



The Rostrum

The Newsletter of the Maryland Geological Society
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President's Message

Recently I sat awestruck as I watched the successful landing of the Mars Perseverance Rover onto the Martian surface. The complexity of this accomplishment is absolutely astounding. A primary focus of the mission is to search for evidence that life in some form once existed on the planet. As I watched the reports, a memory from many years ago resurfaced and is described below.

Prior to school or scout group visits, I would create fossil discovery bags for each child that contained fossil shark teeth and shells mixed with sand to use as a hands-on exercise. The discovery bags have never failed to generate a great deal of excitement for children of all ages. Following a lunchtime program at a local school, I gave out some leftover bags to several co-workers that had young children. The next Monday I was rewarded with the following story:

Harry gave his ten-year-old daughter the fossil bag after lunch on Saturday. She proceeded to spend the next several hours meticulously separating the fossils from the matrix and then carefully examined her finds with a magnifying glass. And then to Harry's amazement, she dumped all the fossils that she had so carefully extracted back into the bag of sand. With a touch of shock in his voice, he asked why she had dumped the fossils back with the sand after working so hard to separate them. Her reason - she was going to do the entire process again the next day to enjoy the experience for a second time. And she did! On Sunday evening Harry's daughter told him that she had made a career decision - she was going to be a space paleontologist. Her reasoning was that there were probably not a lot of people pursuing this career path and then she could be one of the first to look for fossils on other planets. Ten years old! Over the years I have lost touch with Harry, but it is my fervent hope that his daughter is a NASA mission specialist looking for ancient lifeforms with the help of the Mars Perseverance Rover and thus fulfilling a childhood dream.

Cheers, Rick

Dates to Remember

Sunday, March 21, 2021 - Zoom Virtual Meeting
Speaker: VP Eric Seifter - "Age Estimation of Mammoth Teeth"

Meeting Time

12:00 Noon to 2:00 PM

Featured Mineral - Sodalite



The whole of science is nothing more than
a refinement of everyday thinking.

Albert Einstein



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Maryland Geological Society

Founded in 1991, MGS is comprised of both amateur and professional mineral and fossil collectors. The organization emphasizes collecting, identification, study and display aspects of the geological sciences. MGS is a nonprofit organization affiliated with the American Federation of Mineralogical Societies (AFMS) and the Eastern Federation of Mineralogical and Lapidary Societies (EFMLS).

Dues

Annual dues are \$15.00 per individual adult member. Applications for membership may be obtained from the MGS website or by contacting the Membership Chairman, Mike Folmer, at 417 West Maple Road, Linthicum, MD 21090, (410) 850-0193. Dues are payable by January 1st of each year.

Meetings

Meetings are held bimonthly, beginning in January at the Bowie Community Center, located at 3209 Stonybrook Drive, Bowie, MD - (301) 464-1737. The doors open at 11:00 AM and the meetings are completed by 3:00 PM. Club meetings will be held as scheduled so long as the Bowie Community Center is open.

Tentative Meeting Dates & Programs for 2021

January 17: Zoom Meeting

March 21: Zoom Meeting

May 16: Zoom Meeting

July 18: General Meeting

September 19: Annual Auction

November 21: General Meeting

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The Rostrum

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Featured Mineral: Sodalite

Bob Farrar

The Featured Mineral for this issue of *The Rostrum* will be sodalite. Named for its high sodium content, sodalite is most familiar as a lapidary material. However, it can also be a very interesting mineral for collectors.

Sodalite consists of sodium aluminum silicate with chlorine, $\text{Na}_8[\text{Al}_6\text{Si}_6\text{O}_{24}]\text{Cl}_2$. It crystallizes in the cubic system. Crystals are uncommon, but usually form dodecahedrons when they do occur. Sodalite is most commonly deep blue, but can also be pink, green, white, or colorless. The pink variety is known as hackmanite. Hackmanite can exhibit the unusual property of *tenebrescence*, or *reversible photochromism*. In hackmanite, this is usually manifested as a tendency of the color to fade upon exposure to daylight, but to be restored on exposure to ultraviolet light. This process can be repeated over and over. Sodalite specimens other than hackmanite frequently fluoresce yellow. Other physical properties include a hardness of 5.5 to 6.0, specific gravity of 2.2 to 2.3, and poor cleavage. Color and tenebrescence distinguish hackmanite. Blue sodalite can be confused with lapis lazuli, but the latter usually has at least some pyrite associated with it.

