A publication of the Rochester Academy of Science FOSSIL SECTION

The FOSSILETTER

VOL. 37 Number 2 November 2019

November Meeting

The November section meeting is on Tuesday, November 12, at 7:30 PM at the Brighton Town Hall. Note: **NOT** Tuesday 11/5, due to election.

Our speaker this month is PhD candidate (Astrobiology) Ashley Pollock from St. Catharines, Ontario and the title is ***"The Late Heavy Bombardment and the Origin of Life"***. Ashley is Field Trip Director with the Niagara Peninsula Geological Society.

Two years ago, Ashley presented "*Precambrian Life and Extinction Events*" to us, covering the first four billion years of life on Earth along with a number of ensuing extinction events.

This year, Ashley will present further discoveries and updates on the first two billion years of the Precambrian - from accretion of Earth to the Great Oxygen Crisis - of how early Earth life lived and died surrounded by both life-giving and catastrophic geologic events, atmospheric changes, plate tectonics, and solar system debris.

Highlights of this upcoming talk include 1) *Synestia*—a high-speed Moon forming event that destroyed life on proto-Earth; 2) the *Late Heavy Bombardment*—which is much more likely to have been 2 billion years long; 3) *the Acasta Gneiss impact* –evidence at 4 billion years ago; 4) *the First reefs*—were they Banded Iron Formations or Stromatolites?; 5) *Copper, pyrite, and microbes*—with more enthusiastic research on archaea, the list of denizens is growing by leaps & bounds - and likely to surpass bacteria. There will be a lot of amazing surprises here, including more definitive proof of how early life started—probably on the Moon & Mars, too.

The presentation will focus on new discoveries from the *Hadean* and *Archean* up through *the Great Oxygen Crisis* occurring about 2.4 billion years ago. It will examine the interrelationship between geologic events—some of them catastrophic—with what life was doing.

Ashley Pollock in the field

President's Report by Dan Krisher

The Section held its October meeting on 10/1. The speaker the meeting was Dr. Lisa Amati, the New York State Paleontologist. For most of her career Dr. Amati has studied arthropods in one form or another and is currently focused on the Ordovician trilobites of Ontario, New York and

Quebec. Dr. Amati's talk was entitled "*Trilobites – The Lost Kingdom*" and gave an overview the biology and evolutionary history of this popular fossil group.

A few hours before the Fossil meeting Dr. Amati also hosted a children's program at the Brighton Library. This program was titled "*Fossil Fun with the State Paleontologist*" and introduced the children and their families to the rich fossil history of the state.

RAS Fall Scientific Paper Session

You will enjoy yourself on **Saturday, November 9, 2019**, 8:30AM to 2PM at the 46th Annual Rochester Academy of Science Fall Scientific Papers Session at Monroe Community College, R. Thomas Flynn Campus Center, 1000 East Henrietta Road, Rochester, New York 14623. We have 37 speaker presentations and 105 poster displays signed up from seventeen different local colleges and universities, and more when co-authors are included. You do not need to be pre-registered to attend. You cannot order lunch at this point, so bring your own.

RAS Scientific Paper Session Schedule

Parking: Free. Park in lot M. A campus map can be had at: www.monroecc.edu/about mcc/locations maps/brighton-campus/.

Get more information at:
https://sites.monroecc.edu/papersession/.

8:30 a.m. Presenters sign in. Refreshments for all attendees. Monroe A & B, Warshof Conference Center, Building 3.

9:30 -- 11:45 a.m. Oral Presentations Building 12.

11:45 a.m. -- 12:45 p.m. Poster Session. Atrium and Terrace of the Flynn Center.

12:45 p.m. Lunch (pre-ordered or bring own).

1:00 p.m. Welcome & Larry King Memorial Lecture. Monroe A & B, Warshof Conference Center, Building 3.

If you have any questions, contact me at paleo@frontier.com.

