A publication of the Rochester Academy of Science FOSSIL SECTION

The FOSSILETTER

VOL. 37 Number 8 June 2020

May Meeting Recap

The May section meeting was note-worthy in two regards. First, it was our first-ever virtual meeting (held on Zoom). After losing our March meeting due to the Science Olympiad cancellation and our April meeting when we found ourselves without a speaker, we were very grateful to Dan Krisher for putting together a very interesting program on "The Year in Geology and Paleontology." Second, we had several people attend who do not normally get to our meetings due to their distance from Rochester. It was good to have them engaged with the club in this way. Since it is a good way for distant members to be in a meeting, it will work equal well for us to have distant speakers engaged. We begin that with our June speaker coming to us over the internet from Fort Wayne, Indiana. You will see this again with some of the speakers we are already lining up for the upcoming 2020-2021 season.

June Meeting

Due to strictures on meetings, there will be no Annual Fossil Section Picnic in June. We will instead have a business meeting and lecture. We may hold a picnic later in the summer. The June section meeting is on Tuesday, June 2, at 7:00PM. This meeting will be conducted as a virtual meeting on Zoom, which requires either a computer with sound (or with a telephone) or a Smart Phone. It is possible to use a telephone only, but you will have only audio and not see the slides for the talk.

We are very pleased to feature Dr. Ben Dattilo, Associate Professor (and Distinguished Lecturer) at Indiana University-Purdue University Fort Wayne. He is a stratigrapher and paleontologist with a particular interest in the ecology and environments of the early Paleozoic. He concentrates his research efforts on the Upper Ordovician (450 million years old) deposits of the Cincinnati region. Current projects include investigations into sedimentary processes of mixed carbonated environments (and, hence, crinoids), the evolution of reefs, and the life habits of extinct brachiopods. He has entitled his talk, "Revealing the hidden functions of crinoid columnals." Since crinoid columnal disks are likely the most common fossil found in Devonian rocks, this should be of interest to every collector. Thus we find a hidden advantage to us in using virtual meeting tools—we can bring in speakers who never could have made a trip to Rochester.

Dr. Benjamin Dattilo reading the rocks

Now, to attend this meeting, you MUST be registered in advance, since only registered members and invited guests will be sent the meeting information to log in and attend. Register with President Dan Krisher (dlkfossil@gmail.com).

Dr. Dattilo sent a description of his talk, which we have published in the RAS Bulletin, since we have decided to open this meeting to all RAS members. Dr. Dattilo also urges you to watch the 10-minute video on the modern crinoids prepared by Dr. Charles S. Messing, Professor Emeritus Nova Southeastern University. Consider this required pre-reading for his lecture. This video is at:

https://vimeo.com/410445885?fbclid=IwAR0OUTq_iqoS2-UVkjf9IjFvVptemETeywPhbM32Dzva-JtSQT2Kxs82pKM

Next meeting after June is October 6

Speaker to be determined. Mark your calendars.

Fossil Section Election

Your ballot has been sent separately and should be returned by email by end of day June 1, so the votes can be tallied and the winners announced at our June 2nd meeting. Note that Michael Grenier has accepted a nomination to be our VP, so two Director positions are open.

RAS Fossil Section Slate for the 2020-2021 Term

For President: Dan Krisher
For Vice Pres. & Program Chair: Michael Grenier
For Secretary: Dan Krisher
For Treasurer: John Handley
For Director (three-year-term): ***Open***
For Director (one-year-term): ***Open***

Field Trip Events & Picnic

by President / Field Trip Organizer Dan Krisher

No Field Trips or picnic will be scheduled before July at the earliest. When and if scheduled, members will be notified by email.

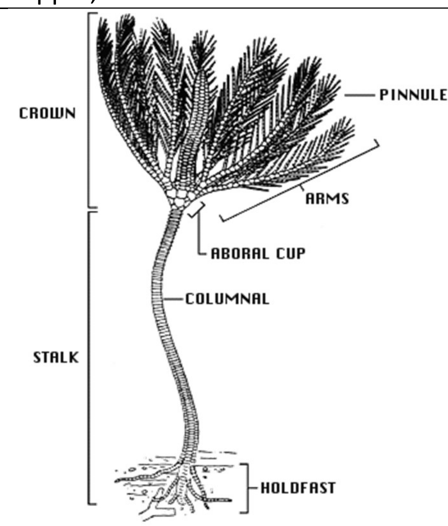
President's Report **by Dan Krisher**

On May 5, the Fossil Section held its monthly meeting via ZOOM with 11 people "attending". After a brief business session, the remainder of the meeting consisted of a presentation by Dan Krisher on recent developments in the field of paleontology. Part way through the meeting we learned that John Handley had successfully secured a remote speaker for the June meeting. In years past the June meeting also consisted of the Section elections as well as the annual picnic. The decision was made to move the picnic portion of the meeting to later in the summer, perhaps in conjunction with a fieldtrip. The Section ballot will be in the June newsletter and the results of the election will be tabulated and announced at the June meeting.