Sodalite typically occurs in alkaline igneous rocks and low silica plutonic rocks. The type locality is Narsaq, Greenland, where greenish sodalite is found. Most commonly, however, it is found as massive blue, translucent material, sometimes in large deposits. This material is popular as a lapidary material. It is frequently cut into cabochons, beads, and carvings. It is mined for this purpose in Ontario, Canada and Brazil. Massive blue material is also found Lichfield, Maine and in Bolivia.

The most prolific source of hackmanite in recent years has been Sar-e-Sang, Afghanistan. There it occurs as pink crystals in marble. Other localities for hackmanite include Mt. St. Hilaire, Quebec, the Kola Peninsula of Russia, Minas Gerais, Brazil, Burma, and Tajikistan.

In the last few years, a material known as "Yooperlite" has appeared on the market. This is a mixture of fluorescent sodalite and syenite. It occurs as waterworn pebbles in the Upper Peninsula of Michigan.

While most sodalite used for lapidary work is the translucent massive blue variety, in rare cases crystals transparent enough to facet have been found. Transparent blue sodalite has been found at Mt. St. Hilaire and in Tajikistan. Transparent hackmanite has been found in Afghanistan. Transparent sodalite is quite rare; good stones may sell for over \$1000 per carat.

Most people think of sodalite as a modestly priced cabochon or bead stone. However, it occurs in a variety of forms, some quite rare, making sodalite a mineral of interest to even the most advance mineral and gemstone collectors.



Sodalite specimen from Afghanistan. The pink variety shown here is known as hackmanite. Image by Rob Lavinsky and reproduced under Creative Commons Attribution-Share Alike 3.0 Unported license. Image is available at [Wikimedia Commons](#).

Field Trips

Field Trip Coordinators - Marci Robinson & David Shore

The Maryland Geological Society is an advocate of responsible collecting. The society has permission to collect in all of the sites listed that require such permission. Most trips are weather dependent and some require at least an average level of physical fitness. Field trips are restricted to MGS members only.

No field trips currently scheduled.

Age Estimation of Mammoth Teeth

Eric J. Seifter, MD

Mammoths are an iconic symbol of our last Ice Age and one of several instantly recognizable extinct animals. Over the last 10 million years, the taxonomic order of Proboscidea were easily distinguished by a large size, tusks, and a long muscular trunk (proboscis). Many families of the proboscidea became extinct at the end of the last Ice Age 12,000 years ago, with current evidence blaming over-hunting more than climate change, although both were in process at that time. Today, the Elephantidae family has only two remaining genera: *Loxodonta*, the African elephant, and *Elephas*, the Asian elephant.

Like our modern elephants, mammoths had one mandibular (lower jaw) tooth on each side and one maxillary (upper jaw) tooth on each side. Of course, as a mandibular tooth was wearing away, a replacement tooth would erupt from below and behind, pushing it forward like a conveyor belt and ultimately out from the front when finally worn down. So, at some moments, two and sometimes three (before age 8) of these may exist on the same side of the jaw (one just erupting, one dominant in the center, and one just ready to fall out). Humans have 2 sets of teeth (baby and adult), while mammoths and elephants have 6 sets. When the sixth set of teeth are all worn out, the mammoth or elephant will die, usually between 45 and 60 years of age, although zoo elephants can have their lives extended with pureed and liquified feedings.

