A publication of the Rochester Academy of Science FOSSIL SECTION

The FOSSILETTER

VOL. 43 Number 8 June 2025

June Picnic Meeting

The Section will hold its final meeting before the summer break on Tuesday June 3. This will mark the return of our joint Fossil and Mineral picnic at the RAS Astronomy Section's Farash Center at Ionia, NY, and will feature the election of officers for the 2025 – 2026 term. The site will be open at 5:30 PM and grilling will start at 6:00 PM.

This meeting will have ASRAS member David Bishop presenting his "2024 Astronomy Year in Review". Those of us who have seen his annual presentation in past years recognize it as a very entertaining report on everything space related. It is good fun science for a general audience.

ACTION REQUIRED: Please notify Dan Krisher (dlkfossil@gmail.com) via email if you plan to attend so enough food can be purchased and let him know whether you prefer hots (red or white) or burgers. The Section will provide meats, rolls, condiments, and plates, cups, and utensils. We ask each attendee or family to bring a dish to pass as well as their preferred beverage.

The site has a large deck as well as indoor facilities (including flush toilets) so if there are rain showers, they will not be an issue. The Astronomy Section has a seating limit of 50 inside the building.

If this is your first time there, you should take the offered tour of the site which includes numerous telescopes enclosed in domes and buildings as well as a radio observatory. Although there are observatories in New York with larger telescopes (such as the 40-inch Newtonian at SUNY Oneonta), the ASRAS Farash Center is the largest NY observatory in number and range of telescopes.

You should visit the website for the observatory via https://www.rochesterastronomy.org/—click on "Farash Center" in the top banner. Then click on "Our Observing Site at the Farash Center". The picture below of "The Wolk Observatory Looking North" shows their facilities. The building all the way to the right has the deck where we will picnic, and the meeting room, kitchen, and bathroom.

You can get driving directions (your GPS, Google maps, etc.) to 8355 County Road 14, Ionia, NY 14475. This will work with most mapping tools. With GPS, you can also use the coordinates: 42.930976, -77.496872 or 42°55'46.7" N, 77°30'01.7" W. If you need explicit directions, write me at mgrenier@frontiernet.net.

The Wolk Observatory Looking North

Next meeting after June is October 7

Speaker is yet to be determined. Mark your calendars. Also, this is the last newsletter until the October issue.

Help Needed at ADK Outdoor Expo

The Expo is on Saturday, June 14 9:30 a.m. to 3:30 p.m. in Mendon Ponds Park, Pittsford. **Please call or email John Handley if you can help for a couple hours** — jhandley@rochester.rr.com, (585) 802-8567. You can help kids "collect" a fossil, show off our new display examples, and talk with prospective members. Astronomy and Mineral Sections will also be there. Under our pop-up, you'll sit in the shade and be sheltered from any showers. You'll have plenty of time to see all the exhibits and activities, enjoy live music by the Golden Link Folk Singing Society, and buy

food or ice cream from Dave's Sidewalk Café and Molly V's.

Presented by the Genesee Valley Chapter of the Adirondack Mountain Club and Monroe County Parks, the Outdoor Expo is a celebration of the great outdoors. Try out a kayak or canoe on the 100-Acre Pond, go for a short hike on the park's beautiful trails, visit the Wild Wings Birds of Prey facility and the Mendon Ponds Park Nature Center, explore camping, backpacking, bicycling and bike repair, crafts, the petting zoo, etc. For the full schedule of events, see: https://adk-gvc.org/play/outdoor-expo-before/

Follow the path to the pond & you will find us.

This event is free, open to the public, and fun for the entire family.

President's Report *by Dan Krisher*

The Section held its first field trip of the season on 4/26 to the Split Rock Quarry southwest of Syracuse. The abandoned quarry exposes Lower Devonian Helderberg Group and Middle Devonian Onondaga rocks. The day was rainy and only 3 members attended.

