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Bulletin

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THE SOCIETY WAS INCORPORATED IN 1986
as a non-profit organization formed to:

1. Promote the science of palaeontology through study and education.
2. Make contributions to the science by: discovery; responsible collection; curation and display; education of the general public; preservation of palaeontological material for study and future generations.
3. Work with the professional and academic communities to aid in the preservation and understanding of Alberta's heritage.

MEMBERSHIP: Any person with a sincere interest in palaeontology is eligible to present their application for membership in the Society. Please enclose membership dues with your request for application.

Single membership $20.00 annually
Family or Institution $25.00 annually

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THE BULLETIN WILL BE PUBLISHED QUARTERLY: March, June, September and December. Deadline for submissions is the 15th of the month prior to publication. Material for the *Bulletin* should be sent to:

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Requests for missing *Bulletin* issues should be directed to the Editor. Send changes of contact information to the Membership Director.

Upcoming APS Meetings

Held in webinar format until further notice.

December 11, 2020—Georgia Hoffman, Alberta Palaeontological Society
The St. Mary River Formation and its fossils. See September *Bulletin*.

January 15, 2021—Eamon Drysdale, University of Calgary.
Understanding growth in the hadrosaur* Prosaurolophus maximus *from southwestern Alberta. See Page 3.

February 19, 2020—Dr. Jon Noad, Sedimental Services.
Adapting to life in the soup: The fauna of the Cretaceous Upper Chalk. See Page 4.

COVID-19 has affected our operations. Watch the APS website for updates!

ON THE COVER: From the 2020 field trip season, APS members examine an exposure of Upper Cambrian McKay Group rocks for trilobite fossils in the Bull Creek region of southeastern British Columbia. See story on Page 24. Photo by Keith Mychaluk.

Upcoming Events

January

Friday, January 15, 2021, 7:30 P.M.

WEBINAR—APS members will be notified by email how to register. Or visit **cspg.org**, navigate to ***Upcoming Events/Division E-talks/Palaeontology/*** and follow the instructions. **REGISTER EARLY! Registration ends at noon Thursday, January 14.** APS and CSPG members may register for free. Non-members will be charged $10.00 to participate. There are NO meetings at Mount Royal University until further notice.

Eamon Drysdale

University of Calgary

Understanding growth in the hadrosaur Prosaurolophus maximus *from southwestern Alberta*

Hadrosaurs, or duck-billed dinosaurs, are large herbivores that were present during the Late Cretaceous Period. Hadrosaurs can be divided into two sub-families: the lambeosaurines, or hollow-crested hadrosaurs, and the hadrosaurines, or solid or non-crested hadrosaurs, both of which have been found on almost every continent. This abundance of hadrosaurs has led to discoveries of specimens at almost every growth stage, making hadrosaurs an excellent group for studying dinosaur growth.

In this study we examine the changes that occur during growth in *Prosaurolophus maximus*, a hadrosaurine known from southern Alberta and northwestern Montana. This species is known for having a small bony crest located directly above the eye, which has been thought to have been used for sexual display. We examine three juvenile specimens of *P. maximus*, which represent the smallest known members of the species, using both morphometric and histological techniques, to better understand growth in this dinosaur species.

Fifteen skulls of *P. maximus*, including the three juvenile specimens, were examined using morphometric analyses to determine the rates at which bones in the skull change throughout growth. The results of these analyses indicate that the snout of *P. maximus* grew at a faster rate than the rest of the skull, which is a strong indicator that this area was used for sexual display. In contrast, the crest of *P. maximus* grew at the same rate as the rest of the skull, suggesting that this area was not strongly related to a display feature. With these results, we hypothesize that *P. maximus* had a soft-tissue display structure associated with the snout and that its bony crest was not strongly associated with sexual display, unlike what was previously thought.

Histological sections of the three juvenile specimens and one large specimen were taken in order to determine the biological age of those specimens. These biological ages were then compared with skull morphology in each specimen, to determine the developmental timing of the display structure present in *P. maximus*, and compared to tibial circumference of each specimen, a proxy for body mass, to create a growth curve for the species. The results of this analysis showed that the examined specimens ranged between the ages of three and seven when they died. When these ages were compared, it showed that the crest is poorly developed at age three, has started developing at age four, and is fully developed at age seven. Additionally, the large *P. maximus* individual that was examined had yet to reach skeletal maturity, suggesting the species may reach a maximum body size larger than represented by currently known specimens, perhaps with a skull length approaching the size of its relative *Saurolophus angustirostris*.

Finally, the reconstructed growth rate for *P. maximus* demonstrated that its growth rate is much lower than other hadrosaurines and is closer to that observed in lambeosaurines, suggesting that environmental differences or the complexity of display structures may play a larger role during growth than was previously thought.

Biography

Eamon Drysdale grew up in London, Ontario. He completed his undergraduate degree at the University of Western Ontario, where he completed an Honours Thesis project examining the mineralogy of Palaeozoic stromatoporoids under **Dr. Jisuo Jin** and **Dr. Roberta Flemming**. He then completed an M.Sc. in Geoscience at the University of Calgary under **Dr. Darla Zelenitsky** and **Dr. François Therrien** investigating the growth and development of the hadrosaur species *Prosaurolophus maximus* using three juvenile specimens from the Bearpaw Formation of southern Alberta. His current research interests focus on understanding the evolutionary factors influencing growth and sexual display in hadrosaurs.

February

Friday, February 19, 2021, 7:30 P.M.

WEBINAR—APS members will be notified by email how to register. Or visit **cspg.org**, navigate to ***Upcoming Events/Division E-talks/Palaeontology/*** and follow the instructions. **REGISTER EARLY! Registration ends at noon Thursday, February 18.** APS and CSPG members may register for free. Non-members will be charged $10.00 to participate. There are NO meetings at Mount Royal University until further notice.

Dr. Jon Noad

Sedimental Services

Adapting to life in the soup: The fauna of the Cretaceous Upper Chalk

Chalk seas covered much of the Late Cretaceous world and outcrop from the White Cliffs of Dover in the UK, one of the Earth's most famous geological landmarks, to as far as western Australia. Fossils are often perfectly preserved in the very fine grained sediment, providing an excellent opportunity to study their morphology. Little consideration has been given to the morphology of the living organisms and the various styles of preservation, and this talk will address these issues.

The stratigraphy of the Chalk has been refined in recent years and this talk will focus on the Upper Chalk or White Chalk. Chalk is composed primarily of coccolithophores, tiny circular discs formed as plankton disintegrate after death. These were deposited as thick, fluidized oozes in shallow warm seas, with little sediment input. Evidence of cyclicity in the sedimentation is demonstrated by the interbedded layers of flints, often representing casts of shrimp burrows. Common cemented hardgrounds were formed during pauses in sedimentation that may relate to relative sea level highs.

Figure 1. The White Cliffs of Dover, UK (photograph from Wikipedia, by Immanuel Giel, **https://en.wikipedia.org/wiki/Dover#/media/File:White_Cliffs_of_Dover_02.JPG**). Used under CC BY-SA 3.0 licence).

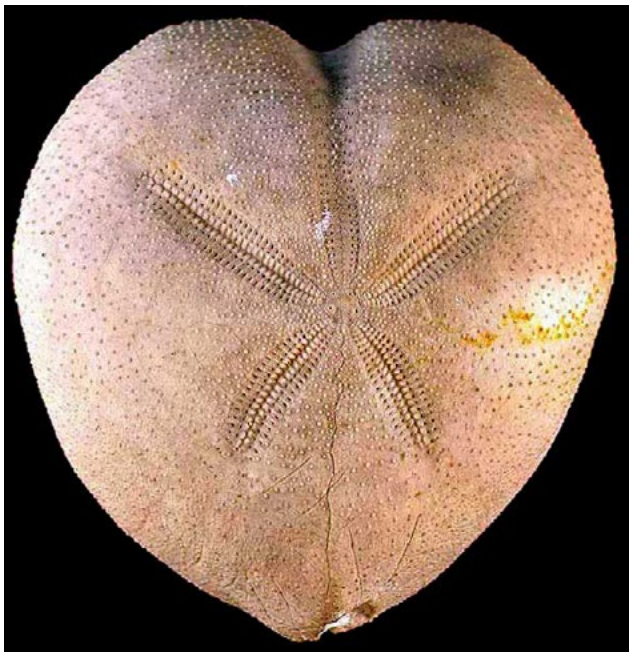

Figure 2. The sea urchin *Micraster* (photograph from the Natural History Museum, London, **https://www.nhm.ac.uk/our-science/data/echinoid-directory/taxa/specimen.jsp?id=1617**: Smith, A.B. & Kroh, A. (editor) 2011. The Echinoid Directory. World Wide Web electronic publication. **http://www.nhm.ac.uk/research-curation/projects/echinoid-directory** [accessed 2020-11-24]).

So what types of organisms colonized the soupy, thixotropic seabed? Many of the inhabitants appear to show adaptations to the soft conditions, with giant flattened bivalves acting like snowshoes. Other bivalves were covered with long spines that may have stopped them sinking into the substrate. The most abundant macrofauna were echinoids (sea urchins), including the heart shaped *Micraster*, which rapidly evolved as it perfected a lifestyle half buried in the sediment. Other echinoderms, such as the domed *Echinocorys*, also seem to have adapted to life within the soup. Their tests are commonly colonized after death, suggesting periodical scouring of the seabed.

There was also a rich pelagic fauna living in the water column. Ammonites and squid-like belemnites squirted water as a form of jet propulsion, while some sea lilies abandoned the seafloor to live

a nomadic life in the water column. Vertebrates include fossil fish, a variety of sharks (mostly known only from their dentition due to their cartilaginous skeletons), and most notably marine reptiles that include the fearsome mosasaurs. One gigantic specimen from Maastricht was so famous that it even had a beer named after it.

A wealth of often contrasting evidence will be presented to suggest that many of the benthic organisms evolved odd morphological features specifically to cope with the unusually fluidized seabed, and the audience will be left to make up their own minds as to whether this was the case.

Biography:

Jon Noad graduated from Imperial College, London in 1985 and moved to South Africa to work on gold and platinum mines. He re- turned to the UK in 1990 becoming a marine geologist laying submarine cables. A Masters in Sedimentology at evening classes was followed by a Ph.D. based in Borneo, leading to a job exploring for oil in the Middle East with Shell. In 2006 Jon moved to Canada and roles as Frontier Team Lead (Shell Canada), Exploration Manager (Murphy Oil) and Senior Geologist (Husky Energy) followed. In 2016 he set up Sedimental Services to teach industry classes in field geology, core and classroom courses, and taught students at the U of A and MRU. He joined Gran Tierra in 2018. In his spare time Jon likes running, wildlife photography, travel and hot curries. ❑

APS Events Cancelled

We regret that the ongoing COVID-19 pandemic has forced us to cancel more of our customary events.