The six sets of mammoth teeth are designated M1 (just born), M2, M3, M4, M5, and M6. As the animal grew, the successive sets of teeth would enlarge to allow processing of increased amounts of food. Based on modern elephants, a six-and-a-half-ton mammoth would require a 114,000 calories per day (550 pounds of grass), while a nine ton Columbian mammoth would need 152,000 calories per day (750 pounds of grass). Mammoths chewed with a back-and-forth motion. Holding food between the molars, the lower jaw would slide forward to shear the food. By opening the mouth, the lower molars slide back and the process repeats itself until sufficient chewing allows swallowing.

Before we proceed to age estimation, you must understand tooth anatomy. Please refer to Figure 1. Mandibular (lower jaw) teeth have a long grinding surface with shorter roots which lead to an elongated shape similar to a stretched isosceles triangle. Maxillary (upper jaw) teeth have a much smaller grinding area and a deeper root structure leading to a shape that looks more like an equilateral triangle bent askew. You must decide whether your tooth is mandibular or maxillary. Searching for numerous photos and diagrams online may further help you make this distinction.

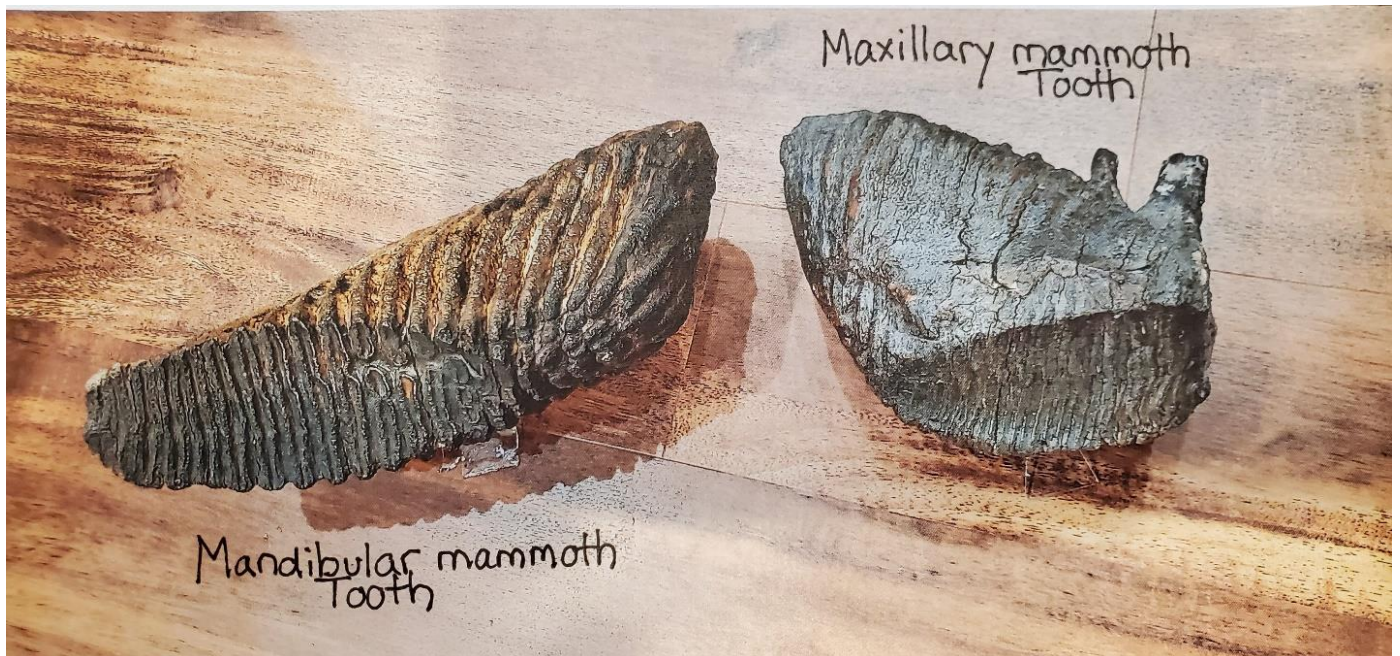


FIGURE 1

Now please refer to Figure 2. A mammoth tooth is composed of numerous plates surrounded by enamel, the hardest dental material. Within the rings of enamel, you will find dentine, a soft dental material. Between the rings of enamel you

find cementum (also soft) which binds the enamel plates together. Check out the diagram of the human tooth to see the commensurate substances. The reason for the hard and soft sandwiched layers is to provide a jagged tooth surface to allow better grinding of the grasses found on the steppe. As the teeth wear down the softer areas wear first leaving the enamel protruding to result in better destruction of the very tough and "glass-like" grasses.