The second trip was on 5/3 to the Silurian Rochester Shale exposure west of Lockport with 3 members attending.

The Section's May meeting was a hybrid meeting held on 5/6. After a short business portion, the meeting was turned over to Section Vice-President Michael Grenier who gave a talk on the always popular subject of dinosaurs. He updated us on some recent finds as well as the paleontological salvage collecting with which he helped across the road from the St. George Dinosaur Discovery at Johson Farm in Utah.

The Section had a field trip scheduled for 5/25 to the Watertown area however the trip was postponed due to the weather.

The Section will hold its annual joint picnic with the Mineral Section on 6/3 at the Farash Center at Ionia. As always, the Sections will be providing the meat and rolls. Member Dave Bishop will give a short talk on the year in astronomy.

On 6/14 the Section will participate in the annual ADK day activities at Mendon Ponds Park. If you would like to help with this, please contact me.

On 6/28 the Section is planning on visiting the Little Beard's Creek site near Geneseo. This is always a Section favorite and a great one for families with kids.

Fossil Section Election

Your ballot was sent separately and should be returned to fredmhaynes55@gmail.com or filled out at the June 3 Annual Fossil Section Picnic, where the votes will be tallied and the winners announced.

RAS Fossil Section Slate for the 2025-2026 Term

For President: Dan Krisher
For Vice Pres. & Program Chair: Michael Grenier
For Secretary: Dan Krisher
For Treasurer: John Handley
For Director (3-year-term): Sonia Lopez Alarcon
For Director (2-year-term): John Bouffard

Director whose term has not expired is Fred Haynes (2026).

Upcoming Fossil Section Field Trips

by Dan Krisher

About a week or so before each trip I will send an email out to all Section members concerning the upcoming trip. All interested members should get back to me via email at least 2 days before the trip and I'll respond with additional information for that trip as soon as I receive your email. I will send out a final email to all attendees the night before the trip. If you have any questions or otherwise need to get a hold of me, you can contact me at DLKFossil@gmail.com or at (585) 698-3147. The following field trips are scheduled for June and July.

6/28 (rain date 6/29) Little Beard's Creek:

This is a large shale exposure along Little Beard's Creek in a stream near Geneseo. The site exposes the Windom Member of the Moscow Formation

and aside from many brachiopods and a few trilobites, the site is most well-known for the size and quantities of horn corals it produces.

The highly productive Little Beard's Creek trip in June 2019.

7/12 - Jaycox Run (date unconfirmed)**:**
In this trip we will visit the Jaycox Run site between Avon and Geneseo and the collecting will be in the Middle Devonian Ludlowville and Moscow Formations. This is a Genesee Valley Nature Conservancy site that requires permission to visit. Heavy rains over the past few years have seriously eroded the Green's Landing bed so collecting in that area of the outcrop will be limited. No large-scale removal of bedrock will be allowed. Collecting will be limited to surface collecting, only the removal of exposed fossils.

Jaycox Run trip in July 2019. (photo by Fred Haynes)

7/26 – Penn Dixie (date unconfirmed)**:** This is a family friendly site is a large open shale pit. There is a modest daily fee to collect but we may be able to get a group rate. The site exposes the Middle Devonian Windom Member of the Moscow Formation. A wide variety of fauna can be found but the site is most well-known for its trilobites. The date selected is shortly after the 'Dig with the Experts' so there will be many well-weathered piles of broken-up rock to sort through.

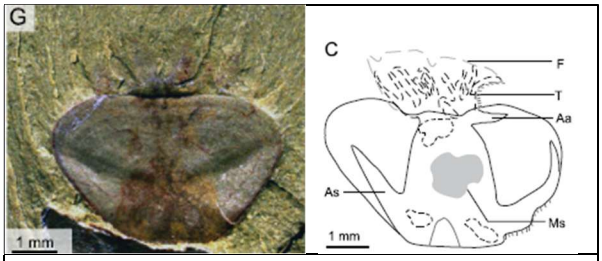
https://penndixie.org

Aside from the above trips, additional trips for late July and August are being planned.