Annual Symposium: Paleo 2021
Normally held in March at Mount Royal University (MRU), has been cancelled.

Monthly General Meetings
Normally held at MRU. Monthly talks are being conducted as online webinars until further notice. See instructions for individual talks.

Microfossil Sorting
Sessions normally held at MRU on Saturday afternoons during the winter months, are cancelled until further notice.

Les Adler donates photo collection

APS would like to thank Life Member **Les Adler**, who recently donated his large collection of approximately 120 photo albums to the Society's archives. Members of the Executive have gone through the albums to select photos that are relevant to the history of APS. This collection will form an invaluable historical record of APS events and personalities. Les recently downsized his well-known collections and has moved to an extended care residence in Calgary. We send our best regards to Les, hoping he is adjusting well to his new digs. We also thank Les' agent, **Mr. Charles Gallardo**, and **Mr. Leslie Fazekas** for facilitating the donation. ❑

Perennially lucky APS Life Member **Les Adler** survives two narrow scrapes with the jaws of death! Photos from the Adler photo archive.

www.albertapaleo.org

A Magical Newfoundland Tour

Featuring palaeontology, geology, geography, archaeology and more.
Part 3: Avalon Peninsula.

Article and photos (unless otherwise noted) by Pete Truch.

"You have to take off your shoes and only walk around in stocking feet so your body oils don't get absorbed by the surface." Instructions from our guide, as I was about to step out onto the surface of what was to be a truly remarkable experience and the palaeontological highlight of Newfoundland. It was so unique in fact that Sir David Attenborough would be seen a few years later stepping where I had already stepped! And so the uniqueness of the Island experience reached its crescendo as I took my first step: "That's one small step for a simple guy, but a giant leap in knowledge for mankind." (Many thanks Guy; and profound apologies to Neil!)

Figure 1. Harbour front and skyline of St. John's as seen from Signal Hill. The large building just to the left of centre is The Rooms Museum.

Stop Twenty-Five: St. John's

To my journal:

Thursday, August 7 (2008). Day #60
No rain A.M.
Cloudy/rain P.M., +14 ˚C

St. John's wears its old waterfront hat well [Figure 1], *especially considering it dates back to 1583 when Sir Humphery Gilbert claimed it for England.*

Map 1. The Avalon Peninsula, Newfoundland, showing stops on our tour (red numbers). Base map image from Google Maps.

Colourfully painted homes [Figure 3] *date to a tradition of foggy days where the bright colours would alert the returning fishermen that they were entering the right homes!*

We're visiting that St. John's associated effigy, Signal Hill and the iconic Cabot Tower [Figure 2]. *It was here at 12:30 P.M. on December 12, 1901 that Marconi, flying a kite at 150 m and aided with zinc sheets on the ground, clearly*

Figure 2. Construction of Cabot Tower started in 1897 to mark the 400th anniversary of John Cabot's landing.

distinguished the three dots of the Morse code letter S being sent on radio waves 3,468 km away in Poldhu, England. The scientific impossibility (it was two years later that the ionosphere was actually verified—an investigation likely arising from Marconi's impossible feat), giving Nova Scotia's Glace Bay a new economy: the transmission towers of the Marconi company.

Glace Bay instead of St. John's came about due to the issuance of legal action started by the trans-Atlantic cable company, Anglo American, which fought Marconi's attempts to build anything in Newfoundland. (Anglo American owned the first trans-Atlantic cable which connected Heart's Content with Europe in 1866—they obviously wanted no competition!)

I assumed that Marconi's radio experiment was where Signal Hill got its name from—wrong! It was called Signal Hill 200 years earlier. It was a battlefield fort (last battle of the Seven Years War was fought here in 1762) that changed hands from English to French to English to French to English to French until the 1713 Treaty of Utrecht, which made it British again. The Cabot Tower was actually built to commemorate the 400th anniversary of John Cabot's landing in Bonavista (refer to Part 2, Stop 18), so it was started in 1897 and finished in 1900. There are many beautiful views of the harbour, St. John's skyline and other features from this vantage point. Long exposed sea views gave lookouts ample warning of approaching ships.

It was also very interesting to read that a Henry Shrapnel (1761 – 1842, of the same exploding shell name which he invented) served in the Royal Artillery here between 1780 and 1784.

The Cabot Tower has seen an average of 370 icebergs per year, but in 1983 – 1984, 2,200 bergs were sighted in St. John's [refer to Fly Over Greenland of Part 1 for more on bergs]. *I liked a quotation seen here as the wind picked up and it started to rain: "Winds can reach a velocity of 140 km/h at St. John's Airport, with gusts up to 200 km/h. Winds on Signal Hill and on open water are generally more severe."*

Good time for us to blow over and visit the Johnson Geo Centre to view great stuff, re: geology, as the Centre is built 6 m into the 570 million-year-old sandstone of Signal Hill. We see and touch and view 3.8 billion-year-old Ooviak gneiss from Labrador; see a piece of "blue box" anorthosite containing labradorite, which is labeled as approx. 1.8 billion years old [Figure 4]. *"Blue box" is another name for labradorite. We see beautiful folds of rock in Port au Port Bay at Black Point; see examples of metamorphic rock (sandstone to quartzite; mudstone to slate; and limestone to marble); see intrusive (cooled slowly underground = bigger crys-*

Figure 3. Brightly painted homes likely help in identification in deep snows, as well as foggy days!

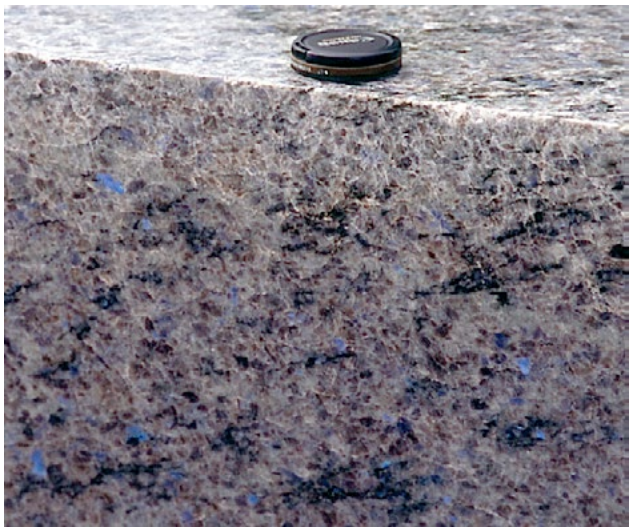

Figure 4. Nain anorthosite, a mid-Mesoproterozoic intrusive rock (1.29 to 1.35 billion years old) from Labrador. This is a polished slab; the blue sparkle is labradorescence, "blue box." Lens cap for scale.

tals); igneous = granite; pegmatite (a large-crystal granite); gabbro and diabase dykes; extrusive (cooled at the surface = smaller crystals) vesicular basalt; amygdaloidal basalt; rhyolite and volcanic breccia and much more on geology.

They also had a *Titanic* display where the J.P. Morgan White Line captain Edward J. Smith is depicted as an arrogant idiot who ignored all iceberg info that eventually led to the 76 m-long gash in the vessel's hull. The number of passengers on the *Titanic* was a fact new to me—it was only 2/3 full. This reminded me of our first "maiden" voyage on the *Star Princess* in February, 2002. Because of 9/11, it was also only about 2/3 full on its maiden voyage from Singapore to Los Angeles. Fortunately for us there were no icebergs to hit and instead we had a memorable 26-day cruise.

More on the local geology from **Harvey Negrich**'s great books (Neale, 1972, pp 16 – 17):

> Most of the city is built on black shales and interbedded sandstones of the St. John's Formation, the lowest stratigraphic unit of the Cabot Group. East of the harbour a prominent range of hills, including Signal Hill, consists of relatively resistant beds of sandstone and pebble conglomerate of the Signal Hill Formation. These beds form the western limb of an open syncline and reappear at Cape Spear, the most easterly point in North America.

Stop Twenty-Six: Heart's Content
Stop Twenty-Seven: Bay de Verde

From my journal:

. . . The 87-year-old from St. John's we just met tells us of a good authentic restaurant at French Cove, and thinks it's called "Hard Rock" or "Mad Rock" Café (the latter is correct).

We take Highway 75 to Victoria where we switch over to Highway 74 and see the Cable Station house at Heart's Content. Funny thing about these town names: Heart's Desire is close to Heart's Content, and also close to Dildo. Interesting that all three are together.

The trans-Atlantic cable was laid in 1866 after two failed attempts. Doreen asks why the station was here and not closer to St. John's—good question, one our guide can't answer. I suspect it was either politics or something to do with the currents and subsea basin. This was the same company who later gave Marconi a rough ride, as they wanted no competition.

We see many beautiful vistas of ocean [Figure 5] *right through to Grates Cove, where a hillside was blasted to provide harbour access. The nearby Bay de Verde ("Green Bay" in Spanish) is much prettier with its reddish/purple*

Figure 5. Turks Cove viewpoint.

Figure 6. Hawthorne Cottage in Brigus, home of Captain Bartlett, now a National Historic Site.

rock touching the sea bottom. Was someone colour blind? It is really quite beautiful and we see it again later at a long distance, from Flambo Head viewpoint.

The houses were built right into the cliffside, providing the quintessential view of many Newfoundland towns. We drive back along Highway 70 to Victoria and then to Carbonear . . .

At French Cove we later find the Mad Rock Café and share fish cakes (cod of course); touton (I have my fried bread with molasses); and fish brewis: fish, potatoes, onions, scrunchions (salt pork fried like squarky) and hard tack, all mixed together—delicious! Coffee & apple pie with soft ice cream topped it off. Great taste! Cash-only, please: $39 including a $5 tip (sounds cheap, but 10% in those days was the standard and this was more than 14%).

We catch the Blueberry Festival at Brigus (south of Carbonear). Great music, but the blueberry pie ($4/slice) had such a thin layer of filling, I thought it was just food colouring—tasted like it too. Must have been a bad year for berries.

Aside from the festival, the main claim to fame here is Hawthorne Cottage, built in 1830. A National Historic Site [Figure 6], it was the home of Captain Bartlett, who was the skipper for Robert E. Peary's expedition to the North Pole in 1909, as well as numerous other Arctic expeditions. A very interesting life!