Crinoids 101, a Primer

In preparation for Dr. Datillo's talk, I thought reviewing crinoids would be a good idea. We have not covered them here since Dr. Wittmer's talk in November of 2018. I expect that everyone reading this newsletter already knows that crinoids are echinoderms like starfish, sea urchins, sea cucumbers, and brittle stars; and that they have five-sided ("pentaradial") symmetry as adults and a calcium carbonate endoskeleton with a spiny skin.

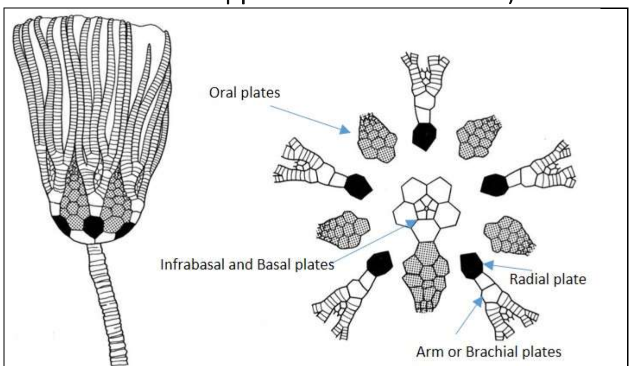
We know that as fossils, they are the most common Paleozoic animal both in sheer numbers and in volume. Many Paleozoic and Mesozoic-age limestone strata are composed almost entirely of crinoid remains to great thickness. Besides numerous, they are also diverse, with over 5000 fossil crinoid species named in over 800 genera. If you are wondering where all the calcium carbonate came from, during the Ordovician, atmospheric CO_2 is estimated to have been as high as 4200 ppm, over ten times current level.



General morphology of a stalked crinoid from Tree of Life project, http://www.tolweb.org/Crinoidea, by William I. Ausich and Charles G. Messing

Morphology

Most of a crinoid's body is its exoskeleton, made of many, many small calcium carbonate plates called ossicles in its crown, and larger discs called columnals in its stalk. The amount of living tissue is small compared to all the skeletal material and much of it is structural, holding all the columnals and ossicles together. The arms have the largest amount of the crinoid's tissue and are used primarily for food gathering and also for locomotion. Primitive crinoids had five arms of connected ossicles. Species evolved branching arms resulting in 10, 15, 20, or more arms. Some living species have 200 arms! The arms grow out from special plates called radials, which are part of the set of plates that make up the outer body, called the *calyx* (from the Ancient Greek κάλυξ (kálux) meaning "husk" or "pod"). It is also called the *aboral cup. (Aboral,* denoting the side or end that is furthest from the mouth, especially in animals that lack clear upper and lower sides such as echinoderms. Opposite to the oral side.)



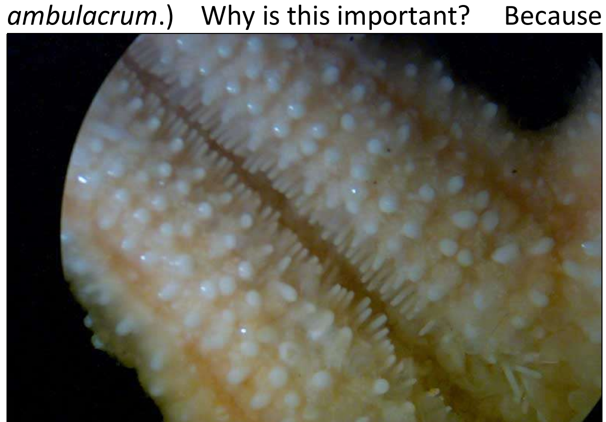
A Camerata crinoid and exploded view of its calyx (from www.fossilcrinoids.com, with labels added by editor)

Above is an exploded view of a calyx of a fossil Paleozoic crinoid showing the attachment and branching of the arms. (In this case, a *Camerata* crinoid, but more on the sub-classes of crinoids later.) The bottom of the crinoid calyx is made up of its "infrabasal plates", to which the stalk attaches, and a ring of "basal plates". Attached to the basal plates are five "radial plates". There are always five of everything due to the five-side symmetry. Even individual plates have five sides! From the top of these radial plates grow the "brachials" or arm plates, the exoskeleton of each arm. In this specimen, each of the five arms splits to make two and they split again into four, so this crinoid is equipped with twenty arms. The "oral plates" fill in the gaps between arms so the cup is solid.