Fossil News

Early ontogeny and other possible molluscan traits in hyolith biology and anatomy

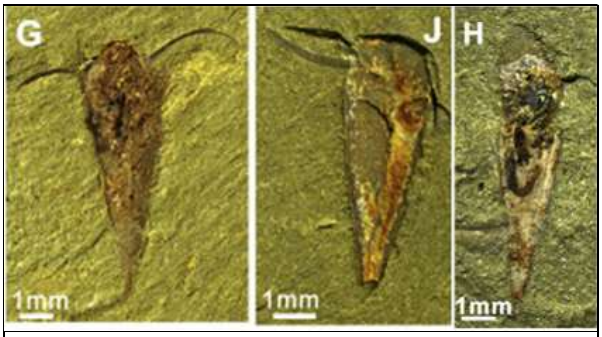
We reported in the February 2017 issue that a study finally resolved the identity of the fossils called hyoliths. That study (Moysiuk et al. 2017) of a Burgess Shale specimen with soft body preservation showing a tentacular feeding apparatus concluded that hyoliths were closely related to brachiopods. However, this was <u>not</u> the final resolution. Two studies in 2020 and 2022 that we did not report concluded that hyoliths are closely related to Mollusca—often proposed before 2017. One study (Liu et al. 2020) looked at the soft parts of the feeding apparatus of an orthothecid hyolith, *Triplicatella opimus* from the Chengjiang biota of South China. Assessment of this tentaculate feeding organ showed that it was not a real lophophore such as brachiopods have. The study concluded that hyoliths are more likely to a member of the clade that includes mollusks.



Liu 2017. Fig 1. Soft tissues preserved in Triplicatella opimus *from the lower Cambrian Chengjiang Lagerstätte. Fig 1G, ELI H-120B, showing the impression of the tentacular organ outside the margin of the operculum. Fig 1C, Interpretative drawing of the hyolith operculum.*

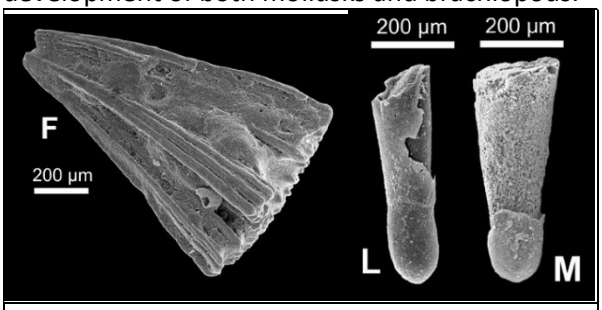
The second study (Liu et al. 2022) focused on a much larger hyolith sample from the Cambrian

Guanshan Biota in Yunnan Province of China with more detailed preservation. A total of 997 hyolith specimens were recovered from the Wulongqing Formation. Of these, 27 specimens are preserved with traces of the digestive system and visceral cavities. The apex of the conch in some specimens exhibits apparent traces of internal septa—also a mollusk feature.



Liu 2022. Fig 2G WD-SJJ-986A & Fig 2J, WD-SJJ-987B, soft body preservation and helens in place. Fig 3H, WD-SJJ-285, the U-shaped digestive tracts preserved in the conch.

A new study published this April by Dr. Jerzy Dzik, Professor of Biology in the Polish Academy of Sciences Institute of Paleobiology, expands on those two, also concluding that hyoliths are mollusks. His approach was to compare the embryonic state of hyoliths, visible at the earliest part of the conch—the tiny point or apex, and their ontogeny (development from a single embryo cell to an adult) with embryonic forms and development of both mollusks and brachiopods.



