

The FOSSILETTER

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Number 3

December 2020

December Meeting

The December Fossil section meeting is on Tuesday, December 1, at 7:30 PM. This meeting will be conducted as a virtual meeting on Zoom. Details on how to login in to this Zoom Session are in the accompanying email.

Our speaker this month is Dr. D. Jeffrey Over of SUNY Geneseo. He will be speaking on “*Devonian Mass Extinctions in New York.*” Of the five major mass extinctions in the past 540 million years, only the Devonian and the end-Ordovician occur in New York’s rocks. The easily-found Devonian strata in New York actually contains evidence of two other significant mass extinctions.



Dr. Over provided this photo of himself visiting Geysir (the type geyser) in Iceland in 2017. He titles it “Geezer and Geysir.”

Dr. Over provides the following description of his talk. “The Devonian strata in New York contain three significant mass extinctions: the end-Eifelian in the Middle Devonian that is within the lower Hamilton Group in the Oatka Creek Formation; the end-Frasnian extinction that is considered one of the “Big Five” Phanerozoic extinctions, found within the Hanover Formation, and perhaps developed here better than any other place in the world; and the end-Devonian Hangenberg event, that occurs in the Catskill Formation. These

extinctions represent significant global changes that mark the Devonian as a dynamic time in the evolution of life on earth.”

AGE (Ma)	PERIOD	EPOCH	AGE	PICKS (Ma)	
360	DEVONIAN	LATE	FAMENNIAN	~358.9 #3	
380			FRASNIAN	~372.2 #2	
400		MIDDLE	GIVETIAN	~382.7	
			EIFELIAN	~387.7 #1	
420		EARLY	EMSIAN	~393.3	
			PRAGIAN	~407.6	
			LOCHKOVIAN	~410.8	
420			PRIDOLI	~419.2	~423.0

#1 Kačák Event end-Eifelian Age extinction
 #2 Kellwasser event end-Frasnian Age extinction
 #3 Hangenberg event end-Famennian Age extinction
 (Scale from GSA Geologic Time Scale, 2018; arrows and numbers in red added by editor)

The Kačák Event occurred close to the end of the Eifelian Age of the Middle Devonian Epoch. Evidence shows a global sea level rise with anoxic (no oxygen) waters, forming black shales in New York (and elsewhere). The end-Eifelian extinction is found in the Oatka Creek Formation, which overlies the Union Springs. The end-Eifelian extinction marks the demise of the Onondaga and Stony Hollow faunas that are replaced by the Hamilton Fauna. The Eifelian-Givetian boundary is in the East Berne Member in the lower part of the Oatka Creek Formation (lower Hamilton Group).

The Kellwasser events, two pulses of organic-rich strata and carbon isotope excursions coincide with the major marine extinction in the high Frasnian within the Upper Devonian epoch. The Kellwasser events are found in the upper Hanover Formation in NYS.

The Hangenberg event occurred at or just below the boundary between the Famennian (last age of the Devonian) and the start of the

Carboniferous period. Again, this event is marked by another layer of anoxic black shale. The extinction affected both marine and terrestrial environments.

Membership Renewal Time

Unless you are a Life Member, note that your membership will expire on December 31, 2020. Please renew your membership at your earliest convenience. A membership form is included with the newsletter and appears in the December RAS newsletter. You can also get one at rasny.org/mbform.pdf. Remember, on the form, you have to add the Rochester Academy of Science membership (\$10 individual/\$15 family) and Fossil Section membership (\$10 individual or family, \$5 student).

President's Report by Dan Krisher

The Section held its November Meeting on 11/10 due to election day on the 3rd. The speaker for the meeting was Danielle Dufault, a research assistant and scientific illustrator at the Royal Ontario Museum in Toronto. She spoke on artwork in the service of science and gave us a “behind the scenes” look at the process of creating anatomically correct illustrations of dinosaur and Burgess shale fossils for illustrations in scientific papers and in murals for ROM fossil displays.

The business portion of the meeting consisted of an update on future meetings which will be held remotely for the first half of 2021 and the announcement that the Science Olympiad if held, will also be remotely by the schools. The Section will not be providing a training session for this in March but will find a speaker instead.

Fred Haynes, our Science Olympiad coordinator sent the following report. “In past years the RAS Fossil Section has hosted a Fossil Night for the Middle School Science Olympiad program at our meeting immediately before their annual competition. This year’s competition is scheduled for Saturday March 6th, 2021. However, the organizers for the program have already determined that the ‘testing’ for all events, including Fossils, will be conducted online

with pictures and there will not be an in-person event with actual fossils to identify. In previous years, the competition has been conducted at St. John Fisher College. Given this prudent and proactive decision, RAS has decided it cannot, and should not, conduct its in person Fossil Night at our March 2nd regular meeting. We wish the Science Olympiad and all the students the best of luck with their online program.”