The ossicles of the arm are articulated and quite flexible. In modern crinoids, small side branches (pinnules) grow out along the arm giving it a feathery appearance. These pinnules bear the

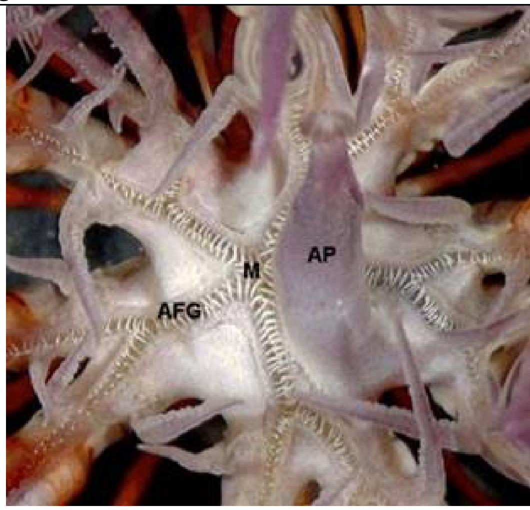
Crinoid arm supported by ossicles in center, with pinnules branching off left and right sides. Each pinnule is attached to an ossicle. On the pinnules can be seen the crinoid's tube feet, part of its water vascular system. Courtesy of cnso.nova.edu

food-gathering tube feet. You probably know that starfish also have tube feet. This is a character of all echinoderms. Starfish tube feet are specialized with a suction pad on the end for gripping and walking. Crinoid tube feet do not have these. Pinnules are known in several Paleozoic crinoids, but they have no calcareous plates, are entirely soft tissue and preserve only under exceptional circumstances. Like starfish arms, the crinoid pinnules and arms have an "ambulacral groove" or ambulacrum. (From Latin *ambulacrum*, a walk planted with trees, from *ambulāre* to walk; from which we also get "amble." With the tube feet on either side of the groove, it resembles an *ambulacrum*.) Why is this important? Because



A starfish's ambulacral groove showing specialized tube feet to move food along to its mouth. From www.bio.fsu.edu

these grooves move food from the pinnules to the mouth. With all this, our crinoid friend is "well-armed" to get its lunch. Crinoids are passive suspension feeders and rely on water motion to bring food to them. The crinoid diet includes protists such as euglenae, dinoflagellates, diatoms and algae, as well as protozoans, foraminiferans, invertebrate larvae, small crustaceans, and organic detritus. These foodstuffs are about 50 to



The crinoid oral surface ("tegmen") looking from the top in. The Ambulacral food grooves (AFGs) run from each arm and converge as they reach the mouth (M). Note the anus (AP) off to one side. Courtesy of cnso.nova.edu

400 microns in size. When a tube foot senses a food particle, it sweeps it into the ambulacral groove, where smaller tube feet encase it in mucus and send it on its way to the mouth moved along by cilia. Yum! By the way, crinoids, unlike starfish and other echinoderms, have a "U"-shaped digestive system, in which the mouth and anus are on the same side of the body.

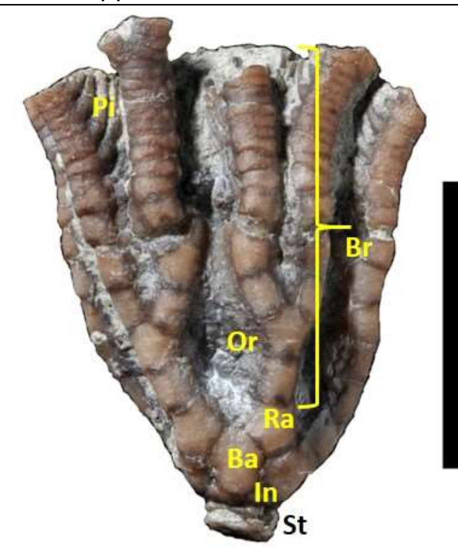
This summarizes the basics of the morphology except the stalk and the holdfast or cirri. These are familiar to collectors and covered in Dr. Messing's video and in Dr. Datillo's coming talk, so we will move on.

