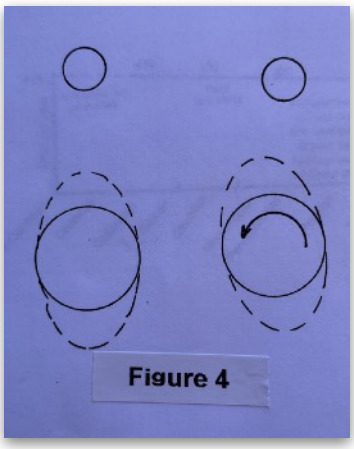
And by the way, before proceeding, notice that now we're doing some astronomy because a geologist wondered, "What if?"

Consider the following planetary information:

- Measured in Earth days, Mercury's day is 176 of our days, and its year is exactly half that, 88 days.
- Venus's year is 225 of our days, its day 243 of our days.
- Mars's year is 687 earth days, its day about forty minutes longer than ours.

This diversity of situations among the planets is not shared, however, by the major moons in our solar system. Our moon both rotates and revolves in about twenty-nine and a quarter earth-days. Nor is it unique in this respect. Every major moon in the solar system has a "day" equivalent to its "year." This means that the same side of each of these moons always faces the planet around which it orbits, just as does our moon. How does this happen?

In the diagram below (Figure 4) is depicted a planet with a moon. The viewpoint is "down," i.e., as if the center of the larger circle were the planet's north pole. The moon's gravitational pull causes a deformation, a bulge, in the planet, represented by the highly exaggerated ellipse. The deformation affects the atmosphere, the oceans (causing the tides), and the rocky crust of the planet itself. As the planet rotates, as in the second diagram, the bulge moves also. The bulge thus represents a mass of material which is moving away from the moon, against the moon's gravitational attraction. The lunar gravity of course resists that separation, thus slowing the rotation of the planet. This effect is real, but so minor that it has only slowed the spin of the earth by about 50 days in 600 million years. And the effect is mutual: the moon is also bulged and slowed. Indeed, the spin of the moon has been totally gravitationally locked, as has that of every major moon in the solar system.



It is tempting to speculate from the data that Mercury, though not locked, is in some sort of equilibrium, since its day and year are related by a factor of two--in reality, maybe just a coincidence. Venus' day and year are so similar, that it seems "almost" locked. Earth is by no means locked, and its year and day "do not come out even," so we have to add a day to our calendar if the year number is a multiple of four; but not if it is a multiple of 100, unless it is a multiple of 400, when we do add a day. Messy.

The gas giant Jupiter spins on its axis every nine-plus hours, but completes an orbit in almost 12 years. Saturn's day is 12 hours, its year 10 years. Uranus and Neptune are similar, as we

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Small Wonders: Horn Coral *Continued from P. 7*

should expect. The farther a planet is from its sun's gravitational pull, the less likely it is to be gravitationally locked.

I find this a remarkable tale of Wells' sleuthing out cosmic timing by microscopically examining horn corals to be amazing, and I hope you enjoyed it. Next time you see a horn coral (chuckle), tip your hat.

Fabulous Tennessee Fossils

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

FTF 100

Jim Roberts' *Exogyra*

Figure 1A. Jim Roberts holding both valves of his *Exogyra*.

The North Mississippi Gem and Mineral Society visited the Coon Creek site a couple of weeks back and had a great time—many great fossils were found by all. While cleaning and prepping specimens, one particular small, juvenile oyster *Exogyra* collected by NMGMS member Jim Roberts caught my attention (Figure 1A). Shell-repair markings are not unusual in fossil shells, especially *Exogyra*; however, this particular specimen had an unusually large and U-shaped repair scar that stood out from most of the examples. The size of the scar was anomalous in and of itself, suggesting a large-mouthed predator. Upon closer examination, I found a couple other skeletal features

Figure 1B. Crescent-shaped bitemark repair on the external surface of the Roberts *Exogyra* (see text for details).

associated with the bite mark that made the specimen more interesting to me and are now the subject of my 100th continuous monthly article for the MAGS Newsletter (and perhaps a few

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MAGS Notes
Continued from P. 6

🎵New Members

Cyndi Bothwell

Christina Clapsdale

Susie Logan

David & Mary Khristine New and children Alex, Lydia, Abigail, Carcy, & James Judah

Caroline & Scott Rambin Stophel

Annie & Robby Uhrman and children Charlotte & Lucy

🎵June Birthdays

1	Pat Judd
6	Amanda Nalley
8	Sharon Fewell
15	Yazsin Boteli Ryan Parish
16	Kin Dempsey Ann Williams
18	Debbie Schaeffer
20	Roger Lambert
23	Kevin Perk
25	Jennifer Featherston Doris Johnston
29	Cornelia McDaniel

Partly Cloudy And Mild

Pretty good weather for a Spring rock swap on Saturday, May 20, the first one of 2023. Williamson Park behind Jan Shivley's house—think of it as the biggest back yard in town—was an ideal place for tables and chairs. There was no sign of the rain most of us had slept through the night before. Plenty of rocks, good food (MAGS provided most of it), pleasant conversation, and door prizes. A few people walking dogs in the neighborhood stopped by to say hello. The pictures show a little of what it looked like.