RAS Larry King Memorial Lecture

The Rochester Academy of Science presents noted climate and environmental scientist Dr. Warren Allmon as our annual Larry King Memorial Lecturer. This is on **Saturday, November 9, 2019** from 1 to 2PM in conjunction with our 46th Annual Rochester Academy of Science Fall Scientific Papers Session at MCC. Dr. Allmon is co-author of the highly-rated book, "Climate Change - Past, Present & Future."

Dr. Warren Allmon

This talk is on environmental change including climate change and what paleontology contributes. We know that there have been many past warming events with Earth temperatures as high or even higher than currently predicted for our future, just as there have been several ice ages of which the Pleistocene was only the most recent. The past warming events can tell us a lot about what to expect. As Warren notes, "Paleontology is the only record we have of the actual history of life on Earth, and therefore the only test case available for judging the potential effects of present and future environmental change – including climate change -- on Earth's biota. The past is not just past. It is a crucial source of data for predicting, and preparing for, the future."

Rest in Peace, Carol Wonder

Long-time members Carol and George Wonder have been mainstays in the Fossil Section and the Mineral Section for a very long time. This past October 4th, Carol passed away unexpectedly from a sudden illness. George and their children were by her side as she passed.

Carol was born on February 1, 1942. She earned both her B.S. degree in Science and M.S. degree in Education from the University of Rochester. She was a volunteer at the Rochester

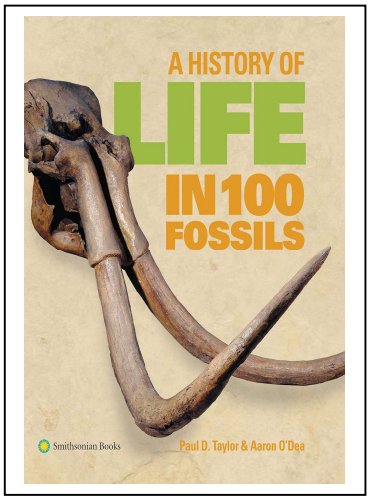
Museum and Science Center, and attended most section meetings. Members of the section attended her wake and her funeral. Carol was a lively and inquiring person and she will be very much missed at our meetings and our outreach programs. Her full obituary can be read at https://obits.democratandchronicle.com/obituaries/democratandchronicle/obituary.aspx?n=carol-macaluso-wonder&pid=194082916&fhid=13400

The family requests donations in her name to Open Door Mission (www.opendoormission.com) or the Rochester Museum and Science Center (www.rmsc.org). Cards can be sent to George D. Wonder, 27 Long Branch Drive, Henrietta NY 14467; or notes to gcwonder1@yahoo.com.

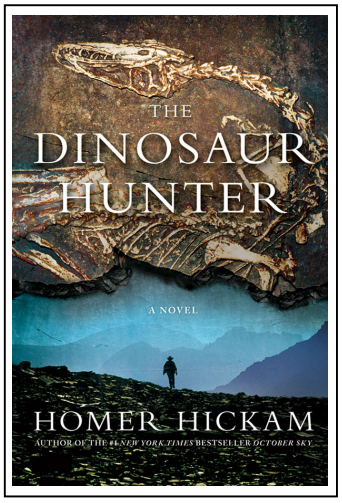
Carol and George Wonder

Make A Donation, Win A Book!!

I published a review of the gorgeous book, ***A History of Life in 100 Fossils***, in the October newsletter. This new copy has been donated to Fossil Section to be raffled as a fund-raiser. Your Fossil Section is a worthwhile organization, and the dues are low, not enough to cover the costs of our events. Since we are a section of the Rochester Academy of Science, all donations to the Fossil Section are tax-deductible. I suggest that members should make a donation of $2 and if they do, I will give them a raffle ticket for a drawing to win this book. Generous friends of the section can make multiple $2 donations and get multiple tickets. For example, if you donate $8, I will give you 4 tickets. However, if you donate $10, I will throw in an extra one--that's right, 6 tickets for a $10 donation.