Evolution of Crinoids

Observant readers doubtless noticed in the exploded view that the plates of the calyx are not random, but occur in rings—rings of basal plates at the bottom followed by a ring of radials, a ring of orals, a ring of brachials, etc. as we move from the bottom of the calyx to the top. At least that is the way they are arranged in this Camerata example. The Camerata are one of three sub-classes of crinoids found in the Paleozoic. We now have covered enough morphology to be able to distinguish these. Anatomically, the Camerata are distinguished from other sub-classes by:

- fused junctions between the plates of the cup
- brachial plates incorporated into the cup
- tegmen forming a rigid roof over the mouth
- no less than ten and sometimes a very large number of free arms, often pinnulate.

With cladistics, much of the Linnaean classification system breaks down, but with crinoids it is still useful down to at least the subclass level. Thus, within the Phylum Echinodermata we have the Subphylum Crinozoa which includes the Class Crinoidea (Miller, 1821) familiarly called crinoids. Other classes include the cystoids, blastoids, rhombiferans, and edrioasteroids, none of which we will cover in this article. Crinoids are organized into various subclasses of which the Camerata are one, and the other Paleozoic fossil crinoid sub-classes are Disparida and Cladida (following phylogenetic analysis of Wright 2017). Some researchers recognize these groups as monophyletic clades, but have dropped the "sub-class" label.



Late Ordovician Gaurocrinus nealli*, a 10-armed Camerata crinoid. Note brachials/arms (Br) with pinnules (Pi) arising from radial (Ra) with orals (Or) between brachials. Radials attach to basal plates (Ba) attached to infrabasals (In) attached in turn to the top of the stem (St). Image from www.drydredgers.com with guide letters and bracket added by editor. Scale = 10mm.*

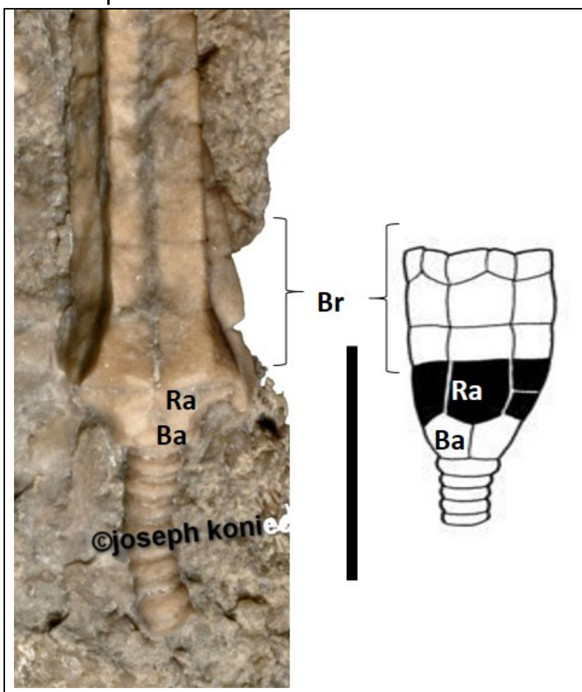
We start with the Camerata—a major clade of Paleozoic crinoids comprising nearly 350 genera, including some of the earliest known crinoid taxa. Camerata are known from the Early Ordovician

(Tremadocian) to the latest Permian. (The Tremadocian is the earliest stage of the Ordovician, from about 485.4 - 477.7 million years ago.) Camerates were the first sub-class to diverge within the Crinoidea. The earliest known camerate is *Eknomocrinus*.

A second sub-class are the Disparida. The earliest known is *Alphacrinus* from the mid-Tremadocian, only somewhat later than *Eknomocrinus.* Disparida are identified by

- two-circlet cup (no infrabasals or orals)
- arms free above the cup (no brachials in the calyx
- cone/barrel-shaped cup
- unequal size of cup plates

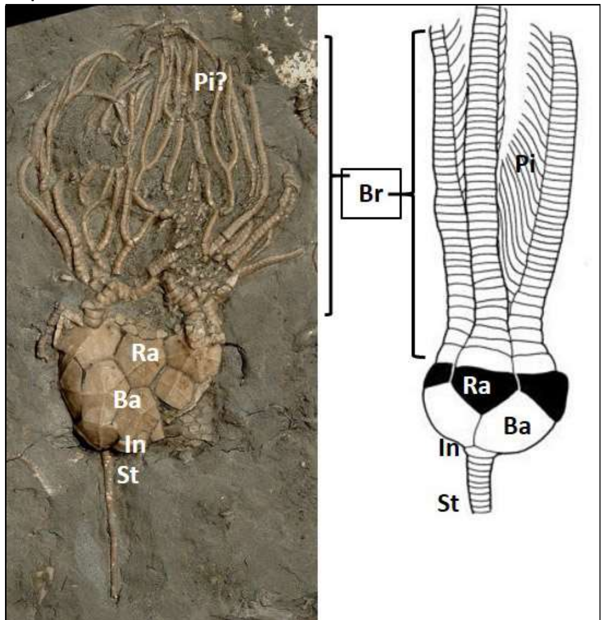
They are also much smaller than camerates and have no pinnules.