Dzik 2024. Subspherical embryonic conchs associated with robust claviculate hyolithids from the Katian sample E-192 of the Mójcza Limestone. Fig 2F, specimen ZPAL Ga1/162, exfoliated clavicle seen from its interior. Fig 2L&2M, specimens ZPAL Ga1/157 & 156, larval conchs.

He examined a large sample of hyoliths from the Late Ordovician Mójcza Limestone, Poland, and another sample from the Early Cambrian Sellick Hill Formation at Mayponga Beach, South Australia. Large samples are needed because the needed apex of the conch is usually broken off in the fossils. Both of these sites also yielded hyolith larval protoconchs and fragmented specimens of sizes transitional between protoconchs and juvenile to adult conches (teleoconchs).

Hyoliths were slowly evolving Palaeozoic organisms with embryonic and larval shells closely similar to those of early gastropods and nautiloids. The hyolith early ontogeny is similar to that of other mollusks but not to brachiopods, annulid worms, or other previously proposed relatives.

And so, it goes. I expect that the placement of hyoliths on the tree of life will continue to be controversial. All four papers referenced here are available from the editor. (Moysiuk, J., Smith, M. & Caron, J.B. 2017: Hyoliths are Palaeozoic lophophorates. *Nature* 541, 394–397. Liu, F., Skovsted, C.B., Topper, T.P., Zhang, Z. & Shu, D. 2020: Are hyoliths Palaeozoic lophophorates? *National Science Review* 7, 453–469. Liu, F., Skovsted, C.B., Topper, T.P. & Zhang, Z. 2021a: Soft part preservation in hyolithids from the lower Cambrian (Stage 4) Guanshan Biota of South China and its implications. *Palaeogeography, Palaeoclimatology, Palaeoecology* 562, 110079, https://doi.org/10.1016/j.palaeo.2020.110079. Dzik, J., 2025. Early ontogeny and other possible molluscan traits in hyolith biology and anatomy. *Lethaia*, 58(2), pp.1-16.)

Scientists determine how extinct giant ground sloths got so big and where it all went wrong

Florida Museum of Natural History press release issued May 22, 2025, by Jerald Pinson. See https://www.floridamuseum.ufl.edu/science/scientists-have-figured-out-how-extinct-giant-ground-sloths-got-so-big-and-where-it-all-went-wrong/ for full story.

Sloths' closest living relatives are anteaters and armadillos. Today, there are only six sloth species, but until 15,000 years ago, there were dozens of them. The largest sloths, in the genus *Megatherium*, were about the size of Asian bull elephants and weighed roughly 8,000 pounds. "They looked like grizzly bears but five times larger," said Rachel Narducci, collection manager of vertebrate paleontology at the Florida Museum

of Natural History. Narducci is a co-author of a new study in which scientists analyzed ancient DNA and compared more than 400 fossils from 17 natural history museums to figure out how and why extinct sloths got so big.

Ground sloths varied widely in size, with the largest known being *Megatherium*, which could rip foliage off the tops of trees with its prehensile tongue and acted as a sort of ecological stand-in for giraffes. Ancient sloths lived in trees, on mountains, in deserts, boreal forests and open savannahs. These differences in habitat nay have caused the wide difference in size between sloth species. Larger sizes might have been advantageous for finding food or avoiding predators.

The authors combined information about the shape of fossils with DNA from living and extinct species to create a sloth tree of life that traced the lineage back to their origin more than 35 million years ago. They added information on where sloths lived, what they ate and whether they were climbers or walkers. Because the authors were specifically interested in the evolution of size, they collected data by measuring hundreds of museum fossils, used to estimate sloth weight.