Tickets will be sold at our November 12th and December 3rd meetings, cash or check. I will have the book there so that you can see it, admire it, fall in love with it, covet it, and donate two bucks to win it. The drawing will be held at our December Annual Holiday Party and "Show-n-Tell" on December 3rd. This book has a list price of $34.95 + tax & shipping. We are selling only 30 tickets, so your odds of winning it are good! All receipts go to the Fossil Section. You can buy a ticket via PayPal. (Just send $2 for each ticket you want to mgrenier@frontiernet.net, friend-to-friend). If you win and you are out of town, I will send you the book, at no extra charge. Make a generous donation and Good Luck!



Book Review

Homer Hickam, *The Dinosaur Hunter: A Novel*. St. Martin's Griffin. This one is unusual for us as we usually review scientific tracts. This one is instead a highly rated murder mystery, which many of you may find appealing. Murder and fossils! This is a great combination. One might expect a mystery author to have little real understanding of paleontology and thus to present a superficial and generally wrong account. Homer Hickham has actually participated in a number of digs in Montana and writes accurately from first-hand

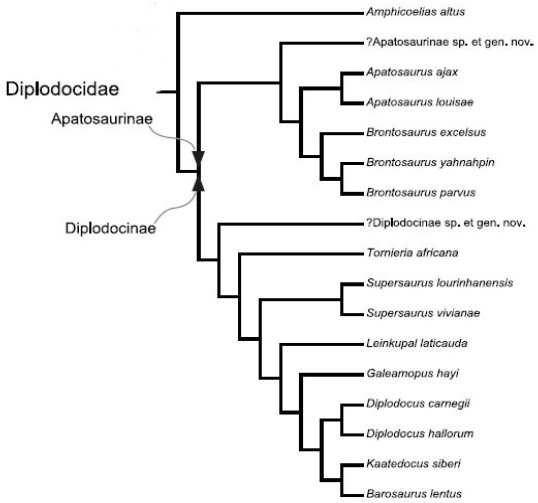
experience working with Jack Horner of the Museum of the Rockies and several other notable dinosaur paleontologists. Hopefully he does not have first-hand experience with murder and Russian gangsters, but puts together an enjoyable well-written story from all of these elements. His protagonist is Mike Wire, currently an experienced cowboy, but formerly an L.A. police detective. He puts both skill sets to good use in unraveling the tangles in this affair. When dinosaur bones are found on his boss's ranch, it attracts not only Dr. Norman "Pick" Pickford (the "Dinosaur Hunter" of the title) and his team but also a number of unsavory characters seeking to cash in on a valuable fossil. Rather than continuing to spill the beans, I will simply offer it with my recommendation. It will be at the November meeting with several other recently reviewed books, available to be borrowed.

Fossil News

BRONTOSAURUS. As a youth, one of the first dinosaurs I learned was *Brontosaurus*, the thunder lizard. As most everyone knows, the real name of this critter is *Apatosaurus* (deceptive lizard) because Dr. Othniel Marsh gave this genus name to a fossil specimen that turned out to be the same as his later-named *Brontosaurus*. Having priority as a name, *Apatosaurus* was in and *Brontosaurus* was out, even though it is a great name and was preferred by Dr. Marsh.

I had great hopes for the resurrection of *Brontosaurus* with the publication of a paper in 2015 which reorganized the entire Diplodocidae family. I have waited until now to see if the premise would be accepted in general peer review. Little criticism has been offered, though most notably by paleontologists Dr. Michael D'Emic and Dr. Donald Prothero. Apparently no reanalysis of this reassignment has appeared in the scientific press, though at least 93 papers have referenced this work in support of their own.