Mid-Tremadocian Alphacrinus *a 10-armed Disparida. Note free brachials/arms (Br) arising from radials (Ra) attached to basal plates (Ba) attached in turn to the top of the stem. Radials are the top of the calyx. Image used with permission from Joseph Koniecki www.crinus.info with guide letters and bracket added by editor. Scale = 10mm.*

The Cladida are the third sub-class to arise, also in the Tremadocian, though apparently later than the other two. The earliest known cladid is *Aethocrinus* in the late Tremadocian. They are a very large and diverse group, but in general they have:

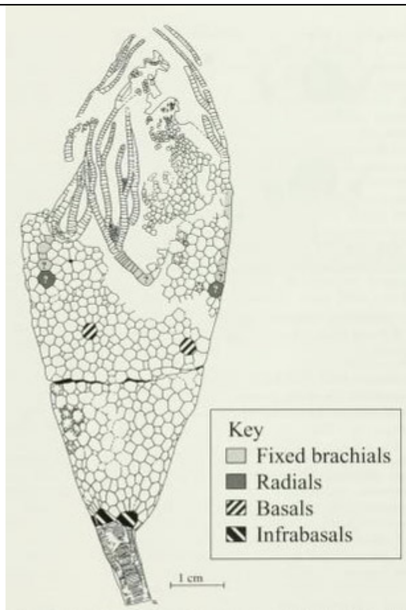
- richly branched arms structure
- arms free above the cup (no brachials in the calyx)
- three-circlet cup (infrabasals, basals, radials)
- few or no oral plates
- prominent anal sac



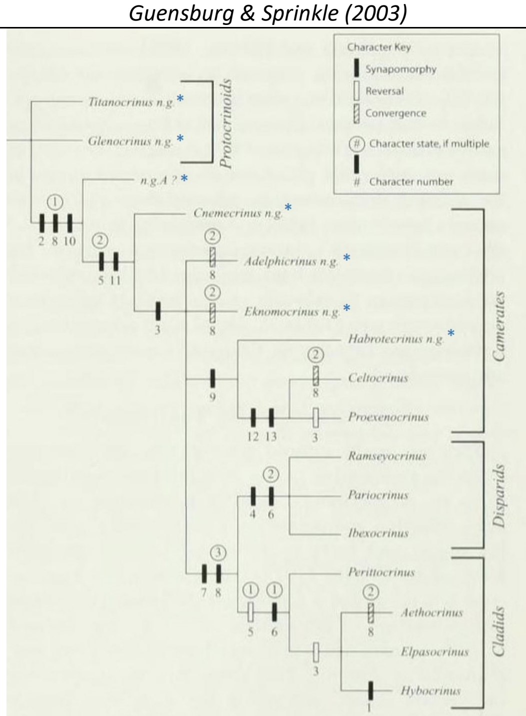
Upper Ordovician (Katian) Carabocrinus vancortlandti*, an early cladid. Note brachials/arms (Br) with pinnules (Pi) arising from radials (Ra) attached to basal plates (Ba) with infrabasals (In) and stem (St) below. Image used with permission from Joseph Koniecki www.crinus.info with guide letters and bracket added by editor. Scale not known.*

At least at a high level, the fore-going should help you classify any well preserved crinoids in your collection.

Until 2001, the earliest known crinoid was the cladid *Aethocrinus* from the middle Early Ordovician (Tremadocian-Arenigian boundary). Then Thomas Guensburg (Rock Valley College) and James Sprinkle (University of Texas at Austin) announced six new crinoid species from the early Tremadocian. Four of these were early Camerata —*Eknomocrinus wahwahensis, Cnemecrinus fillmorensis, Adelphicrinus fortuitous,* and *Habrotecrinus ibexensis* The two oldest very primitive crinoids however did not fit in any clade and were assigned to a new group, Protocrinoidea. This is a primitive stem group to the others, though some researchers more recently include them in Camerata. These crinoids were named *Titanocrinus sumralli* and *Glenocrinus globularis.*



Titanocrinus sumralli*, earliest known crinoid (from Guensburg & Sprinkle (2003)*



Guensburg & Sprinkle (2003) phylogeny. New genera indicated by n.g. with further emphasis by editor with asterisks. Note that these 16 genera from the early Ordovician were manually assessed based on 13 characters. Crinoid labelled "n.g. A" was not yet described.