A Revisit to Stop Twenty (Burin Peninsula)

Even though you've made plans and laid out an itinerary, at times such plans can and should change, with new information, especially if you don't know if you'll ever be back in an area. We were told at the Brigus Blueberry Festival about a great ferry trip from Bay L'Argent (Map 2) in the Burin Peninsula (Stop 20 in Part 2) to isolated communities like Rencontre East (Figure 11), so we detour back along winding coastal roads to the nearby Burin Peninsula. Near Swift Current, just east of Bay L'Argent, the landscape displays its glacial heritage (Figure 10) which continues through to Bay L'Argent and beyond to the isolated Rencontre East.

Map 2. Area of Stop 20, Burin Peninsula: Bay L'Argent to Recontre East. From Google Maps.

We overnight in Bay L'Argent (Figure 7) for the early morning ferry ride—so early, in fact, that we see a fishing boat getting ready to spend the day on the high seas (Figure 9). Next morning reveals itself as cloudy and a blistering 8°C. Funny how minds work when you're travelling. Good

Figure 7. An overnight spot close to the water to catch the ferry for the trip to isolated towns on the Burin Peninsula.

Figure 8. Doreen Truch, always prepared, puts the Mexican blanket to good use.

Figure 9. Fishing boat at Bay L'Argent, preparing for a good day's fishing.

Figure 10. Typical U-shaped glacial valley scoured out to join the ocean waters in the background. Gravels in the foreground may indicate a terminal moraine as the glacier retreated.

Figure 11. The seaside at low tide, surrounding the buildings including fishermens' shanties (exclusive members-only bars) that make up Rencontre East's quaint dockside.

thing Doreen's mind works differently than mine, as I thought she had lost it a bit when she had me barter for a thick Mexican blanket in 30 °C weather at an Acapulco market. Her foresight for a blanket (Figure 8) came to good use on this rather cool trip! To paraphrase Mark Twain: "The coldest winter I ever spent was a summer in Newfoundland." (He was, of course, referring to another locality: Duluth, Minnesota.)

We spend time ashore at Rencontre East exploring all this quaint fishing village has to offer. For those who value isolation, a more perfect setting would be hard to find. The return trip took us past scenery that again reflected the diversities that make up Newfoundland. We were both very pleased we had spent the time and didn't miss this particular excursion.

Figure 12. Cape Spear, the easternmost point in North America, with a cliff side view.

Back to St. John's (Stop Twenty-Five); Cape Spear (Stop 25a) and a fossil locality

We hit Cape Spear (Stop 25a) on Thursday, August 14. With superb luck it was a beautiful sunny day. At longitude 52°37′24″W, it is the most easterly point of land in North America (Figure 12), and site of the reappearance of the Signal Hill Formation in a large syncline. It was also a point fortified with a big gun during World War II (Figure 13).

One of the more unusual sights that day was a Sea King helicopter chasing a fishing boat. A local explained that someone must have reported shady activity to the Coast Guard who then dispatched the helicopter. Seizure of the boat, along with a hefty fine, was the likely outcome.

Humpbacks (Figure 14) kept us entertained for the rest of the afternoon as we managed to see a couple of breaches, though at quite a distance out in the bay. By a "fluke" we saw one dive near the shoreline.

My journal indicates it rained heavily every day after that for about a week. We did as many indoor activities as possible including visiting the Basilica of St. John the Baptist (Roman Catholic Church) built in 1841 of local stone and modeled after Italian churches. Beautiful stained glass windows and a false wood ceiling of decorated plaster, browned to look like wood and sprinkled with gold flecks, complete the interior.

Figure 13. An old relic of World War II (the gun, that is!)

We also visited The Rooms, a museum that features history and archaeology. They didn't want to compete with the Geocentre with its exhibits.

Figure 14. Humpback breach, seen from the shore. Talk about a cheap whale watching excursion!

There was also a lot of artwork on display. Especially intriguing was Graham Patterson's *Woodrow Saskatchewan*, a scale model of animated, decaying buildings—quite intriguing from the hockey game complete with animated video to a church with music and an organist; down to an old garbage dump. Very unique! The cafeteria's good food (cod, naturally) came complete with a superb view of St. John's Harbour.

Between downpours we found the Mile Zero marker of the Trans-Canada Highway at City Hall (Figure 16). Depends on which direction you are going, because we also found a Mile Zero marker in Victoria, BC. After some "tracking it down," we finally found the very small Terry Fox Memorial (Figure 15). Doreen stands taller than the monument. For what he accomplished, this memorial reflects the kind of attention he got in Newfoundland. It really goes to show where our values are at times—locals Brad Gushue and his Olympic gold medal curling team got a highway named after them; Terry—a small, hard-to-find monument.

Figure 15. The Terry Fox memorial.

We also toured the Railway Coastal Museum (Figure 17), a must for all who are railway buffs (it's good to have lots of interests). It also serves as the Mile Zero marker for people who are more ambitious and can walk the great distances of the Trans-Canada Trail. From my journal:

. . . the Reids were first to build a railroad in 1890 and ran it until 1923. They also ran a telegraph company, a ship service, a sawmill at Grand Falls and a dry dock in St. John's. They were the First Family of industry here. Their first train left Witbourne (Harbour Grace) on April 23, 1898 and got to Port aux Basques in June. Obviously speed was not of the essence! The Newfoundland Government ran the railroad from 1923 to 1949, when CNR took over. In 1965 the Trans-Canada Highway was completed, paralleling the rail line except at Gaff Topsails, where snow banks would normally be more than 2 m deep. The last train ran in 1988.

We also learn more about flags of Newfoundland. The current one was designed by Christopher Pratt [the painter] *and adopted on May 28, 1980. The rebellion flag (the vote to join Canada was unpopular with 48% of the population) had an interesting history. Woodcutters for the Protestant Church would mark their woodpiles with pink cloth. The rival Catholics would use green and they would fight over whose was whose. So both sides talked to Bishop Michael Fleming for reconciliation. He wisely tied a white flag of truce between the two, resulting in the green-white-pink tricolour!*

Figure 16. Mile Zero of the Trans-Canada Highway.

Figure 17. The provincial Railway Coastal Museum in St. John's.

Cod drying took part on wooden flakes or "bawas" over rocky beaches. The MV Caribou *we sailed on to get to Newfoundland was built in 1986. The original* SS Caribou*, built in 1925, was sunk by the Germans in 1942.*

. . . It finally quit raining, so we head out to Conception Bay South, find Red Bridge Road and locate several quarries I was told about. I find some interesting pieces, but I don't think I'm in the right place so we drive about 400 m further to the next pit. I find many more shells and cephalopods and lots of pyrite. But none of the trilobites I was told were here; however, there's lots of work to do with all I collected.

Stop Twenty-Eight: Witless Bay Ecological Reserve
Stop Twenty-Nine: Ferryland
Stop Thirty: Cape St. Mary's Ecological Reserve

To my Journal:

Sunny then cloudy (NO RAIN) +20˚C
Thursday, August 21 (2008). Day #74

We don't get very far—Witless Bay area in a tiny hamlet called Tors (also called Burnt Cove). It's a beautiful spot overlooking Witless Bay Ecological Reserve. I can make out what appears to be puffins from the motorhome's executive lounge as we are parked with such an incredible view [Figure 18]. *We are booked for O'Brian's Bay of Bulls tour tomorrow, so I look for rocks, fossils and shells on the beach and then relax, sipping Screech for the rest of the day. Kind of reminds me of doing the same in the Caribbean Island of Antigua (1997) after a day of archaeology digging; a new beach to wash away the dirt and collect shells; and then to the veranda (at Cobb's Cross overlooking the distant Nelson's Harbour and the more distant spewing volcano on Montserrat) for sipping Cavalier rum, on the rocks, of course . . .*

Beautiful blue sky day +25˚C
Friday, August 22 (2008). Day #75

Summer again and we're out on the O'Brian's tour boat looking at all the Witless Bay Ecological Reserve's islands of puffins [Figure 19] *and some 200,000 black-legged kittiwakes and other birds such as the great black-backed gull, cormorants, murres, and others like eagles—in other words, a potpourri of flying dinosaur descendants. Guano is everywhere. We are blessed with a close encounter with a humpback, at least the closest we've been to on this entire trip. The water was clear enough to see the whale swim completely under the boat from one side to the other. There are also beautiful views of the red layered sandstones that have been tilted in an uplift* [Figure 20].

Lunch is a super serving of cod and chips (what

Figure 18. Scenic Burnt Cove – view from our picnic table.

Figure 19. Atlantic puffin (*Fratercula arctica*).

Figure 20. Witless Bay Ecological Reserve red layered sandstone formation.

other fish than cod? The word "fish" in Newfoundland means cod). Doreen buys a bowl of fish chowder and blueberry desert which, with leftover cod and chips, will constitute supper. We had left the beautiful view of Burnt Cove and decided to stay at Ferryland, so we're off down Highway 10.

Lord Baltimore (George Calvert) was given the task of setting up a colony for England back in 1620. In 1621 Edward Wynn and eleven craftsmen set up the colony with brick from the ballast of ships and slate roofs and water wells so that by 1628 it was functional and occupied. It was a tough first winter and by 1637 all of Newfoundland was given to Sir David Kirke (and his wife Sara) and he took over the colony. He started charging for everything and accumulated a lot of wealth. However, being none too bright, he forgot to give the King his share, so was imprisoned for, in essence, tax evasion. His wife Sara took over, becoming the New World's first lady entrepreneur.

The forge, completed in 1622, was recently excavated by archaeologist Dr. Tuck (there are now eight books on the digs, written by him). The colony occupied four acres, with sheep and cows; it was contained within a 2 m tall colonnade of wood and a battle moat. This didn't stop the French, who invaded with seven war ships and 700 men (the colony had only 150) under the French Governor, de Broullion. Kirke had renamed the Avalon the Pool Plantation but the name of the town became Ferryland after the Portuguese map showing Farilham (Farelhao) which is "sheep island" (or rock).

A sword-and-scepter gold coin [Figure 21] *had just recently (June, 2008) been found here, near the main gate, as were many artifacts (a "tyg" mug—three-handled—passed around to share beer, because the water couldn't be trusted: a carryover from England; we bought a replica in the gift store). We toured the digs* [Figure 22], *still under excavation by Dr. Tuck (unfortunately we missed him, it being a weekend: he attended the site only Monday to Friday) and camped on the seashore beside the 1621 Colony of the Avalon.*

In chronological order, the "Cathedral of the Precambrian" (my phrase for what to me is the palaeo-highlight of Newfoundland: Mistaken Point)

Figure 21. Sword-and-scepter gold coin found in 2008. Gold is a very durable metal. It can lie buried for thousands of years, be dug up, cleaned and look like it was made yesterday.