FIGURE 2

The occlusal surface is the potential grinding area or chewing area. The occlusal surface above the gum is "in wear," and wears down over time. The unerupted areas of the occlusal surface are still below the gum and are considered "not in wear." If a tooth shows no areas of wear at all, it is considered unerupted and the mammoth died before the tooth could be used. Within the jaw, an unerupted tooth would be covered by a very thin layer of bone with gum on top. The circles of enamel with dentine in the center define an enamel plate and you must be able to count the number of enamel plates in the tooth. The percentage of plates "in wear" is the number of worn plates divided by the total number of plates. In figure 1, the mandibular tooth has 5 plates not in wear and 16 more plates "in wear," for a total of 21 plates. The percentage "in wear" is 16/21 or 76%.

To determine left or right side, hold your tooth so that the inner curving in the tooth (the shorter rim) is facing outside (laterally) while the occlusal surface is kept furthest away. In other words, keep the bulk of the root closest to you. A left mandibular tooth has both ends curving to the left, even though the jaw holding it would be curving to the right.

We are now ready to do an age estimation.

Please count the number of enamel plates in the whole tooth and refer to the chart on the next page. You may fall in two categories, but we will parse this with other data.

NUMBER OF PLATES

<u>Molar Number</u>	<u>MAXILLARY</u>	<u>MANDIBULAR</u>
M1	3 - 5	4 - 6
M2	6 - 10	6 - 8
M3	9 - 11	9 - 12
M4	11 - 13	11 - 15
M5	13 - 17	11 - 16
M6	18 - 24	15 - 24

To further solidify your choice of molar number, measure the maximal length and maximal width of the whole occlusal chewing surface (worn and unworn) in millimeters. Refer to figure 3 to find the placement of the tooth. These measurements refer to the Columbian Mammoth (*Mammuthus imperator*), the largest of the species. Adjust your measurements down by around 15 to 20% in the case of the smaller Woolly Mammoth (*Mammuthus primigenius*).