Meanwhile, you might ask, where are the earlier ancestors, those that should be in the Cambrian? They remain unfound. One candidate from the Burgess Shale, *Echmatocrinus brachiatus* was proposed as a possible early crinoid. That has been rejected by most crinoid specialists, who recognize it as a primitive echinoderm, and possibly of a sister group to crinoids, but not a crinoid itself.

Echmatocrinus brachiatus*, from the Burgess Shale. Courtesy Royal Ontario Museum (www.rom.on.ca)*

After 230 million years as one of the most successful marine animals ever, crinoids hit the End-Permian mass extinction. It is estimated that 96% of all marine animal species were wiped out. Survivors were all but a rounding error. No trilobites, eurypterids, or blastoids survived. Only four genera of coral survived. It is likely that only one genus of crinoid lived through it, possibly a single species, with all extant crinoids their descendants. When crinoids reappear in Triassic deposits, they are of a sub-class unknown in the Paleozoic record, Articulata. All the Camerata, Disparida, and Cladida are gone. Where are the Paleozoic Articulata ancestors? We do not know. It has been proposed that they evolved from cladid ancestors, which appears likely given the numbers of cladids during the Permian, but no specific genus has been identified as the likely ancestor. Today there are about 540 known species of crinoids. About 80 of these are deep-water stalked crinoids (bourgueticrinids) and the remainder are unstalked Comatulida, the feather stars.

The following websites and papers are useful.

I will send copies of the papers on request.
Online Sources: *en.wikipedia.org/wiki/Crinoid*, *www.fossilcrinoids.com*, *cnso.nova.edu*, *Tree of Life project* *www.tolweb.org/Crinoidea*, *www.crinus.info.*

The following papers are available from the editor:

1) Ausich, William I., and Loren E. Babcock. ***Echmatocrinus, a Burgess Shale animal reconsidered***. *Lethaia* 33.2 (2000): 92-94.

2) Guensburg, Thomas E. ***Phylogenetic implications of the oldest crinoids***. *Journal of Paleontology* 86.3 (2012): 455-461.

3) Guensburg, Thomas E., and James Sprinkle. ***Earliest crinoids: new evidence for the origin of the dominant Paleozoic echinoderms***. *Geology* 29.2 (2001): 131-134.

4) Guensburg, Thomas Edgar, and James Sprinkle. ***The oldest known crinoids (Early Ordovician, Utah) and a new crinoid plate homology system***. Paleontological Research Institution, 2003.

5) Wright, David F. ***Bayesian estimation of fossil phylogenies and the evolution of early to middle Paleozoic crinoids (Echinodermata)***. *Journal of Paleontology* 91.4 (2017): 799-814.

THE BOOK SHELF

The libraries here are still closed, and I suspect that may be the case where all our members are. Here's my offer—I have listed 19 of the books that I have reviewed in this newsletter over the past three years that are sized to fit in shipping envelopes. All of them are recommended. If you want to borrow one, I will ship it to you at no charge, upon request. You must return it within four months (sooner if you finish it). Let me know what you would like.

1. Briggs, Derek E.G., Erwin, Douglas H., Collier, Frederick J.; The Fossils of the Burgess Shale; 1994
2. Clack, Jennifer A.; Gaining Ground: The Origin and Evolution of Tetrapods (2nd Edition); 2012
3. Dawkins, Richard; The Ancestor's Tale: A Pilgrimage to the Dawn of Evolution; 2005
4. Emling, Shelley; The fossil hunter: dinosaurs, evolution, and the woman whose discoveries changed the world; 2009
5. Fortey, Richard; Life: a natural history of the first four billion years of life on earth; 1997
6. Fortey, Richard; Trilobite! Eyewitness to Evolution; 2000
7. Foster, J.; Cambrian Ocean World: Ancient Sea Life of North America; 2014
8. Gee, Henry; In search of deep time: Beyond the fossil record to a new history of life; 1999
9. Gould, Stephen Jay; Wonderful Life: The Burgess Shale and the Nature of History; 1989
10. Hickam, Homer; The Dinosaur Hunter: A Novel; 2010
11. Knell, S. J.; The Great Fossil Enigma: The Search for the Conodont Animal; 2013
12. Long, John A.; The Rise of Fishes: 500 Million Years of Evolution (2nd edition); 2010
13. Macdougall, Doug; Frozen Earth: The Once and Future Story of Ice Ages; 2004
14. MacLeod, Norman; The Great Extinctions: What Causes Them & How They Shape Life; 2013
15. Mayor, Adrienne; The First Fossil Hunters: Paleontology in Greek and Roman Times; 2000
16. McGhee, George R. Jr.; When the Invasion of Land Failed--The Legacy of the Devonian Extinctions; 2013
17. Prothero, Donald R.; Evolution: What the Fossils Say and Why It Matters; 2007
18. Prothero, Donald R.; The Story of Life in 25 Fossils: Tales of Intrepid Fossil Hunters and the Wonders of Evolution; 2015
19. Shubin, Neil; Your Inner Fish: A Journey into the 3.5-Billion-Year History of the Human Body; 2008