Fabulous Tennessee Fossils
Continued from P. 8

more articles).

The U-shaped repair scar (Figure 1B) shows a couple of interesting features, which I interpret to be the result of a non-lethal bite by some unknown animal. Notice that the repair scar is (a) large (covers a width of three full ribs and grooves in the *Exogyra* shell), (b) that each cut rib was cut such that the lost shell was angled backwards up toward the shell's umbo (this is an odd angle), (c) that the regenerated new growth within the bite area began as smooth continuous repair shell paralleling the bite shape, but without ribs for a few millimeters before ribs "resumed", (d) that the new ribs were roughly continuous with the original ribs; however, the right two rib widths were repaired with a smaller diameter (and the right-most rib never became as wide as the original), and (e) that the smooth shell repair growth at the beginning of the repair extents downward to the margin of the shell between the severed right rib and the uninjured ribs to the right of that rib (outside the bite arc). Growth increments within this smooth repair are concentric to the bite shape and coarse, but curve to become parallel to the unaffected right-most rib as it approaches the shell margin (commissure). All of the affected ribs within the bite area make a slight clockwise rotation within the crescent of the bite mark and the horizontal ridges that cross each rib are continuous in the left-most rib below the repaired area. These are not typical features of a healed bite-mark.

In most in-

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Fabulous Tennessee Fossils
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stances of non-lethal bites on bivalves, followed by repairing, the bite removes a chunk of the shell permanently and regenerative shell growth then resumes across the wound. What we usually see is a faint divot-shaped disruption of growth lines across the shell as normal shell-margin growth resumes. This is usually because the bite mark, a result of "cropping" behavior, occurs along the growing edge of the shell (the commissure). I think that this wound is different and a slightly different bite scenario explains the features listed above. Whatever organism bit the shell did so deeply into the shell and did not completely remove the shell margin piece as part of its cropping behavior. I think that part of the original *Exogyra* shell remained partially attached, but separated, from the main *Exogyra* shell. The three ribs below the smooth repair shell material (and parallel to the third rib inside the repair) are the original pre-bite ribs. This explains why the left-most rib is contiguous with the ribs outside of the bite radius. The bite put a crescent-shaped hole in the shell that the *Exogyra* infilled with the smooth shell material in a concentric growth pattern that matched the shape of the wound. The parallel growth pattern of the right side of the repair, and the smaller rib size, is explained the same way, by filling-in the gap between ribs left by the bite action of the potential predator. The slight rotation would have resulted from the weakened attachment of the fragment of *Exogyra* shell that did not get eaten during the attack and growth adjustment during repair infilling. Furthermore, the triangular cut angles of the three ribs at the top outside of the crescent-shaped bite suggest to me that the angle of the bite was from above and slightly downward toward the growth margin of the *Exogyra*. Unique!

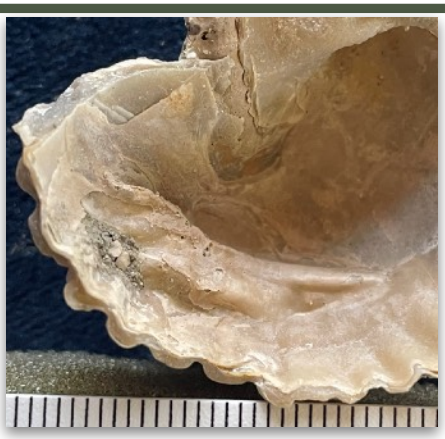

Figure 1C. Internal surface of *Exogyra* showing thickened repair ridge extending across the distal margin of the shell.

The inside of the shell (Figure 1C) shows that the damage to the tissue of the *Exogyra* during the attack was more extensive than the bite mark might have suggested. There is a thick repair ridge that extends from the location of the left edge of the bite mark on the outside surface of the shell all the way across to the far right edge of the shell, well beyond the crescent-shaped repair area visible on the outside of the shell. There is even some evidence that the repair was trying to make false ribs on the inside of the shell. Clearly this animal underwent a sublethal traumatizing event but survived, at least for a while. I say, "for a while", because the overall size of this *Exogyra* is very small when compared to most of the *Exogyra* we find. It clearly had a shorter life span than most. Why did it succumb after being able to survive and repair? That I cannot explain in the space I have for this article; however, I do think I can postulate a reasonable hypothesis for its ultimate death. So, in my next article, I will continue-on with this specimen and share some additional irregularities that are preserved in the shell. Many thanks to Jim Roberts for visiting the Coon Creek fossil site and kindly donating the fossil for study!