NO January Section Meeting

The Section will not hold a January meeting or issue a newsletter due to the holiday season. The next meeting will be Tuesday, February 2nd, 2020 on Zoom at 7:30 PM.

February 2nd Meeting



E.A. Willoughby

We are thrilled to have Ph.D. candidate Emily Willoughby join us (on Zoom, of course) to discuss her work with Mesozoic birds and feathered dinosaurs and the translation of the

science into life restoration art.



Balaur bondoc, by Emily Willoughby. This is a late Cretaceous basal avialan, the group that includes modern birds. Found in Romania and published in August 2010, Balaur had not just one but two large, retractable, sickle-shaped claws on each foot.

Turn Your Shopping into RAS \$\$\$

If holiday shopping at Amazon.com, please do it at their Smile Amazon site. If you set up RAS to benefit, Amazon will make a donation of part of the proceeds to the RAS, at no extra cost to you.

The gift purchases you make at Amazon will provide the extra gift of helping to support your Academy! To start, simply go to smile.amazon.com and sign up.

The Great Geysir

On page 1 Dr. Over pictures himself with “The Great Geysir” in southwestern Iceland. The English word geyser (a periodically spouting hot spring) derives from Geysir. The name Geysir itself comes from the Old Norse verb “geysa” (“to gush”). Although there are hot springs and steam vents elsewhere in Europe, this was the first geyser known to Europeans and the first to be scientifically described (1847, Robert Bunsen).



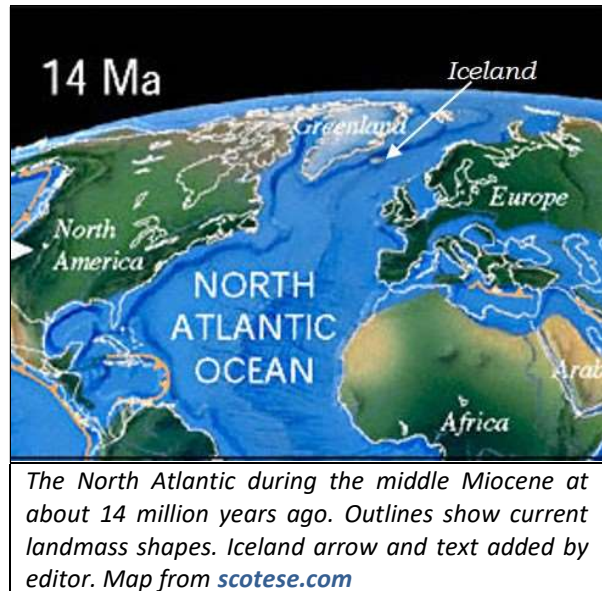
Eruptions at Geysir can hurl boiling water up to 70 meters (230 ft) in the air. However, eruptions may be infrequent, and have in the past stopped altogether for years at a time. Fifty meters south of Geysir in the Haukadalur valley is another, the Strokkur geyser.

Fossils in Iceland

There is more to see in Iceland than the Aurora Borealis, as Geysir shows, though the Aurora seems to be the top tourist draw. But what about fossils—the real reason we go anywhere? There should be no hope for those on a volcanic island. But there is.

The Iceland plume hotspot on the mid-Atlantic Ridge rift has been active for about 80 million years or so, with evidence of its volcanism found in Greenland (which moved over the hotspot between 70–40 million years ago (Ma)) and elsewhere. Iceland went from being an undersea volcanic sea mount to becoming an island above the sea about 15-18 Ma in the early Miocene.

The oldest fossils in Iceland are not much younger, being around 15 million years old and being mainly impressions of leaves, carbonized plant remains, pollen grains, compressed logs, and lignite coal, according to the Icelandic Institute of Natural History. Denk et al (2005) noted that the Miocene fossil plant material includes four ferns and fern allies, seven conifers, and about 40 species of flowering plants, including extinct species. The vegetation in four plant-bearing sedimentary formations from the late Mid Miocene to Late Miocene (12-6 Ma), is typical for a humid temperate broadleaved (deciduous)–coniferous mixed forest of that time. Changes reflect a shift from warm temperate (e.g., Magnolia, Sassafras, Rhododendron, beech, chestnut, elm) to cool temperate conditions from the late Mid Miocene to the latest Miocene.