Fossil News

Society for Vertebrate Paleontology Bars Work on Myanmar Amber

If you look up "Burmese Amber", you will find that this amber from the Hukawng Valley in northern Myanmar has become controversial due to its role in funding the internal conflict in Myanmar and hazardous working conditions in the mines where it is collected. Human Rights Watch and Amnesty International have documented egregious human rights abuses by the military government. According to Graham Lawton, writing in the May 1, 2019 issue of the UK-based *New Scientist* journal ("Blood amber: The exquisite trove of fossils fuelling war in Myanmar") and other sources, this amazing deposit has been controlled by the Burmese Military, which took over the mines in June 2017 from the Kachin Independence Army. Most of the amber from the mines appears to be smuggled into China to be sold, and sales of amber have been alleged to help fund the Kachin conflict by various news organizations in 2019.

On April 21, the Society of Vertebrate Paleontology issued the following statement: *Dear Fellow SVP Members:*

Vertebrate paleontology as a field of science depends upon the ethical acquisition and long-term availability of fossil specimens. These fundamentals are written into SVP's bylaws and code of ethics. Nonetheless, our profession also exists within a broader community, where new ethical situations arise in the face of global events.

One area of growing concern centers on the Cretaceous amber mines of northern Myanmar. The amber from Kachin State (so-called Burmese amber) has been used in jewelry for centuries, and a number of exquisitely preserved vertebrate fossils have been published recently. Although these finds have advanced scientific knowledge, they come with a human cost. The region has been in the throes of a civil war for decades, and the area containing the amber mines is currently controlled by Myanmar's military. In fact, money from the sale of amber (including pieces that contain fossils) may be funding the conflict (Sokol, 2019, Troubled Treasure, Science). It is also alleged that inequitable labor practices are being used to collect the amber under exceptionally dangerous working conditions, the material is collected with little geological context, and is often smuggled out of the country to avoid import taxes and Myanmar's restrictive export laws. Although the fossils undoubtedly have immense scientific value, they lie under an ethical cloud.

In response to this situation, the SVP Executive Committee has sent a letter expressing our concern to editors from over 300 scientific journals worldwide. Within this letter, we have also requested editors to review and update their policies around fossil specimen deposition, in accordance with the principles of future verifiability that underpin the statement in SVP's Code of Ethics.

We ask that all SVP members assist in this effort. The Society of Vertebrate Paleontology strongly discourages its members from working on amber collected in or exported from Myanmar since June 2017, until the situation changes. We recognize that there are other paleontologically productive areas with their own concerns, but the issues in Myanmar are particularly pressing. Furthermore, members on editorial boards can help craft updated journal ethics policies, and individual peer reviewers and authors can help by double-checking that any fossils proposed for publication are held within the public trust.

The practice of science has a human dimension—and sometimes very real human costs. It is our responsibility as vertebrate paleontologists and global citizens to ensure that our actions are both scientifically and ethically solid. Indeed, we firmly believe that ethical science is the best science. Thank you for your assistance in these efforts.

Sincerely yours,
SVP Executive Committee
SVP Government Affairs Committee

Late Cretaceous Beetle Identified

(We will publish no more Burmese amber articles after this one finishing an open issue from last month.) Dr. George Poinar Jr. has named and described the beetle whose triungulins hitched a ride on the bee, *Discoscapa apicula*, as reported in our May issue. The discovery provides the earliest known date for the co-evolution between bees and beetle triungulins. All 21 triungulins fossilized with the bee are from the same species. Comparison with modern beetle triungulins enabled Poinar to identify the family of the parent. Surprisingly, the beetle parent is not a Meloidae "blister beetle" as your editor expected, but rather belongs to the Cleridae, the "checkered beetles," of which few attack bees. Poinar has named the beetle *Anebomorpha cercorhampha*. This is a new collective group genus for fossil triungulins that have been identified to an insect family but cannot be placed in any extinct or extant genus. If the adult form is ever identified, a new genus for it will be erected and these triungulins will be assigned to it. The earliest fossil record of the family Cleridae is from the Upper Jurassic of southwestern Mongolia. There are a number of additional Mesozoic records as well so the presence of members of this family in the mid-Cretaceous is expected.