These Florida Museum fossils come from several different sloth species, including Eremotherium eomigrans *(bottom) and* Megalonyx leptostomus *(second from bottom) collected from a sinkhole in Florida, and* Parocnus serus *(second from top), from the Caribbean. photo by Kristen Grace*

The Florida Museum has the largest collection of North American and Caribbean-island sloths in the world, according to Narducci. She measured 117 limb bones for the study, which finds a correlation between size differences among sloths and the types of habitats and climate in which they lived. The earliest sloths would have likely been small ground dwellers, about the size of a great Dane. At various times in their evolutionary history, some adopted a semi-arboreal lifestyle. largest sloths, including *Megatherium* and *Mylodon*, likely evolved from a tree-adapted sloth.

The size of sloths hardly changed until the period of global warming called the Mid-Miocene Climatic Optimum from 17.5 to 14.5 million years ago. Sloths responded by getting smaller. This may be because warmer temperatures brought increased precipitation, which allowed forests to expand, thereby creating more habitat for smaller sloths. Size reduction is also a common way for animals to deal with heat stress.

After this, temperatures fell and sloths increased in size. Ground sloths climbed the Andes Mountains, fanned out through open savannahs, migrated into the deserts and deciduous forests of North America and made a home for themselves in the boreal forests of Canada and Alaska. Larger bodies helped sloths contend with cooling climates. They reached their greatest stature during the Pleistocene ice ages, shortly before they disappeared.

There's still debate about what happened to sloths, but it is true that humans arrived in North America at about the same time that large sloths went extinct. Neither fast nor well-defended, ground and semi-arboreal sloths would have been easy pickings for early humans.

This paper (Boscaini, Alberto, et al. (2025) "The emergence and demise of giant sloths." *Science* 388.6749: 864-868) is available from the editor.

Digital reconstruction reveals 80 steps of prehistoric life

University of Queensland press release issued May 14, 2025.

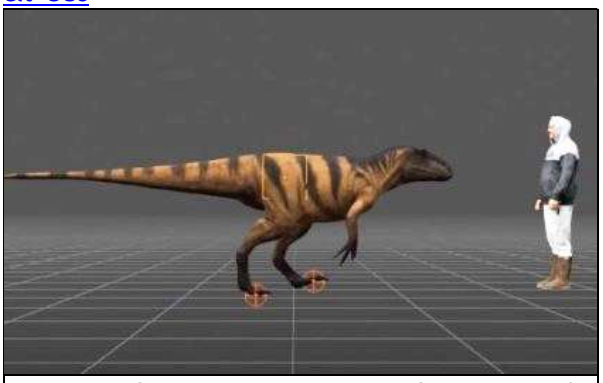
https://www.uq.edu.au/news/article/2025/05/digital-reconstruction-reveals-80-steps-of-prehistoric-life

A dinosaur's 40-second journey more than 120 million years ago has been brought back to life by a University of Queensland-led research team using advanced digital modelling techniques. Dr Anthony Romilio from UQ's Dinosaur Lab analyzed

and reconstructed the Phoenix Trackway, the longest documented set of footprints made by a predator walking on two legs in East Asia. "For the first time this dinosaur's movements have been reconstructed step by step, revealing how it walked, changed pace and responded to its environment," Dr Romilio said. "Through digital animation, we can observe that moment as it unfolded, getting unprecedented insights into the animal's behavior and biomechanics." The sequence of 80 consecutive footprints extends for 70 meters in Sichuan Province, China.

Using trackway measurements, the research team has revealed the dinosaur walked on two legs, stood 1.13 metres tall at the hip and weighed up to 292 kilograms. "The footprints show this dinosaur moved at a steady 5.3 km/h which is equivalent to a brisk human walk and then briefly accelerated into a light trot before returning to its regular pace," Dr Romilio said. "This wasn't just a dinosaur wandering aimlessly, it was moving with purpose in a nearly perfectly straight line." This dinosaur was similar in size to the feathered *Yutyrannus* which lived in northeastern China in the early Cretaceous period.