Figure 22. Orderly archaeology – every building footprint is segregated. Despite the multitude of small pebbles, each one had to be hand-drawn *in situ* to complete the mapping.

Figure 23. Rare specimen of an Amphicar in St. Mary's.

was our next stop, but I'm saving those details as the last stop (#34) in Newfoundland.

In St. Mary's at Gibbon's Store we ran into an old James Bond (Sean Connery era) lookalike movie prop, an amphibious car, the only one in Newfoundland and one of only 150 left in the world of the 5,000 made (Figure 23). Maybe the rest sank. We passed Peter's Valley, which is so reminiscent of an Alberta setting. But quickly our minds were back in Newfoundland with scenes of St. Vincent's Beach.

Camping in Newfoundland ranged from the well-serviced areas in Western Newfoundland and Pippi Park in St. John's to ocean beaches, roadsides and quarries. When you take a four month journey in a small motor home, considerations have to be made for your spouse. I must be part Gypsy, as my home is wherever I happen to be. Doreen, on the other hand, needed the real home connection, so in Ancaster Ontario we had bought "Mrs. Biscus," a hibiscus that promptly bloomed and made Doreen feel right at home (Figure 25).

Then we plunged into the fogs, via the Highway through Cape St. Mary's Ecological Reserve (Stop Thirty). From my journal:

The gannets at the bird rock at St. Mary's are awesome. Too bad it's foggy and we can't see the whole area. The Ranger told me that it is usually foggy here: in July, twenty-eight days of the thirty-one were in heavy fog! It can be sunny in the rest of the province but foggy here. It's no wonder 20,000 birds make this the roosting area of choice. Gannets (I think these are Cape gannets, Morus capensis*), which mate for life—unless a better-looking one comes along—arrive here in March and leave in October; so with the prevailing fog* [Figure 26]*, the chicks have better protection from land and air predators and may even benefit from the prevention of overheating by the sun.*

Figure 24. Miniature constructions of Newfoundland on display just outside St. Mary's. Doreen Truch for scale.

Figure 25. Doreen has about 100 house plants in our Calgary home. In order to not miss them during our four months on the road, we added a hibiscus named "Mrs. Biscus" (which promptly flowered) to calm the separation anxiety.

Stop Thirty-One: Bellevue Beach

It rained a good part of the night. Fitting for this province. We have a very nice leisure day and walk at least a mile along the rocky beach to what I would call the "Siwash Rock of Bellevue Beach" [Figure 27]*. It reminds me so much of a Roy Henry Vickers print we have hanging in our family room, titled "The Elders Are Watching." The image contains one of those cleverly hidden faces painted in the Vancouver Siwash rock that is visible only from certain angles. But the legends grow from the realities of geology.*

Figure 26. St. Mary's gannet colony in fog. It is very difficult to see the darker coloured chicks.

From the Wikipedia article on Vancouver's Siwash Rock (Wikipedia, 2020c):

> About 32 million years ago, a volcanic dike formed in the sedimentary rock that forms the foundation of the park (sandstone and mudstone). Magma was forced to the surface through a fissure in the Earth's crust creating the basalt stack, which is more resistant to erosion than the softer sandstone cliffs. Siwash Rock is the only such sea stack in the Vancouver area.

Bellevue Beach's "Siwash Rock" might be volcanic as well, as per the following (Neale, 1972, p. 33):

> Conspicuously red rhyolite lavas of the Bull Arm Formation are exposed in the core of an anticline in the Doe Hills, a short distance east of the Bellevue Beach access road.

Figure 27. The "Siwash Rock" of Bellevue Beach.

Fog enshrouds the cliffs in the distance, creating a beautiful seaside scene. Igneous and metamorphic rocks of colours from purple to fluorescent greens add to the colours of the coastline and form the sources of the many, many rocks of the long beach. We walk and pick at leisure . . .

Wednesday, August 27, Day #80

So around the world in 80 days (on this trip so far, 12,390 km to date).

Stop Thirty-Two: Ship Harbour

Continuing from my journal:

The red fox was making his way down the virtual cow path of a "road" into the Atlantic Charter National Historic Site. He watched as we approached and stopped his forward progress. Then he went into the bush, but I had a couple of shots of him in the road. Driving the motorhome very slowly, I stopped at the point of his exit. He was calmly sitting beneath a tree [Figure 28] *and I snapped off a few more shots before he decided to leave.*

The Atlantic Charter was a Churchill-Roosevelt agreement signed on August 9, 1941 (the US had not yet entered the war) aboard the ship Augusta, *off the coast of Ship Harbour. We found the small memorial to this event, the foundations of which created the United Nations. We camp later in Argentia at the Sunset Park and watch a cow moose and her calf browse just across the "street" from us* [Figure 30]. *Nice way to wrap up a day!*

Stop Thirty-Three: Castle Hill and Placentia

Saturday, August 30. Day #83

We see Castle Hill [Figure 31], *the original French fort that was turned over to the British in the Treaty of Utrecht, 1713. The French moved on to Louisbourg in Nova Scotia and the British remained in Newfoundland. I remember speaking to seasonal actors at Fortress of Louisbourg (Nova Scotia) who*

Figure 28. Red fox, *Vulpes vulpes*.

Figure 29. Wet and foggy highway near Fox Harbour.

played period characters. One guard told me the actors were paid well, as all were part of the airline stewards/stewardesses union!

Then it's on to the archaeological dig of Fort Louis in the town of Placentia, followed by a visit to the War Museum. Townsfolk of Placentia paid with their homes—350 of them—in 1940/41 that were bulldozed for the US air/naval base that was built there. Newfoundland was still a British colony at that time. I find a few more fossils in cobbles in the park—compensation to me for the extra labradorite [Figure 43] *Doreen bought for our anniversary.*

And finally onto the highlight of Newfoundland palaeontology!

Stop Thirty-Four: Mistaken Point World Heritage Site

In stocking feet, I spot the first critter I want to try and get a picture of. It takes me a minute to calm down the excitement in order to be able to hold the camera steady enough.

So back to Mistaken Point, that "Holy Grail of the Edicaran" (my term). When I had taken my first University of Calgary geology course, the period before the Cambrian was simply called the "Precambrian" with little known about it. Exam questions were therefore easy to answer! This is what made the pending visit to this site so exciting for me—filling in a knowledge gap that had existed, at least for me, for the last 40 years or so. Just for the record, it's not the only knowledge gap I have.

Access by this point in time (2008) was by guided tour only. To get there requires the use of twisty Highway 10 (Figure 32) and a long walk in from the visitor centre. The local guide was very good and very protective of the area. She gave me the impression that this site was found fairly recently, about 6 or 7 years earlier (that would have made it around 2001/02). Trust the excellent guide books (Anderson, 1972, pp. 29 – 31) from Harvey to dispel that myth:

> Mistaken Point is a conspicuous, southeasterly directed headland 4.7 miles (7.5 km) west-southwest of Cape Race at the southeastern corner of the Avalon Peninsula. It is underlain by uppermost Conception Group strata . . .

Figure 30. Moose cow (*Alces alces*) near Placentia.

Figure 31. View of Placentia from Castle Hill National Historic Site.

Figure 32. With Highway 10 bordering the left side of the image, the surrounding coastline harbouring Mistaken Point reveals dipping slabs.

The Conception Group comprises a monotonous series of graded beds, the lower part of each consisting of fine to medium-grained greywacke and the upper part of argillite generally secondarily silicified, with intercalated tuffaceous beds . . .The graded beds are interpreted as turbidites laid down in a moderately deep-water marine environment. The tuffaceous beds, 2 to 60 cm thick, are light coloured yellow to pale greenish grey, finely laminated and strongly cleaved.

Fossils were first discovered in 1967 in the cliffs on the western side of Mistaken Point (Anderson and Misra, 1968; Misra 1969). There are three fossiliferous horizons at this original locality, one above the other within 10.4 m of strata (FH.1 to 3). Several other fossilerous horizons have since been discovered in the Conception Group sequence on this headland and elsewhere. The fossils are soft-bodied representative of multicellular organisms or metazoa, preserved as impressions or casts showing external features. They occur in large numbers on ripple-marked bedding surfaces of argillite, and wherever fossils are present the overlaying layer is tuffaceous. The fauna, including both benthonic and pelagic forms, thus owes its demise and preservation to burial beneath ash blown seaward during volcanic eruptions . . .

It has, so far, proved impossible to remove the fossils from the hard, much fractured argillite beds and, therefore, to obtain type specimens for naming. Consequently Misra (1969) in his account of the fauna, referred to them by their shapes. He recognized spindle-shaped, leaf-shaped, dendritic and medusoid (jelly-fish) types. More recent discoveries are of pectinate frond-like, star shaped and net-like forms. Not all of these types are, however, present at the original locality and various associations of types are found at different fossiliferous horizons. The following are the associations found at the original locality with the forms present listed in their order of abundance:

FH.1: Spindle-shaped, pectinate, and medusoid.
FH.2: Spindle-shaped, leaf-shape, medusoid, dendritic, net-like and star-shaped.
FH.3: Leaf-shaped, dendritic, and medusoid.

From my journal:

Sunny +22˚C
Saturday, August 23 (2008).
Day #76

I see a gull that Doreen first spotted yesterday with a scallop in his beak—I saw him drop it from some height onto rocks behind us, to break it open—this is not the action of a dumb critter! Glad he didn't bounce it off my head.

August 24, 79 AD, Mt. Vesuvius blows and buries Pompeii and Herculaneum, which we had the good fortune to explore back in 1997. One thousand nine hundred twenty nine years later, almost to the day, I'm looking at the Ediacaran Pompeii as the rare biota of approximately 565 mya was alive and living under the sea when a volcanic eruption buried and then preserved them in a spot today called Mistaken Point.

Figure 33. The tour group is small, limited to five of us and the guide. I asked Ned (the guy in the middle, walking with his hands behind his back), if he had ever been in prison, working on a chain gang. The question at least got a laugh. As he constantly walked in that stance, I thought he would fall flat on his face, but he never did.

Figure 34. Stocking-feet group on the fossiliferous bedding surface, in discussion with guide Julie (left). Beneath their feet is an incredible world!