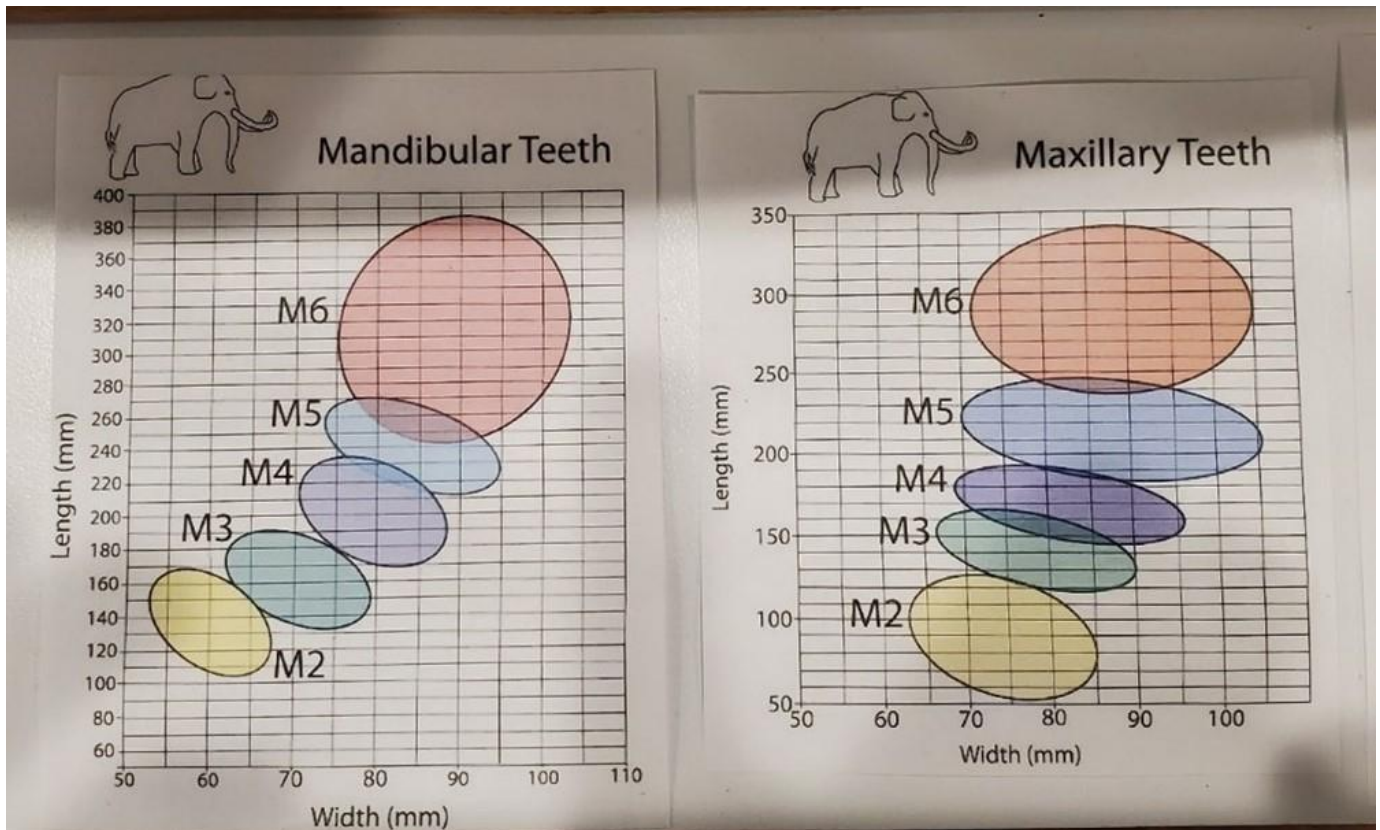


FIGURE 3

Once you have assigned the molar number, you need to calculate the percentage of plates "in wear":

$$\frac{\text{Number of plates "in wear"}}{\text{Total number of plates}} = \% \text{ plates "in wear"}$$

Now refer to Figure 4 on the next page to determine the age.