The type species is *Brontosaurus excelsus*, as it was originally. The study also reclassified two additional species that had been previously considered *Apatosaurus parvus* as *Brontosaurus parvus* and *Eobrontosaurus yahnahpin* as *Brontosaurus yahnahpin*. These three are most



Excerpt from the cladogram (figure 120) in Tschopp, Mateus, and Benson (2017)

closely related to *Apatosaurus ajax* (the type species) and *Apatosaurus louisae*, but character-by-character analysis shows that they are different enough that they should be considered two separate genera.

This paper (Tschopp, Emanuel, Octávio Mateus, and Roger BJ Benson. "*A specimen-level phylogenetic analysis and taxonomic revision of Diplodocidae (Dinosauria, Sauropoda)." PeerJ* 3 (2015): e857) is available as a pdf download from https://peerj.com/articles/857/?utm_source=peerj&utm_medium=blog&utm_term=taxonomicrevisionofdiplodocidae&utm_content=article857&utm_campaign=BrontosaurusBlog.

Massive fangs and a death crush: How a 370 million year old tetrapod hunted and killed (www.sciencedaily.com/releases/2019/10/191024105825.htm)


Parmastega aelidae

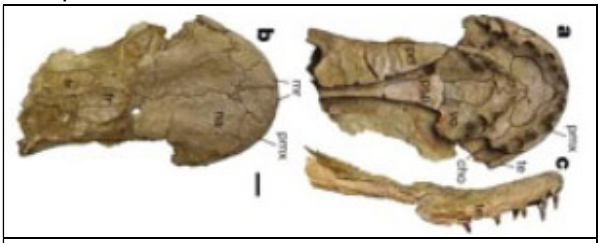
The habits of a needle-toothed tetrapod which lived in the Famennian, the last stage of the Devonian, 372 million years ago have filled in a

piece of the evolutionary puzzle. An international team of paleontologists pieced together the fossilized skeletons of a new species of tetrapod called *Parmastega aelidae* and found it had a skull which resembled a crocodile -- a unique feature among the earliest tetrapods -- with eyes above the top of its head, suggesting it was capable of watching unsuspecting prey while it swam close to the surface of a tropical lagoon.

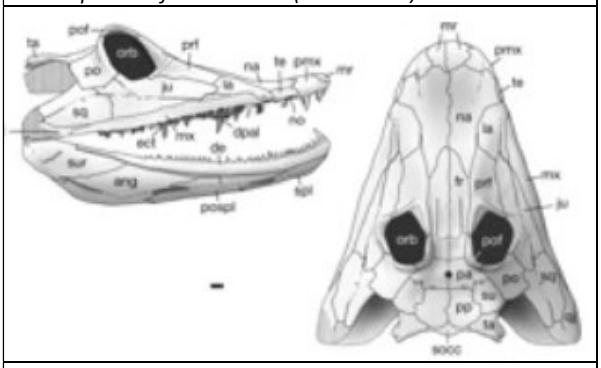
The unusual combination of anatomical features has cast new light on how one of most distant ancestors hunted and its life-style. Researchers believe it would have used its slender needle-like teeth and elastic jaw to snatch prey before crushing it to death with massive fangs protruding from its palate.

The team also found that part of its shoulder girdle consisted of cartilage, and its vertebral column and paired limbs could also be made of cartilage, indicating it probably spent most or all its time in water. The concentration of the fossil remains also suggests that it may have lived in large groups. The new study was led by the Russian Academy of Science, partnering with the Universities of Lincoln and Cambridge in the UK, the University of Latvia, and the University of Uppsala in Sweden.