Although there is convincing evidence that plants colonized Iceland both from North America and Europe until 12 Ma, migration in the younger formations appears to have occurred mainly from Europe. Both North America and Europe were closer to Iceland in the middle Miocene. Also, Iceland may have been connected to Europe by a land bridge—now the undersea Greenland–Scotland Transverse Ridge—or accessible via a chain of islands. A land bridge between proto-Iceland and North America is also likely.

Other finds from the Miocene include fossilized water fleas, several well-preserved insect fossils



Middle Miocene plant fossils including hazel, maple, and magnolia. Photo: Margrét Hallsdóttir

including one species of beetle, some aphids, and bionid March flies. There are also traces of insect activity on fossilized plant remains. Soils and lake-bed sedimentary layers formed after basalt flows and then were buried by subsequent flows, creating clay-rich siltstone and sandstone layers. The layers of volcanic rock can each be dated, bracketing the fossiliferous layers in time.

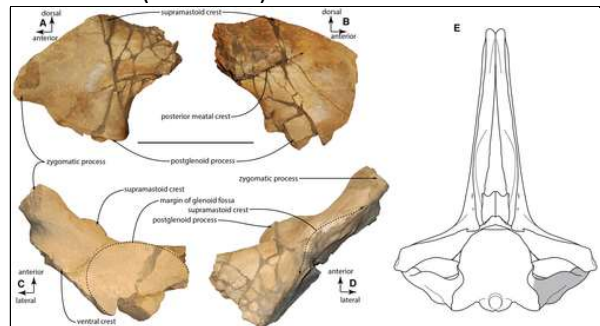
Today, many of the mollusc species are found only in warmer waters than those around Iceland. Around 80 shell species have been identified. The origins of just over 20 of these species can be traced to the Pacific Ocean due to the opening of the Bering Strait around 5 million years ago.



The fossils at Hallbjarnarstaðakambur

A few fossilized terrestrial mammal bones have been found in sedimentary layers from the Pliocene, including a pre-Ice Age deer. Marine mammal fossils are more common and an important site these are the strata on the Tjörnes peninsula in North Iceland. There are three main sequences, separated by lava beds useful in dating. These sedimentary beds give valuable information about the climate and the marine environment in the north Atlantic at the start of

the Ice Age. Molluscs, crustaceans, and foraminifers are the most common fossils in the lower Tjörnes sequence, but the fossilised remains of fish and marine mammals have also been found, including fossilized seal and walrus bones. In 2017, Field et al. published the first Icelandic fossil whale, a partial skull from a large right whale, found in situ from the Pliocene Tjörnes Formation (c. 4.5 Ma).



Partial skull of Eubalaena sp., IMNH 9598. A, medial view. B, lateral view. C, ventral view. D, dorsal view. E, reconstruction. Scale bar represents 50 cm. (From Field et al. 2017, fig. 2.)

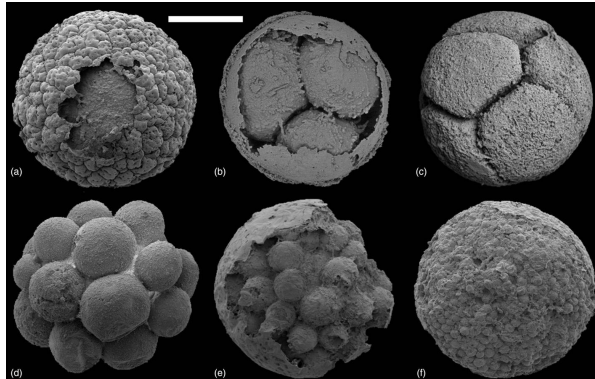
Many of these fossils are to be found in the Icelandic Institute of Natural History (Náttúrufræðistofnun) just 12 km south of Reykjavík.

Fossil News

The Ediacaran period (635–541 Ma) was a time of major environmental change, accompanied by a transition from a microbial world to the animal world we know today. Multicellular, macroscopic organisms preserved as casts and molds in Ediacaran siliciclastic rocks are preserved worldwide and provide snapshots of early organismal, including animal, evolution. (from Willman et al 2020.)

When Shuhai Xiao et al. published their report in 1998 on the micro-fossils of the Ediacaran Doushantuo Formation, circa 570 – 609 Ma, it created quite a stir. The paper made four incredible claims. The first was that fossils of multi-cellular bilateral organisms had been found deep in the Ediacaran where never seen before. The second was that the fossils included single celled eggs and embryos of multicellular animals. The third was that a novel form of preservation was responsible, a form now referred to as

Doushantuo type preservation, involving cells being replaced by phosphate before they degrade. The fourth was that cell division in the eggs was perfectly preserved and embryonic development could be studied. Some or all of these claims were rejected by many scientists. Although more generally accepted now, there is still some opposition.