This digital animation can be viewed at https://www.youtube.com/watch?v=Zx6_ZrqFkzg&t=38s



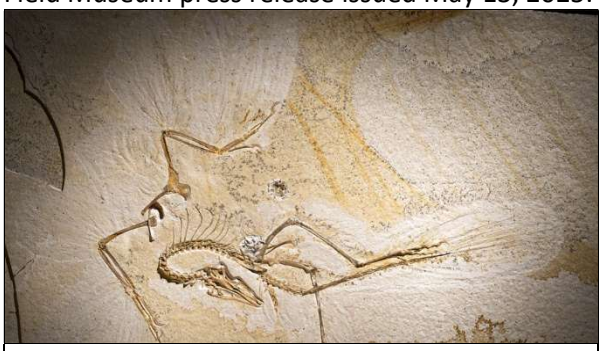
An image from the reconstruction of the dinosaur's movements. Image: Dr A Romilio

"Trackways can reveal behavioral information and stories that fossilized bones alone cannot provide," Dr Romilio said. "But long trackways such as this have historically been understudied due to the logistical difficulties of measuring them in detail in the field. Our entirely digital approach allows us to capture, interpret and preserve all the measurements and calculations of fossil track sites on computer to provide a glimpse into the dynamic life of an ancient creature."

This paper (Romilio, A. and Xing, L., 2025. A Digital Analysis of the 'Phoenix Trackway' at the Hanxi Cretaceous Dinosaur Tracksite, China. *Geosciences*, *15*(5), p.165) is available from the editor

UV light and CT scans helped scientists unlock hidden details in a perfectly-preserved fossil Archaeopteryx Never-before-seen feathers were the key to Archaeopteryx flight

Field Museum press release issued May 13, 2025.



The Chicago Archaeopteryx*. All photos by photographer Delaney Drummond (c)*

Archaeopteryx is the fossil that proved Darwin right. It's the oldest known fossil bird, and it helps show that all birds—including the ones alive today—are dinosaurs. And while the first *Archaeopteryx* fossil was found more than 160 years ago, scientists are continuing to learn new things about this ancient animal. In a paper in the journal *Nature*, researchers described the features of the latest *Archaeopteryx* fossil to be shared with the public scientific record: the Chicago *Archaeopteryx*, which went on display in 2024 at the Field Museum. Thanks to the incredibly detailed work by the scientists who prepared the specimen, this fossil preserves more soft tissues and fine skeletal details than have ever been seen in *Archaeopteryx*. Notably, a set of feathers never before seen in this species help explain why it could fly when many of its non-bird dinosaur cousins could not.

Like all *Archaeopteryx* fossils, the Chicago specimen was found in limestone deposits near Solnhofen, Germany. This specimen was found by a private fossil collector prior to 1990 and had been in private hands since 1990. A coalition of

supporters helped the Field Museum procure it; it arrived at the museum in August 2022.

Archaeopteryx lived about 150 million years ago during the Jurassic Period and was a small animal. The Chicago specimen is the smallest one known, only about the size of a pigeon. Its tiny, hollow bones are preserved in a slab of extremely hard limestone. A team of fossil preparators spent over a year working on the Chicago *Archaeopteryx*. A CT scan was used to delineate the boundaries of the fossil. "A CT scanner is essentially a machine that takes a series of X-rays, which it uses to build a three-dimensional image, based on differences in density. It lets you see inside things," says Jingmai O'Connor. "CT scanning was very important for our preparation process— it let us know things such as that the bone is exactly 3.2 millimeters below the surface of the rock, which let us know exactly how far we could go. This is the first time a complete *Archaeopteryx* CT-scan has been made available."

The Chicago Archaeopteryx, under UV light to expose soft tissues.

The team used UV light to illuminate pieces of the fossil's skeleton and even its soft tissues, such as the scales on the bottom of the toes. This careful, technology-guided preparation led to more fine details being preserved in the Chicago *Archaeopteryx* than in any other specimen. "We're lucky in that this specimen happens to be extremely well-preserved, but we can also see features that probably were preserved in other specimens, but which didn't make it through cruder preparation processes in the past," says O'Connor. "Having the preparation of this specimen done by scientists whose goal was to preserve as much tissue and bone as possible made a huge difference."