Ages of the rocks range from 575 to 542 mya with 542 being the time of the "Cambrian Explosion" of biotic diversity. Soft-bodied animals did not preserve well, so very few fossils existed, giving rise to "Darwin's Dilemma," the fact that he could not explain the "explosion."

Walking with the guide, Julie, [Figure 33] *amid the red bunch berry (a member of the dogwood family) and looking for bakeapple and finding blueberries and many whimbrel (curlews around here) which migrate from the Arctic to South America, my thoughts are full of the expected fossils such as the "spindles" and the screw-like* Charniodiscus. *When we reach the slabs, it's off with the shoes—stocking feet only, to protect the slabs from our body oil* [Figure 34]. *I see a very detailed spindle that is so sharp. The light on the copper coloured rockface is just perfect for detailed shots—I can only hope they turn out well.*

*After exploring the surfaces for a while, and attempting to take as many pictures as possible, Julie heads us back. For me, seemingly all too soon. The Eastern Hyper-Oceanic Barrens are full of berries and in the ocean at least seven spouts all belonging to humpback whales (*Megaptera novaeangliae*) are seen. I think I also caught one diving.*

At the Centre, Julie makes me a photocopy of Chapter 3 from The Rise of Animals: Evolution and Diversification of the Kingdom Animalia [Fedonkin et al., 2007; my first introduction to the work of co-author and Ediacaran expert Guy Narbonne on this site]. *I read the photocopy before I finished this journal update. Too bad I didn't have it before I did the tour. I found out there are about thirty different types among the documented 6,000 fossils on the two big block faces exposed at Mistaken Point. U/Pb dating of zircons in the ash yields a date of 565 mya for the copper face slab* [Figure 35]. *This was deep under the sea in a dark, high-pressure environment. "Most specimens are rangeomorphs, which were composed of simple fractal branching patterns that allowed them to reach up to a metre in length. These organisms developed shortly after a large increase in oxygen levels about three million years prior."* [Fedonkin et al., 2007] *Absolutely fantastic. Well worth the 12,000 or so kms to get here!*

Partygoers at the one house near our beach spot start skeet shooting with shotguns, bringing us back to reality. Hopefully their aim isn't too influenced by Screech. The shooting stops at sundown and Doreen and I watch a beautiful sunset [Figure 42] *over the waters in front of the motor home, which thankfully shows no signs of pellet holes. Clear skies signal we're in for a cold night.*

As a followthrough, when I started writing this article twelve years after taking the trip, I did some research on what happened with the site between 2008 and 2020. It quickly became apparent that this article would have been a lot easier to write shortly after we completed the trip.

Dr. Guy Narbonne was a guest speaker at the 100th anniversary of the discovery of the Burgess Shale at a Banff conference, "The International Conference on the Cambrian Explosion, August 3 – 8, 2009," where I, and many other people had the great opportunity to meet and talk with him. He had studied the Mistaken Point fossils over the preceding 22 years and wrote the proposal to the UN to have this designated a World Heritage Site. He was successful in 2016. (In discovering this, I also saw that Jack Brink was equally successful in getting Writing On Stone Aisinai'pi in southern Alberta recognized as a World Heritage Site in 2019. I had lost track of his application in the summer of 2019 when I was hospitalized, so I want to pass on our congratulations to him.)

When checking out Dr. Guy Narbonne's Queens University (Kingston) website (**https://www.queensu.ca/research/features/ediacaran-educators-story-**

mistaken-point), I noted he has a clip of Sir David Attenborough on the same slabs I had walked on in 2008. Nice to finally get a jump on someone famous!

I have included a brief quote of Guy's original application to the UN. For the entire document, refer to the source, **http://whc.unesco.org/en/list**

Outstanding Universal Value
Brief synthesis

Mistaken Point is a globally significant Ediacaran fossil site almost entirely located within Mistaken Point Ecological Reserve on the south-eastern tip of the island of Newfoundland in eastern Canada. The 146-hectare property consists of a narrow, 17-kilometre-long strip of rugged naturally-eroding coastal cliffs, with an additional 74 hectares adjoining its landward margin designated as a buffer zone. The superbly exposed, 2-kilometre-thick rock sequence of deep marine origin at Mistaken Point dates to the middle Ediacaran Period (580 to 560 million years ago) and contains exquisitely preserved assemblages of the oldest abundant and diverse, large fossils known anywhere.

Figure 35. A wide variety of fossil shapes can be seen on this bedding surface next to the Atlantic waters. In the visitor centre, there was (in 2008) a display board with representative fossil photos together with an interpreted drawing of how each animal may have looked.

More than 10,000 fossil impressions, ranging from a few centimetres to nearly 2 metres in length, are readily visible for scientific study and supervised viewing along the coastline of Mistaken Point. These fossils illustrate a critical watershed in the early history of life on Earth: the appearance of large, biologically complex organisms, including the first ancestral animals. Most of the fossils are rangeomorphs, an extinct group of fractal organisms positioned near the base of animal evolution. These soft-bodied creatures lived on the deep-sea floor, and were buried and preserved in exceptional detail by influxes of volcanic ash—each layer of ash creating an "Ediacaran Pompeii." Modern erosion has exhumed more than 100 fossil sea-floor surfaces, ranging from small beds with single fossils to larger surfaces adorned with up to 4,500 megafossils. The animals died where they lived, and their resultant fossil assemblages preserve both the morphology of extinct groups of ancestral animals and the ecological structure of their ancient communities. Radiometric dating of the volcanic ash beds that directly overlie the fossil-bearing surfaces is providing a detailed chronology for 20 million years in the early evolution of complex life.

Criterion (VIII): Mistaken Point fossils constitute an outstanding record of a critical milestone in the history of life on Earth, "when life got big" after almost three billion years of microbe-dominated evolution. The fossils range in age from 580 to 560 million years, the longest continuous record of Ediacara-type megafossils anywhere, and predate by more than 40 million years the Cambrian explosion, being the oldest fossil evidence of ancestors of most modern animal groups. Mistaken Point contains the world's oldest-known examples of large, architecturally complex organisms, including soft-bodied, ancestral animals. Ecologically, Mistaken Point contains the oldest and most diverse examples of Ediacaran deep-sea communities in the world thus preserving rare insights into the ecology of these ancestral animals and the early colonization of the deep-sea floor. Other attributes contributing to the property's Outstanding Universal Value include the world's first examples of metazoan locomotion, exceptional potential for radiometric dating of the assemblages, and evidence for the role of ancient oxygen levels in the regional and global appearance of complex multicellular life.

And now the area and fossils themselves as they were photographed in 2008, with as much of an update on them as I could find. As described in Wikipedia (2020a):

Bradgatia linfordensis [Figure 41] is a bush-like Edicaran fossil. It consists of six or more fronds radiating from a central anchor point at the base. It resembles a squashed cabbage in appearance. When multiple fossils are found together they are regularly spaced out rather than randomly distributed. It dominates the ecosystem at 8 to 22 cm above the mud surface at the bottom of the sea where it grew. It was over-towered by *Charnia* and *Charniodiscus* which grew nearby.

Bradgatia has been found in Charnwood Forest in England, at Mistaken Point and Bonavista Peninsula in Newfoundland and also in British Columbia. These fossils are dated from 565 to 575 mya.

On the former "spindle," (Figures 37, 38) now *Fractofusus mistrai* (**http://www.ediacaran.org**):

Fractofusus, originally described as the "spindle organism" is one of the most common rangeomorphs in fossil assemblages from Newfoundland. Two species have been described, distinguished by their overall morphology and number of branches.

Figure 36. A "comb," or "pectinate," *Pectinifrons abyssalis* (lower left) and a "spindle" (*Fractofusus*; upper right).

Figure 37. A "spindle," *Fractofusus misrai* (left) and a "feather duster" (right).

Figure 38. Another "spindle," showing exquisite preservation of the finer structures.

Figure 39. A "key," *Charniodiscus procerus*.

Figure 40. A "pizza," classified today only by its pizza shape, it needs further study.

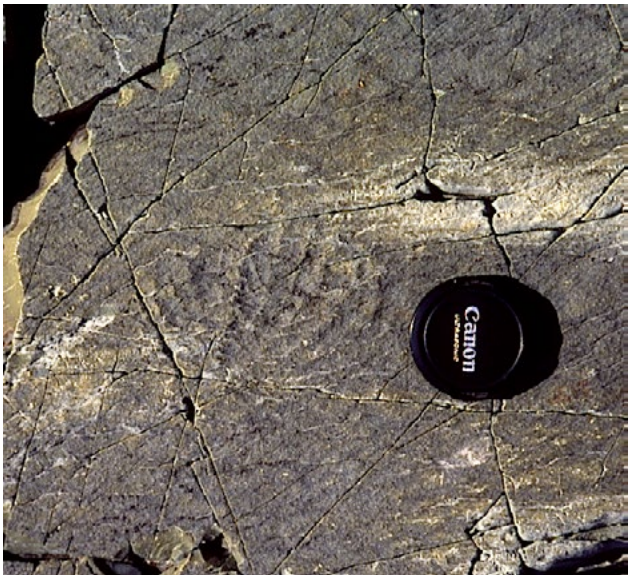

Figure 41. A "fan," now classified as *Bradgatia linfordensis*.

F. misrai and *F. andersoni* . . .

Fractofusus is considered to have lain flat on the seafloor in life. The suggestion has been made on the basis of the often excellent preservation of the lower surface of the specimens (suggesting they were already in contact with the sediment), and the lack of alignment of the fossils on bedding surfaces (which along with a lack of evidence of an anchoring structure suggests that *Fractofusus* was not elevated into the water column; Gehling & Narbonne, 2007).

From Wikipedia (2020b):

Charniodiscus [Figure 39] is an Edicaran fossil that in life was probably a stationary filter feeder that lived anchored to a sandy sea bed. The organism had a holdfast, stalk and frond. The holdfast was bulbous shaped, and the stalk was flexible. The frond was segmented and had a pointed tip. There were two growth forms: one with a short stem and a wide frond, and another with a long stalk, elevating a smaller frond about 50 centimetres (20 in) above the holdfast. While the organism superficially resembles the sea pens (cnidaria), it is probably not a crown-group animal.

Additional fossil sites to explore in Newfoundland that I was not aware of on the 2008 journey are as follows (**http://www.ediacaran.org**):

Additional key localities include Ferryland, where 1000s of discoidal fossils are preserved; and Spaniard's Bay, where one bedding plane in particular reveals spectacular preservation of juvenile rangeomorphs that are remarkably three-dimensional in their appearance.