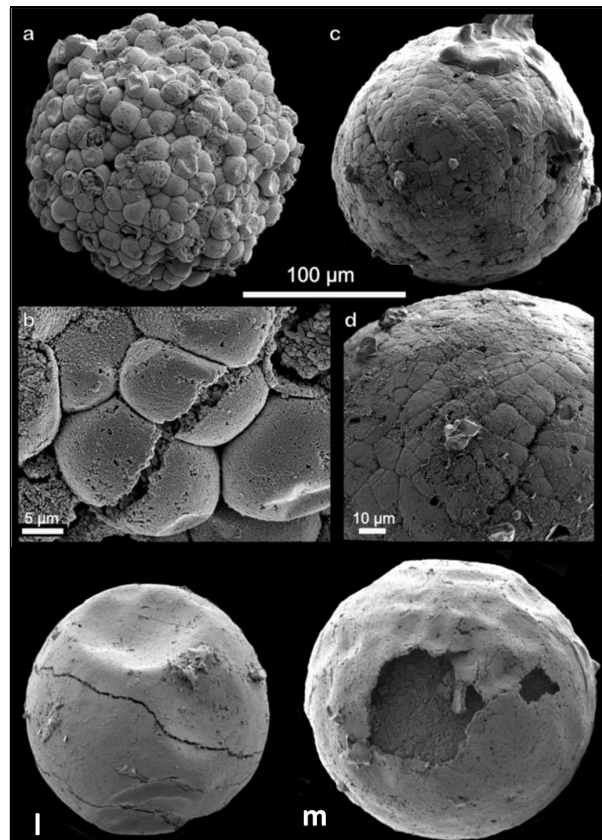


Cunningham et al. 2017. Fig. 2. Scanning electron microscope images of fossils from the Doushantuo Weng'an biota. (a–f) Tianzhusiania (a possible stem-animal) specimens at various stages of division from a single cell (a) to many hundreds of cells (f)

One point of opposition is that no other similar case in the Ediacaran had ever been found. However, just this November, a new study was published that reports on the finding of similar fossils with similar preservation from the Portfjeld Formation in the north of Greenland circa 560–570 Ma in the Ediacaran only a few million years younger than the Doushantuo fossils, but largely identical to those from China.

The authors report on a “Lagerstätte from Laurentia with phosphatized animal-like eggs, embryos, acritarchs, and cyanobacteria, the age of which is constrained by the Shuram–Wonoka anomaly (c. 570–560 Ma). The discovery of these Ediacaran microfossils from outside East Asia extends the distribution of the remarkable biota to a second palaeocontinent in the other hemisphere of the Ediacaran world, considerably expanding our understanding of the temporal and environmental distribution of organisms immediately prior to the Cambrian explosion.”

The author’s conclusion is that “The assemblage of extremely well-preserved microfossils presented here, and its striking similarity to previously described fossils from the Doushantuo



Willman et al 2020 Fig. 3 Putative eggs and embryos from the Portfjeld Formation. a–d Putative cleavage embryos. b, d Enlarged to show the detail of polygonal cell junctions. l, m Putative eggs showing various degrees of taphonomic degradation. m specimen is similar in many specimens and may therefore be interpreted as a biological feature rather than random breakage.

Formation of China, demonstrates greater complexity and worldwide distribution of the late Ediacaran ecosystem than previously recognized. The finds from North Greenland extend the known distribution of the Ediacaran Doushantuo-like biota along the length of the Pannotian palaeocontinent, from low to middle latitudes in the northern hemisphere (China) to the middle latitude position in the southern hemisphere occupied by North Greenland in eastern Laurentia; their age is confirmed by chemostratigraphy.”

Note: All papers referenced in this issue are available from the editor on request.

CALENDAR OF EVENTS

December

Tuesday December 1, FOSSIL MEETING 7:30 PM Virtual Meeting on Zoom. Speaker: Dr. D. Jeffrey Over of SUNY Geneseo on “Devonian Mass Extinctions in New York.” RAS members and guests welcome. Contact Michael Grenier at paleo@frontier.com.

January

NO MEETING

February

Tuesday February 2, FOSSIL MEETING 7:30 PM Virtual Meeting on Zoom. Speaker: RAS members and guests welcome. Contact Michael Grenier at paleo@frontier.com.

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 will be held on Zoom until at least February 2021. Meetings are held the first Tuesday of each month from October to December and from March to May at 7:30 pm. In person meetings, when they can be held again, are at the Brighton Town Hall, Community Meeting Room, 2300 Elmwood Avenue, Rochester, NY unless otherwise listed.

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The FossilLetter 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 FossilLetter 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.