This paper, (Poinar Jr, G., & Brown, A. (2020). ***Dating the Co-evolution Between Bees and Beetle Triungulins (Coleoptera: Cleridae) to the Mid-Cretaceous.*** *Biosis: Biological Systems*, *1*(01), 02-07.) is available from the editor.

New Crinoids in Brechin Lagerstätte

The Upper Ordovician (Katian) strata of the Lake Simcoe region of Ontario record a spectacularly diverse and abundant echinoderm fauna known as the Brechin Lagerstätte. Preservation is spectacular. Despite having a very diverse crinoid paleocommunity, it has had little taxonomic study since the Springer monograph in 1911. With access to a private collection, the authors have analyzed 15 species of cladids across 11 genera, including descriptions of two new genera and four new species, which are pictured here.

The Ordovician is a key interval for understanding the evolutionary history and diversification of crinoids. After their initial diversification during the Early Ordovician, crinoids underwent a major radiation during the Great Ordovician Biodiversification Event (GOBE), reaching peak taxonomic diversity during the Katian Stage. Following the GOBE, crinoid taxonomic diversity dramatically declined during the Hirnantian and was decimated by the end-Ordovician mass extinctions. Knowledge of Katian faunas is critically important to understanding the evolutionary history of crinoids. This paper, (Wright, D. F., Cole, S. R., & Ausich, W. I. (2020). ***Biodiversity, systematics, and new taxa of cladid crinoids from the Ordovician Brechin Lagerstätte***. *Journal of Paleontology*, *94*(2), 334-357) is available from the editor. It is profusely illustrated with many excellent specimen photographs and drawings. Unfortunately, these are entirely in black and white. The newly described specimens are reposited in the University of Michigan Museum of Paleontology (UMMP). Through special arrangements with the donor, Joseph Koniecki, we are pleased to be able to present his own color photographs of them.

Left, Konieckicrinus josephi *n. gen. n. sp. (holotype); right,* Dendrocrinus simcoensis *n. sp.*

Left, Konieckicrinus brechinensis *n. gen. n. sp. (holotype); right,* Simcoecrinus mahalaki *n. gen. n. sp.,*

CALENDAR OF EVENTS,

June,

Tuesday June 2, FOSSIL MEETING 7:00 PM Virtual Meeting on Zoom. Dr. Ben Dattilo slide-show talk on "Revealing the Hidden Functions of Crinoid Columnals." Guests welcome, but must register.

July, August, September

Possible Field Trips & Picnic. These will be announced to members by email when they can be held again.

You can 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 March 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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Vice President/Program Chair: ***Open***		
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Director (one-year-term): Fred Haynes	585-203-1733	fred.patty.haynes@gmail.com
Director (three-year-term): ***Open***		
APPOINTED POSITIONS		
Field Trip Coordinator: Dan Krisher	585-293-9033	DLKFossil@gmail.com
FossiLetter Editor: Michael Grenier	585-671-8738	mgrenier@frontiernet.net

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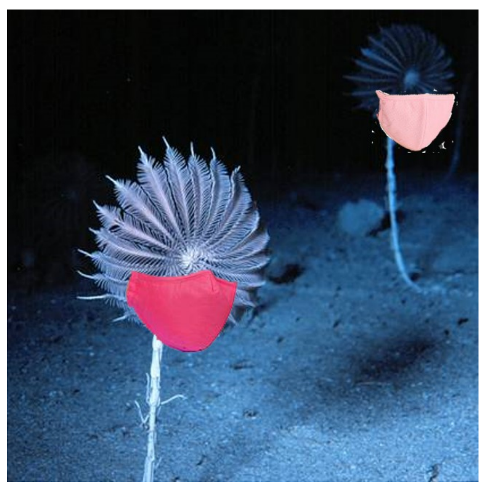
The FossiLetter is published before each meeting month of the year. Please send submissions to mgrenier@frontiernet.net or by U.S. Postal Service mail to 692 Maple Drive, Webster, NY 14580. Deadline for submissions to the Fossiletter is the 15th of the month., For scheduling changes and the latest updates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



New deep sea photo showing social distancing among crinoids