Epilogue

At the end of any of our trips, my wife and I take some time to absorb our experiences and like to discuss them. Sometimes this is challenging, as I remember one time that we had only three hours on a plane from Sydney to Christchurch to go over three months worth of Australian experiences before we started into the upcoming month in New Zealand. At least with Newfoundland, we had the full day and later ferry ride (18 hours) back to the mainland to ponder our blessings. To my journal:

Cloudy (no rain) +16˚C
Monday, September 1 (2008). Day #85

The Joseph and Clara Smallwood *ferry is booked for a late night departure from Argentia. Another typical Newfoundland weather day. But overall, as discussed this morning, we wouldn't have missed this magical island experience that occupied our lives for almost two months since we first landed in Port aux Basques and did the traditional Tim Horton's thing. The people here are friendly, but I think a bit guarded and maybe feel like they have to fulfill a reputation of external friendliness. There is a "small-town-laid-back-pace" to the entire island population.*

The boat trips were extraordinary to landlubbers; seeing the icebergs, whales and avian populations, from Atlantic puffins to gannets, made me start to appreciate more and more the birds themselves—I now understand why people become birdwatchers. I also understand "we're on an island" limitations, even if it's a big island. We can only explore the areas between the ferries and need to rely on them to go further.

The geology/palaeontology here is superior in variety and abundance. Think about all the uniqueness of Gros Morne geology. And Palaeontology—how can I even begin, but to say I'd like to someday organize an expedition here, especially to walk on the Edicaran.

The archaeology—the Palaeoeskimo; the Beothuk; the historical English Colony of Avalon; the French (Castle Hill) and many others in between (Lance aux Meadows; Red Bay; Port au Choix) were superb. Two World Heritage Sites [note there are now four in total, as two more sites were added to the list since 2008]. *The climatology—seeing the effects of full glaciation: the Bay L'Argent; the erratic at the quarry site (Burnside); the coves and bays and fjords; the Barren Lands and other sites—wow, wow!*

The biogeography of six or so climatic zones was very unique and changed rapidly over short distances. Overall history—complete genocide of the Beothuk;

Figure 42. A metaphor for life, this beautiful sunset captures a moment on this magical island, near Mistaken Point.

Figure 43. Labradorite bracelet, a fitting reminder of this great travel experience.

denuding the Burin; the railway and Dr. Grenfell and the whole fishing industry; the fluorspar mine; the Churchill Falls/Quebec saga; and the history portrayed on postage stamps was great. Learning of the 52% acceptance to join Canada was a real eye-opener.

And then there was all the jewellery ranging from fluorite to the iconic labradorite [Figure 43]*, all of which, when Doreen wears them, become living reminders of our travel experiences. She has gathered samples from all over the world, from the fossilized dried tree saps (amber of course) of Finland to the opals of Australia.*

Boarding at 2:20 A.M. is not a lot of fun, but having the cabin #530 is a godsend. The bunk beds are hard but feel really good anyway. The ocean is smooth and we have a very nice crossing. The Smallwood *is a large vessel and we have not-bad meals on it. Having our thermos of coffee was great for the room wake up.*

We see a humpback breaching about two hours from docking at North Sydney, Nova Scotia—a fitting close to a super adventure! We dock at dusk: 7:30 P.M. Atlantic time and camp at Arm of Gold, Little Bras Dor. Our thoughts now turn to driving the Cabot Trail in the reverse order of last time; visiting Joggins [another Palaeo World Heritage Site which **Mona Trick** and **Vaclav Marsovsky** of APS did a "10-minute presentation" on]*; and seeing the fall colours from the Montreal Trestle in Agawa Canyon, but that will be a tale for another time.*

As I deal with life limitations imposed by ALS and a leaky heart valve, I chose to try and write these articles, rather than giving talks, which would likely have been painful to all. I thank Howard so much for all his fine work in presenting these to you, the reader, especially given what he had to work with. I hope you have enjoyed our sharing in a taste of all that Newfoundland offers, and wish that each of you will get to experience the magic of this place first hand. May you all walk on the Edicaran! ❑

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_____ 2020b. Charniodiscus. **https://en.wikipedia.org/wiki/Charniodiscus**

_____ 2020c. Siwash Rock. **https://en.wikipedia.org/wiki/Siwash_Rock**

Fossils in the News

Scientists find oldest fossil of a land animal. Small millipede-like arthropod lived in Silurian Scotland. **https://www.cbc.ca/news/technology/oldest-land-animal-1.5592917**

Bonavista Peninsula gets historic nod from UNESCO for 560-million-year-old fossils. Attention **Pete Truch**! More Ediacaran fossils protected at new Geopark. **https://www.cbc.ca/news/canada/newfoundland-labrador/bonavista-peninsula-geopark-discovery-1.5644201**

Huge new "shark toothed" dinosaur found. Cretaceous *Siamraptor* is from Thailand. **https://www.nationalgeographic.com/** [search "Siamraptor"]

More Fossils in the News on Page 37 ☞

Bull River Valley and Fernie British Columbia

Review of Field Trip 2020-3, August 15 – 16

Figure 1. APS members examine Upper Cambrian shale for trilobites. Photo by Henrietta Koning.

Bull River Valley Trilobites

By Keith Mychaluk

It is easy to start out a discussion of our 2020 field trip season on a negative note but I must admit our August trip to British Columbia was a great success. Yes, we had to postpone the first two planned trips (Green River, Wyoming and Devil's Coulee, Alberta) until 2021, but we had a great experience hunting for trilobites in the Bull River valley on Day 1 of our trip and enjoyed the pilgrimage to the giant ammonite near Fernie on Day 2. Luckily both sites afforded the opportunity to "physically distance" ourselves from one another so we could safely conduct the trip within recommended health guidelines.

On Saturday, August 15, we gathered at the Fort Steele Heritage Town parking lot in Fort Steele, B.C. We had just under ten participants, including a pair of enthusiastic young boys. Once again, our friend **Chris Jenkins** of Cranbrook, BC not only allowed access to his claimed trilobite localities but was our terrific guide and host for the day. We followed Chris in a caravan from Fort Steele for about an hour up the Bull River forestry road. About half of our crew had never been to this rugged and beautiful part of BC before and were treated to a great experience.

Unfortunately, **Tako** and **Henrietta Koning** did experience a major puncture causing a flat tire early in the day but our friendly group helped them change to their spare tire and accommodated them into other vehicles for the day. I can report they safely made it out of the mountains and to a tire shop after the trip. I personally love the challenge of driv-

Figure 2. The only misfortune of the day was a destroyed tire. Photo by Keith Mychaluk.

ing on mountain roads but this incident reminds one to be prepared for problems. Make sure your spare has proper air pressure and it cannot hurt to bring a portable air compressor or flat tire repair kit too.

After helping the Konings, Chris led us to three different sites where members were allowed to search for trilobites within the rocks of the McKay Group; a sequence of shales, limestones and dolostones deposited 494.5 – 493 million years ago during the Late Cambrian.

Chris (and his partner **Chris New**) truly are enlightened amateur palaeontologists and have allowed access to their sites not only to societies like ours, but also to scientists like **Dr. Brian Chatterton** of the University of Alberta. Dr. Chatterton has been studying and publishing on the trilobites of the McKay Group for decades and I am told (by Chris J.) that over 70 species of trilobites have now been identified from these rocks at fifteen distinct sites. For those interested in learning more about McKay Group trilobites I recommend an internet search of Dr. Chatterton's published works. Having visited many of these sites, I am personally fascinated with both the unique fossil preservation at each locality and the exquisite detail seen in these trilobites.

It is safe to say that everyone found and observed a large variety of trilobites including a few Chris Jenkins saved for further scientific analysis. This was our Society's fifth trip to the Bull River valley, attesting to the area's rich fossil heritage and I suspect we will visit the area again in the years ahead.

Fernie Area—The Giant Ammonite

By Tako Koning

When I read in the March, 2020 *Bulletin* that a field trip was being organized to visit trilobite beds in southeastern BC and a giant ammonite near Fernie, I immediately signed up my wife Henrietta and I to join the trip. Professionally I am a petroleum geologist but I have had a lifelong interest in fossils and the field of palaeontology. For example, 52 years ago, in the autumn of 1968, I was an 18-year-old second-year geology student at the University of Alberta and I was inspired to hitchhike by myself from Edmonton to Field, BC and I hiked up past the tree line to see the world-famous trilobites in the Burgess Shale.

My profession has resulted in our working and living for many years in various parts of the world. Lucky for me, my wife also enjoys looking for fossils, mainly since this provides opportunities to go

Figure 3. The mythical Fernie ammonite. Photo by Henrietta Koning.

on road trips and visit places "off the beaten path." Over the years we have looked for fossils in places like Sumatra, Indonesia, along the coast of Angola for Cretaceous ammonites and in the interior of Angola for Proterozoic algal stromatolites. We have also been to various fossil localities in Alberta and British Columbia, and have explored for fossils in the "badlands" of Saskatchewan and North and South Dakota.

The possibility to see a giant ammonite was very intriguing to me. Over the years, I had heard occasionally about this ammonite located somewhere in the mountains of southeastern BC but I never followed up on it. So, this field trip for me was simply an excellent opportunity!

Ahead of the field trip, I did some online research on the global occurrences of giant Late Jurassic-age ammonites. The ammonite near Fernie, which is Jurassic in age, is regarded as one of the largest in the world with its diameter of almost 1.5 m (5 feet). Only along the Dorset coast of England have comparable sized ammonites been discovered. Why some of the ammonites grew so large in the Late Jurassic remains a mystery. Certainly, the ammonites that lived later in the Cretaceous never reached a comparable size. And as most folk with an interest in palaeontology know, ammonites worldwide, along with the dinosaurs, failed to survive the mass extinction event at the end of the Cretaceous.

Figure 4. *Orygmaspis jenkinsi*, a Late Cambrian trilobite from the Bull River area. Length is approximately 13–15 mm. Photo courtesy of Chris Jenkins.

On Sunday morning, August 16, our small group of five met in downtown Fernie and drove southwards for about 5 km on Coal Creek Road to the starting point of the trail which is called "The Ammonite Trail" by those living in Fernie. One week before the field trip, Keith Mychaluk had sent an email to the participants which stated: "we will have to cross Coal Creek on foot to reach the start of the trail to the giant ammonite. Please bring rubber boots and, perhaps, a walking stick to help yourself across the river. We hope to have low water conditions." I brought neither rubber boots nor walking sticks. While crossing the river I slid on some water-covered slippery rocks and landed flat on my back, momentarily completely submerged beneath the water. So not an auspicious start to this hike, being completely soaked from top to bottom!