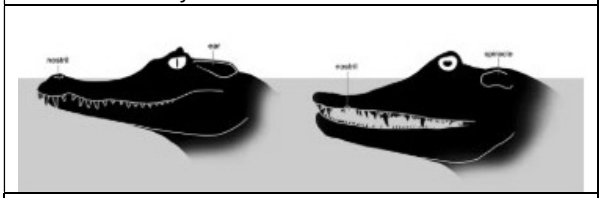
The authors write in their abstract: "The known diversity of tetrapods of the Devonian period has increased markedly in recent decades, but their fossil record consists mostly of tantalizing fragments. The framework for interpreting the morphology and paleobiology of Devonian tetrapods is dominated by the near complete fossils of *Ichthyostega* and *Acanthostega*; the less complete, but partly reconstructable, *Ventastega* and *Tulerpeton* have supporting roles. All four of these genera date to the late Famennian age (about 365–359 million years ago)—they are 10 million years younger than the earliest known tetrapod fragments and nearly 30 million years younger than the oldest known tetrapod footprints. Here we describe *Parmastega aelidae* gen. et sp. nov., a tetrapod from Russia dated to the earliest Famennian age represented by three-dimensional material that enables the reconstruction of the skull and shoulder girdle. The raised orbits, lateral line canals and weakly ossified postcranial skeleton of *P. aelidae* suggest a largely aquatic, surface-cruising animal. In phylogenetic analyses, the majority of trees place *Parmastega* as a sister group to all other tetrapods."



Front portion of skull. This is one of 132 specimens comprising 183 skeletal elements collected during the entire period of excavations (2002–2012).



Reconstruction of the skull



Comparison of caiman (left) with Parmastega *(right) showing structural parallels in hunting at surface. Crocodiles do this today, because they are keeping an eye out for land animals that they might want to catch.*

The fossils come from the Sosnogorsk Formation, a limestone formed in a tropical coastal lagoon, which is now exposed on the banks of the Izhma River near the city of Ukhta in the Komi Republic of European Russia. But these are no mere fragments: when the limestone is dissolved with acetic acid, out come perfectly preserved bones from the head and shoulder girdle which can be pieced together into a three-dimensional reconstruction of the animal, by far the earliest for any tetrapod. Large and small individuals are found, the biggest with a head length of about 27 cm. Fish-like characteristics in some bones indicate that this is not only the

earliest but also the most primitive of the well-preserved Devonian tetrapods.

Tetrapods are represented today by amphibians, reptiles, birds and mammals, and *Parmastega* predates the former earliest records of complete or almost complete tetrapod skeletons by nearly 12 million years. Professor Per Ahlberg from the University of Uppsala in Sweden, explained that a clue to the lifestyle of *Parmastega* was provided by its sensory canals, used to detect vibrations in the water, which *Parmastega* inherited from its fish ancestors.

"These canals are well developed on the lower jaw, the snout and the sides of the face." he said. "This probably means that it spent a lot of time at the surface of the water, with the top of the head just awash and the eyes protruding into the air. There may have been large arthropods such as millipedes or 'sea scorpions' to catch at the water's edge. The slender, elastic lower jaw certainly looks well-suited to scooping prey off the ground, its needle-like teeth contrasting with the robust fangs of the upper jaw that would have been driven into the prey by the body weight of *Parmastega*. These fossils give us the earliest detailed glimpse of a tetrapod: an aquatic, surface-skimming predator, just over a meter in length, living in a lagoon on a tropical coastal plain."

Dr. Marcello Ruta from Lincoln's School of Life Sciences added: "The evolution of tetrapods is one of the most important events in the history of backboned animals, and ultimately led to the appearance of our own species. Early in their history, tetrapods evolved many changes in their feeding strategies, movement abilities, and sensory perception, but many of these are still shrouded in mystery. Like all fossil organisms, *Parmastega* occupies a special and unique place in the tree of life. Our study welcomes a new, very early member of that tree which shows considerable anatomical, functional and ecological experimentation.