Scientific Generalist

Matthew Lybanon, Editor

How many of you have ever met a famous person? Now let's suppose the famous person is a scientist. How many of you were fortunate enough to have had the opportunity to study under a person like that?

Couldn't happen, you think? Due to an almost comical combination of accidents (I'm leaving out the details), I was fortunate enough. My first job after leaving Georgia Tech was in Baltimore, and I took some physics courses at Johns Hopkins University. (For some of that time another student you may have heard of was an undergraduate at Hopkins: Michael Bloomberg—later three-time New York City mayor, founder of a major financial information company, philanthropist. But he wasn't the famous scientist.)

The first of the courses I took was taught by a professor named Franco Rasetti. The name didn't really register with

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me when I signed up for the course. The course just seemed interesting.

Franco Rasetti was born in Pozzuolo Umbro, Italy. His father was a scientist and his mother was an artist. They educated their son themselves, and at the age of 17 he published his first paper, on the insects of Pisa and Lucca.

When the family moved to Pisa, Rasetti met a young Roman called Enrico Fermi. Fermi encouraged Rasetti to study physics rather than entomology. Eventually Fermi, Rasetti, and three other physicists formed a group at the Physics Institute of Rome. They started investigating the transmutation of elements by neutron bombardment. They quickly discovered 60 new radioactive nuclei and used slow neutrons to induce the fission of uranium. This work led to the patent for the chain-reaction process—of which Rasetti was the last surviving holder.

(Their work formed much of the foundation for the Manhattan Project, the U.S. program during World War II that developed the atomic bomb. Fermi also built the world's first nuclear reactor, at the University of Chicago.)

As World War II approached several members of the group left Italy to get away from fascism. Fermi went to the United States and Rasetti went to Canada, to Laval University in Quebec. On his arrival at Laval in 1939, Rasetti was given the task of creating a physics department from scratch. He did a good job. His department did important research and turned out honors students. At the end of WWII Rasetti moved to the United States and Johns Hopkins University, which is where I lucked into one of his classes.

Yes, Rasetti was an important physicist with some significant accomplishments. But what makes him interesting to rockhounds? How about this? *Faunas of Tennessee: Upper Cambrian Trilobite Faunas of North-eastern Tennessee*. By Franco Rasetti. Smithsonian Institution, Washington, D.C., 1965. 150 pp.

Where did **that** come from? It started in Canada. A born naturalist and outdoorsman, Rasetti took up geology and paleontology while in Quebec. An interest in Canadian geology led him into paleontology and then to trilobites. He sought out trilobite fossils everywhere, collecting thousands of specimens, which he described, classified, and in many cases named. He developed techniques for preserving and photographing them for journals, and his collection rivaled the Smithsonian's.

Just as he had been honored for his work on nuclear physics and Raman spectroscopy, Rasetti received numerous awards for his contributions to paleontology. In 1952 he won the Charles Doolittle Walcott Pre-Cambrian Research Medal, which was awarded every five years by the U.S. National Academy of Sciences. (Later, in October 2008, the NAS Council created the NAS Award in Early Earth and Life Sciences by combining the Walcott Medal and the Stanley Miller Medal, which recognizes research on Earth's early development as a planet, including prebiotic chemistry and the origin of life; planetary accretion, differentiation, and tectonics; and early evolution of the atmosphere and oceans.)

Franco Rasetti is a prime example of something that many may not appreciate—high achievers often have interests outside their primary field, and they usually do very well in those "secondary" endeavors. (Rasetti was also an authority on Alpine wildflowers. His book on Alpine flora has sold tens of thousands of copies. And don't forget his entomology paper, published when he was 17.). And, by the way, he was a very good teacher. His English was good, his beautiful Italian accent was fun, and I loved his course. I can't believe how lucky I was!

Ol' Man River

Matthew Lybanon, Editor

NASA's Perseverance Mars rover captured this mosaic of a hill nicknamed "Pinestand." Scientists think the tall sedimentary layers stacked on top of one another here could have been formed by a deep, fast-moving river.
Credits: NASA/JPL-Caltech/ASU/MSSS

New images taken by NASA's Perseverance rover may show signs of what was once a river on Mars.

More information: https://www.nasa.gov/feature/jpl/images-from-nasa-s-perseverance-may-show-record-of-wild-martian-river

MAGS At A Glance

June 2023

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
28	29	30	31	1 Zoom Board Meeting, 8:00 pm	2	3 MAGS Field Trip to 20 Mile Creek
4	5	6 Last day to pay for Member Show Tickets before the price increases ——>	7	8	9 Membership Meeting, 7:00 pm, "Solar Eclipses"	10
11	12	13	14 	15	16	17
18 	19	20	21 	22	23	24 DMC Field Trip
25	26	27	28	29	30	1

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