But thereafter the hike went well. The small trail goes westward and upward along a narrow creek valley. However, extensive very recent clear-cut logging has levelled parts of the creek bed and sometimes had us confused to as to where the trail continued. After about 45 minutes we were blown away to see the famous fossilized creature, the giant ammonite.

The history of this ammonite is that it lived, died and was buried some 150 million years ago. The rocks are from the Kootenay Group of latest Jurassic to earliest Cretaceous age. Then, 150 million years later in July, 1947 it was discovered by a crew of the British Columbia Geological Survey who were mapping coal outcrops in the area. Due to its size and shape, a student on the crew described it as a "fossilized truck tire." A few years later **Dr. Hans Frebold**, a palaeontologist with the Geological Survey of Canada, named the fossil *Titanites occidentalis* after the giant Jurassic ammonites found in Dorset, England.

While we were at the site of the ammonite, we discussed that with an increasing number of people from Fernie and elsewhere visiting it, a sign should be erected, perhaps by the British Columbia Geological Survey, explaining the history and significance of the ammonite. Also, the sign should ask people to not damage it, either accidentally or deliberately. We think there is a risk that it could be vandalized by someone with a hammer or spray paint. The ammonite is encased in very hard, indurated siltstone so it could not be removed without causing much damage to it. Also, we thought a plaster of Paris model or multiple models of it should be made as soon as possible, which would be a record of it while it is still undamaged. The models could be displayed in a museum in Fernie or elsewhere in BC and also at the Royal Tyrrell Museum in Drumheller.

For me, this ammonite was on my "bucket list" of fossil locations I have wanted to visit. Accordingly, I am most grateful for **Keith Mychaluk** and the Alberta Palaeontological Society for organizing this outstanding field trip. ❑

www.albertapaleo.org

Tyndall Stone

Hunting Ordovician Fossils in Downtown and Inner-City Calgary

Article and photos by Tako Koning

The Tyndall limestone is iconic building stone from the Late Ordovician (450 million years old) Red River Formation, at Garson Quarry, near the town of Tyndall, about 30 km northeast of Winnipeg, Manitoba. The Tyndall limestone, also known as Tyndall Stone, occurs within the Red River's Selkirk Member, which is 43 m thick (Coniglio, 1999). The Tyndall Stone is extracted from a 6 – 8 m thick interval within the lower part of the Selkirk Member (Pratt et al., 2016).

Tyndall Stone is used throughout Canada as an ornamental building stone. It is one of the most beautiful building stones in the world. In Ottawa the interior of the Parliament Building, Centre Block, the Confederation Hall and the Hall of Honour are clad in Tyndall. The exterior of the Museum of

Figure 1. The entrance to the Bank of Montreal Building (currently Goodlife Fitness) on the northeast corner of 1 Street and 8 Avenue SW, (Stephen Avenue Mall), the columns and façade are entirely Tyndall Stone.

Civilization in Gatineau, Quebec is clad in Tyndall. The exteriors of the Provincial Legislature buildings in Winnipeg and Regina are Tyndall. It clads the University of Alberta's Tory Building, the Rimrock Hotel in Banff, the Chateau Lake Louise and the Empress Hotel in Victoria, among many others.

The Tyndall limestone was deposited in a tropical, shallow marine environment. It is fine grained and cream coloured with pervasive mottling of darker dolomitic limestone. The highly distinctive mottled appearance is due to trace fossils known as *Thalassinoides,* which are fossilized burrows left behind by organisms, possibly worms and crustaceans such as mole shrimp, that burrowed through the soft lime mud during or just after its deposition. These organisms were soft-bodied, leaving no fossilized remains for palaeontologists to study. This adds to the enigma of the Tyndall Stone that to this day no one knows which organisms caused the extensive burrows and mottles in the Tyndall.

The Tyndall is highly fossiliferous at the locations described in this article. The fossils represent life that flourished on an ancient sea floor. A variety of fossils can be observed including nautiloids, gastropods, stromatoporoids, brachiopods, sponges, corals, and large—up to 25 cm diameter—circular "*Receptaculites*" (Figure 2; now referred to the genus *Fisherites*; **Dr. Brian Pratt**, pers. comm.) which is informally called "sunflower coral" even though it is not a coral. This fossil is an enigma for palaeontologists, having been assigned to various unrelated groups since its discovery. Relatively recently it was hypothesized to belong to a group of calcareous algae, but its true relationships remain a topic of speculation (Nitecki et al., 1999). Its skeleton is generally globular, though commonly squashed due to sediment compaction. Basically it comprises a hollow, double-walled spheroid, with inner and outer walls separated by a layer of closely spaced pillars (Figures 29 and 30). Diamond-shaped plates cap each end of a pillar and fit together in a mosaic, forming the inner and outer walls. The plates and pillars are arranged in a double spiral pattern, like the arrangement of seeds in a sunflower head—hence the common name "sunflower coral." The appearance of the fossil on surfaces of Tyndall Stone is quite variable (Figures 27, 28), depending on how it was cut.

Figure 2. "*Receptaculites,*" the misnamed "sunflower coral." The darker mottled features in the limy matrix, so characteristic of Tyndall Stone, are burrow traces known as *Thalassinoides.*

Nautiloids are cephalopods related to modern day squids or the shelled *Nautilus*. Nautiloids with straight shells are called **orthocones**, whereas those with curved shells are **cyrticones** (Teichert, 1964).

Downtown

On the north side of the classic art-deco style AGT (Alberta Government Telephones) Building at 119 6 Avenue SW, built in 1929, one can observe specimens of "*Receptaculites.*" *Thalassinoides* are well displayed there. The dolomitized traces are more resistant to weathering than the limestone matrix, so they are prominently etched on the surface of the blocks by almost a century of weakly acidic rain.

Ten-metre-tall Corinthian-style columns of Tyndall Stone grace the entrance of the heritage Bank of Montreal Building on the northeast corner of 1 Street and 8 Avenue SW, built in 1932 (Figure 1).

Similar style columns of Tyndall Stone can be seen at the entrance to the Centre for the Performing Arts, southeast corner of 1 Street and 8 Avenue SE. Built in 1930, it was originally called the Calgary Public Building. Both buildings are on the Stephen Avenue Mall.

Further west on 8 Avenue, between 3 and 4 Streets SW, the south-facing façade of the former Eaton's building is clad in Tyndall Stone (Figure 3). A block north of this, the Shoppers Drug Mart on the southeast corner of 7 Avenue and 3 Street SW has a more modern Tyndall Stone façade (Figure 6).

The front and west sides of the John J. Bowlen Building, formerly the Calgary Court House, at 620 7 Avenue SW, are Tyndall Stone (Figures 4 and 5).

The oldest Tyndall-clad building in Calgary is not downtown. Rather, it is the 109-year-old Canadian Imperial Bank of Commerce (CIBC) building in Inglewood, at 1230 9 Avenue SE which was built in 1911 and continues to function as a CIBC bank. There are many other Tyndall-clad buildings in downtown Calgary: keep your eyes peeled!

Figure 3. South-facing front of the former Eaton's building (currently Hy's Steakhouse), on 8 Avenue between 3 Street and 4 Street SW, entirely clad in Tyndall Stone.

Figure 4. Entrance to the John J. Bowlen Building, former Calgary Court House Building, 620 7 Ave. SW. Built in 1969, inaugurated by Premier Harry J. Strom. White blocks are Tyndall Stone.

Figure 5. John J. Bowlen Building. The west side is entirely clad in Tyndall Stone.

Figure 6. Shoppers Drug Mart, 7 Avenue and 3 Street SW. The façade surrounding the entrance is Tyndall Stone.

Kensington Safeway Store, Sunnyside

In front of the Safeway store in Sunnyside-Kensington (northeast corner of 10 Street and 3 Avenue NW), ten blocks of Tyndall Stone are present (Figure 9). The top dimensions of each block are about 1.0 m by 1.0 m and the depth is 0.5 m. These blocks allow the observer to study the fossils in 3 dimensions (top, front, sides and back).

For a palaeontologist or anyone interested in fossils, the blocks provide a unique opportunity since, by standing beside these blocks and looking down, you can imagine yourself snorkeling above and looking down through clear, warm water on the organisms which lived on or above the Late Ordovician sea floor, 450 million years ago.

Figure 7. Safeway; *Maclurina* gastropod. Dollar coin for scale.

Figure 8. Safeway; "*Receptaculites*." Dollar coin for scale.

Figure 9. Kensington Safeway. Blocks of Tyndall Stone are randomly placed on the plaza for use as benches.

Figure 10. Safeway; a large sponge, *Aulacopella*, and a straight-shelled (orthocone) nautiloid in the lower right corner. Dollar coin for scale.

Figure 11. Safeway; cross-section of a *Favosites*-like "honeycomb" tabulate coral head. Ruler is 15.7 cm long. See detail, Figure 11a (next page) and compare to Figure 15 at SAIT campus.

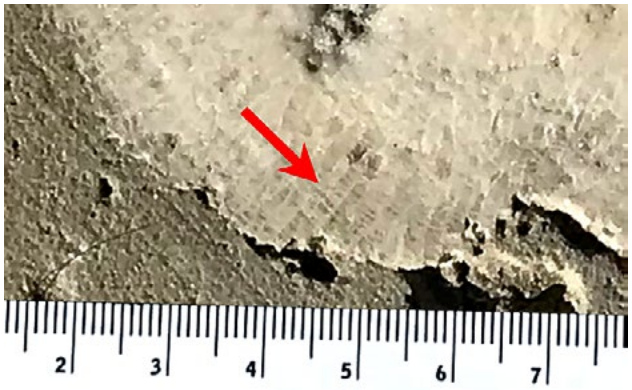

Figure 11a. Safeway; enlarged detail of Figure 11, showing coral tabulae and corallite walls (arrow). Scale in cm and mm.

Southern Alberta Institute of Technology (SAIT)

The best location in Calgary to view Tyndall Stone fossils is at the SAIT campus, south of 16 Avenue between 10 and 14 Streets NW. In the south-east corner four large buildings are covered by slabs of Tyndall Stone. These slabs are still relatively new so the texture is quite fresh and unweathered, allowing the fossils to be seen almost in their original state. There is nearly 0.9 km of continuous, accessible Tyndall exposure at SAIT, so you will see new specimens with repeated visits. It's best to visit with others to get the benefit of more eyes on the rocks and more opportunity for discussion.