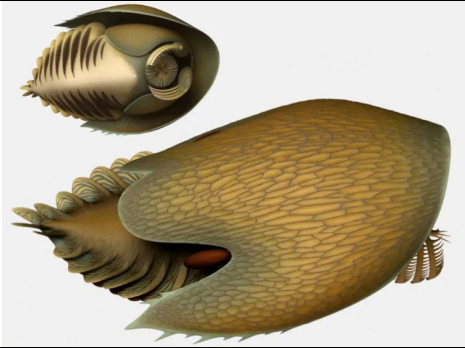
"These new findings demonstrate that the sequence of evolutionary changes that occurred during the transition from fish-like creatures to tetrapods were much less linear than previously thought. This helps us to amend or challenge previous evolutionary scenarios and give new insights into the life and environments of our most distant forerunners. Findings like those of *Parmastega* can help us grasp the complex patterns and processes that have shaped life's diversity for hundreds of millions of years."

(Beznosov, P.A., Clack, J.A., Lukševičs, E., Ruta, M. and Ahlberg, P.E., 2019. Morphology of the earliest reconstructable tetrapod Parmastega aelidae. *Nature*, *574*(7779), pp.527-531.) The paper is not publicly available but may be purchased from *Nature* at https://www.nature.com/articles/s41586-019-1636-y#Sec17

New Burgess Shale Fossil Predator Found in Kootenay National Park (Content from https://www.cbc.ca/news/technology/cambroraster-burgess-shale-1.5229120, visit for the videos!)

If you are looking for good reason to visit the Royal Ontario Museum (ROM) in Toronto, they have recently put on display a new Cambrian fossil from the 506-million-year old Burgess Shale in British Columbia's Kootenay National Park. As of this past summer, select specimens of *Cambroraster falcatus* have been put on display in the New Research case within the current temporary ROM Willner Madge Gallery. Eventually, these and other Burgess Shale specimens will be showcased in a brand-new gallery Dawn of Life exhibition, to open in 2021.

Cambroraster falcatus was a radiodont arthropod, a clade (family) that included the Cambrian's top predator, *Anomalocaris*. These were distant relatives of crabs, insects and spiders and other animals with jointed legs, although *Cambroraster* didn't have any legs itself.



Cambroraster falcatus *reconstruction showing head shield, its rake-like claws, its lamprey-like mouth, and its swimming flaps. (Lars Fields/Royal Ontario Museum)*

The species name is based on the *Star Wars* space ship, *Millennium Falcon*, due to the resemblance in outline. (The first part of the name refers to the fact that it lived during the Cambrian and had rake-like claws). Graduate student Joseph Moysiuk, PhD candidate at the ROM, spotted the first mysterious pieces of *Cambroraster* fossils in 2014, in a pile of loose rocks at a fossil site called Marble Canyon. In the Cambrian, British Columbia was near the equator, and Marble Canyon was part of a shallow ocean a few hundred meters deep. The animals that lived there — many unlike anything alive today — were exquisitely preserved after being buried in an underwater landslide.

Joseph Moysiuk shows Cambroraster *fossil slab*

The first bits and pieces of *Cambroraster* didn't even look like they could be from the same animal. But in 2016, as the team excavated small quarries into the mountainside, they started finding entire specimens. The "spaceship," it turned out, was a protective carapace or shield covering *Cambroraster's* head.

Cambroraster was about the size of a painted turtle or a medium pizza — making it huge by Cambrian standards. At that time, most animals were smaller than your little finger, Moysiuk said

Like a horseshoe crab (not a true crab but a distant relative of spiders), Cambroraster dug in the muddy bottom for food such as worms, researchers think, although it did so with a set of rake-like claws studded with hooked spines — something horseshoe crabs definitely do not have, but some relatives of real crabs do. *Cambroraster* devoured its prey with a circular, toothy mouth that was the calling card of the extinct radiodont group named for their round, toothy mouths), which died out about 350 million years ago.