In this paper, the team focused on the head, the hands and feet, and the wing feathers. "The bones in the roof of the mouth help us learn about the evolution of something called cranial kinesis—a feature in modern birds that lets the beak move independently from the braincase. The soft tissues preserved in the hands and feet bolster ideas that *Archaeopteryx* spent a lot of its time walking on the ground and might even have been able to climb trees.

The wing feathers help resolve a long-standing scientific debate about the origins of flight in dinosaurs. "*Archaeopteryx* isn't the first dinosaur to have feathers, or the first dinosaur to have 'wings.' But we think it's the earliest known dinosaur that was able to use its feathers to fly," says O'Connor. The key to *Archaeopteryx*'s flight might be a set of feathers never seen before in a member of its species: a long set of feathers on the upper arm, called tertials. "Compared to most living birds, *Archaeopteryx* has a very long upper arm bone," says O'Connor. "And if you're trying to fly, having a long upper arm bone can create a gap between the long primary and secondary feathers of the wing and the rest of your body. If air passes through that gap, that disrupts the lift you're generating, and you can't fly." However, modern birds have evolved a solution to this problem: shorter upper arm bones, and a set of tertial feathers to fill the gap between the bird's body and the rest of its wing. "Our specimen is the first *Archaeopteryx* that was preserved and prepared in such a way that we can see its long tertial feathers," says O'Connor. "These feathers are missing in feathered dinosaurs that are closely related to birds but aren't quite birds. Their wing feathers stop at the elbow. That tells us that these non-avian dinosaurs couldn't fly, but *Archaeopteryx* could."

This paper (O'Connor, Jingmai, et al. "Chicago *Archaeopteryx* informs on the early evolution of the avian bauplan." *Nature* (2025): 1-7) is available for purchase from *Nature*.

CALENDAR OF EVENTS

June
Tuesday, June 3, FOSSIL ANNUAL PICNIC 6:00 PM Location: Farash Center for Observational Astronomy, Ionia, NY.

Saturday, June 14, ADK Outdoor Expo, Mendon Ponds Park, Pittsford.

Saturday, June 28, FIELD TRIP: Little Beard's Creek (rain date 6/29)

July
Saturday, July 12, FIELD TRIP: Jaycox Run (date unconfirmed)

Saturday, July 26, FIELD TRIP: Penn Dixie (date unconfirmed)

Visitors are welcome to all Fossil Section meetings! For more information and the latest updates check the RAS Website (**www.RASNY.org**). You can also contact Dan Krisher at DLKFossil@gmail.com or John Handley at jhandley@rochester.rr.com for further information.

ROCHESTER ACADEMY OF SCIENCE FOSSIL SECTION

Monthly meetings are held as hybrid meetings, live but also broadcast on Zoom. Meetings are held on the first Tuesday of each month from October to December and from February to May at 7:30 pm. In person meetings are held at the Pittsford Community Center, Room 019, 35 Lincoln Ave, Pittsford, NY 14534 unless otherwise listed.

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Director (expires 2027): ***Open***		
Director (expires 2028): ***Open***		
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FossiLetter Editor: Michael Grenier	585 671 8738	mgrenier@paleo.com

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The FossiLetter is published before each meeting month of the year. Please send submissions to mgrenier@frontiernet.net or by U.S. Postal Service mail to 692 Maple Drive, Webster, NY 14580. The deadline for submissions to the FossiLetter is the 15th of the month.

For scheduling changes and the latest updates please check the RAS Website (www.rasny.org) and click on the Fossil Section link. Last-minute updates can also be found on the *General Announcements* page of the Academy Website.

This trackway at the Hanxi Cretaceous Dinosaur Tracksite, formerly believed to be of a snake, now has a new interpretation.

https://www.freepik.com