Age Estimation of Dentition in Mammoths

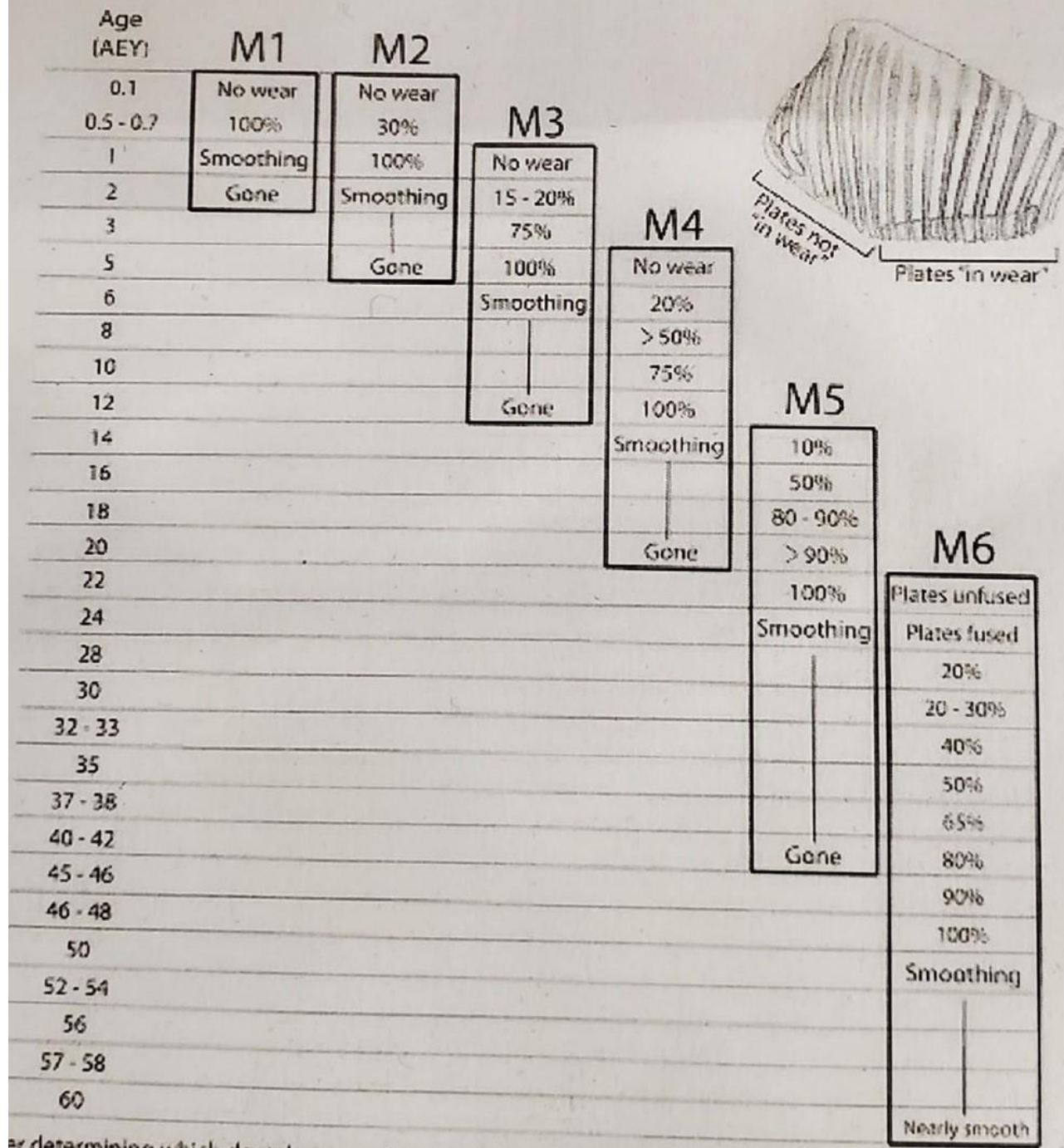


FIGURE 4

The mandibular mammoth tooth in Figure 2 (and Figure 1) measures 300 mm x 95 mm and has 21 enamel plates. This places the tooth as M6. The % in wear is 76%. Figure 4 tells us that the tooth came from a mammoth 39 to 40 years old (in analogy to African elephant years from where these figures derive).

Age determination of teeth can be even more accurate if an intact mammoth jaw can be found with its teeth. Having the size and wear pattern of multiple and even adjacent teeth lends even greater accuracy.

Mastodons and gomphotheres are half the size of mammoths (living in forests) and we do not have enamel plates to rely on. We suspect they had 6 sets of teeth also, but this is also not proven. These charts are obviously unreliable outside the mammoth genus.

Much of this information derives from a visit to the Mammoth Site and Museum in Hot Springs, South Dakota, a destination well-recommended if you have special interest in this subject.

Shows & Events

Due to restrictions in place for social gathering in many states resulting from the current pandemic, the majority of previously scheduled shows and events have been canceled or postponed. Consequently, no events are being listed here. Check with organizers for their latest guidance before planning on attending any event.

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Dates to Remember

Sunday, March 21, 2021 - Zoom Virtual Meeting
Speaker: VP Eric Seifter - "Age Estimation of Mammoth Teeth"

Meeting Time & Location

12:00 Noon to 2:00 PM
Bowie Community Center
3209 Stonybrook Drive, Bowie, MD 20715
301-464-1737

Location/Directions: The Center is located off of Route 450 in Bowie. Detailed directions and a map can be found on the MGS website (www.ecphora.net/mgs/).

The Rostrum

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First Class Mail