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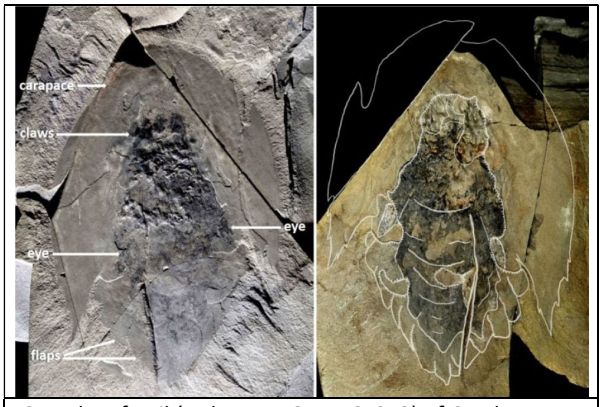

Complete fossil (Holotype ROMIP 65078) of Cambroraster falcatus, showing the eyes and the body with paired swimming flaps below the large head carapace. The shale in which the fossil was entombed was split open, leaving parts of the body on both sides (right and left). (Jean-Bernard Caron/Royal Ontario Museum.)

"It's telling us that the Cambrian ecosystems were really complex." said Moysiuk, lead author of a paper describing them. “This is not a sort of primitive, simple organism. This is a highly specialized predator."

Figuring all that out wasn't easy, as many fossils are just pieces, and they're completely flattened. It took more than a hundred fossils squashed from different angles to uncover what the animal looked like in 3D. Fortunately, *Cambroraster* fossils were surprisingly common at Marble Canyon, with sometimes dozens of individuals covering a single slab of rock.

Cambroraster is quite different from other radiodont fossils, suggesting that the group was quite diverse. The fact that it has so much in common with modern horseshoe crabs and lived among many creatures with similarities to modern marine organisms tells us something about life 506 million years ago, Moysiuk says. "It's not so different from the sort of situation that we have today. We may have different players. But overall, the ecosystems are performing very similarly."

CALENDAR OF EVENTS

November
Tuesday November 12 (NOTE 2nd Tuesday, not 1st Tuesday, due to election), FOSSIL MEETING 7:30 PM Brighton Town Hall Downstairs Meeting Room 2300 Elmwood Ave. Speaker Ashley Pollock, " ***The Late Heavy Bombardment and the Origin of Life*** ". Visitors welcome.

December
Tuesday December 3, FOSSIL MEETING 7:30 PM Brighton Town Hall Auditorium 2300 Elmwood Ave. Our traditional Show-and-Tell with pizza and drinks provided by the section. This is a great opportunity to show off your finds from the past year. Visitors welcome.

Visitors are welcome to all Fossil Section meetings! Refreshments are served. 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 the first Tuesday of each month from October to December and from February to May at 7:30 pm at the Brighton Town Hall, Community Meeting Room, 2300 Elmwood Avenue, Rochester, NY unless otherwise listed.

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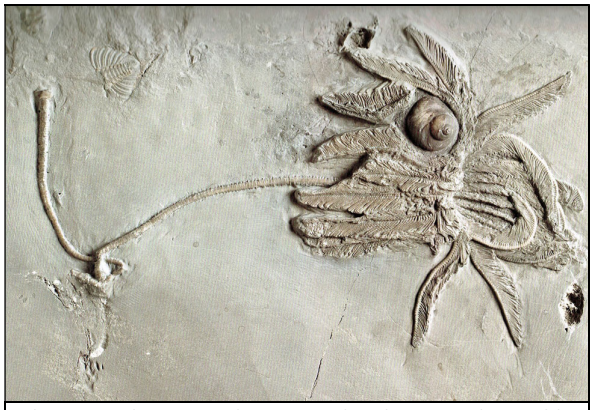
The FossiLetter is published before each meeting month of the year. Please send submissions to **mgrenier@frontiernet.net,** or by U.S. Postal Service mail to 692 Maple Drive, Webster, NY 14580. Deadline for submissions to the Fossiletter is the 15th of the month.

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.



*Platyceratid gastropod associated with a crinoid, possibly a symbiont or a parasite, as these are usually found on crinoids. (from **A History of Life in 100 Fossils**)*