Figure 12. Safeway; side of a block showing a laminated organic buildup, perhaps stromatoporoid and/or coral. Note how resistant burrows stand out in relief. Block is 0.5 m tall.

Figure 13. SAIT; north entrance to the Senator Patrick Burns Building which was built in 1967. The white columns are Tyndall Stone. The slabs have been subject to 53 years of weathering but show very little signs of deterioration, allowing the numerous fossils to be clearly viewed.

Figure 14. SAIT; This is the south side of the Senator Patrick Burns Building, entirely clad with white, fossiliferous Tyndall Stone.

Figure 15. SAIT; A "honeycomb" tabulate coral colony, probably *Trabeculites* or *Saffordophyllum*. Note the closely-set polygonal corallites.

Figure 16. SAIT; a gastropod (snail), cf. *Hormotoma* sp., height approximately 4 cm.

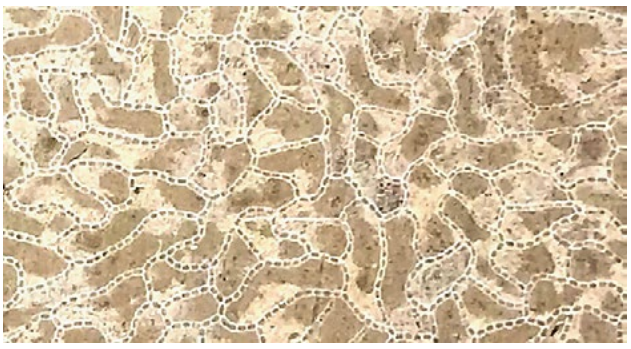

Figure 17. SAIT; top image shows a large tabulate coral colony, probably *Catenipora*, a "chain coral." Diameter approximately 40 cm. Lower image is an enlarged detail, showing the chain-like arrangement of the corallites in cross-section.

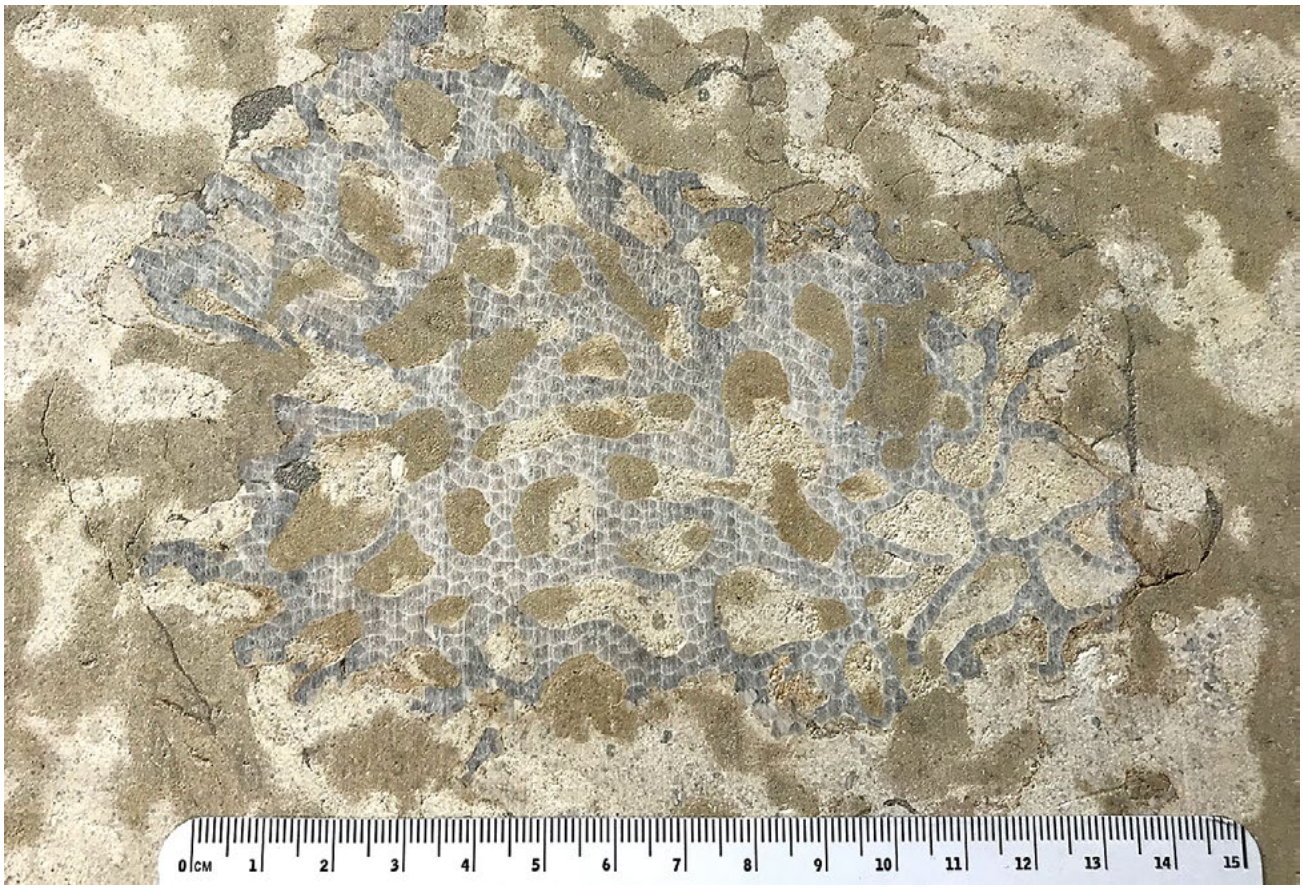

Figure 18. SAIT; Another tabulate "chain coral," this one probably *Manipora*, distinguished from *Catenipora*(?) (Figure 17) by the commonly double or triple-width "chains" of corallites.

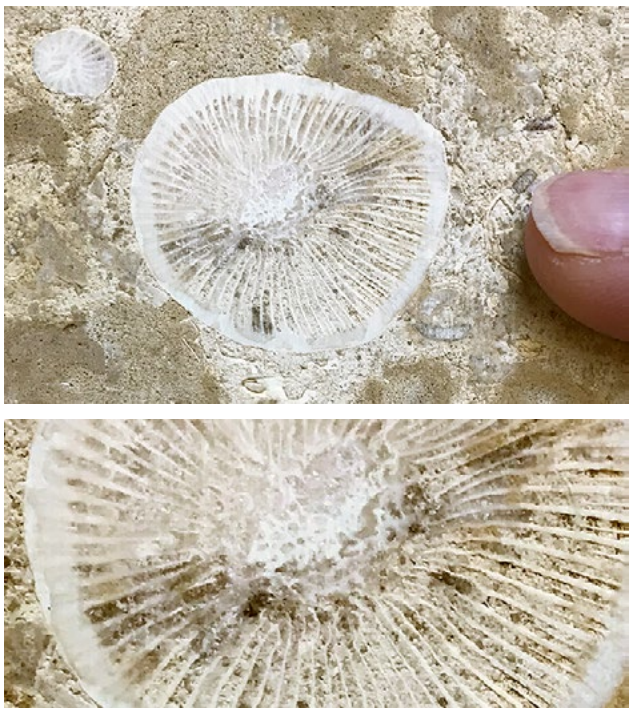

Figure 19. SAIT; two small, solitary rugose corals ("horn corals") in cross section. The smaller individual may be a different species, a younger specimen of the same species, or a mature specimen that was simply cut closer to the tip of the "horn." Lower image is an enlarged detail of the bigger specimen.

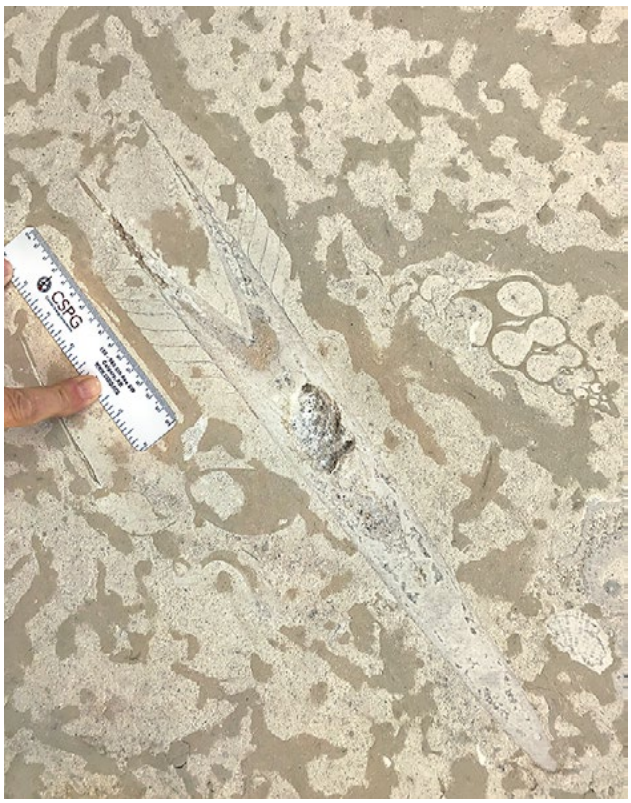

Figure 20. SAIT; a large orthocone nautiloid showing internal structures, length 48 cm. *Hormotoma* gastropod on right.

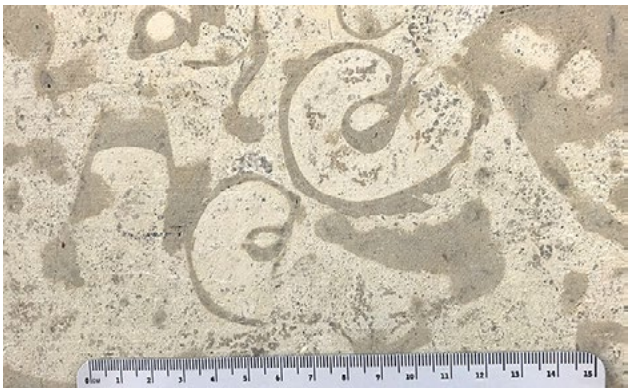

Figure 21. SAIT; a pair of gastropods, cf. *Hormotoma* sp.

Figure 23. SAIT; large orthocone nautiloid, length 50 cm.

Figure 25. SAIT; large, semi-circular (cyrtocone) nautiloid, similar to *Winnipegoceras*, length about 30 cm.

Figure 22. SAIT; large orthocone nautiloid, width 20 cm.

Figure 24. SAIT; "*Receptaculites,*" width 20 cm.

Figure 26. SAIT; "*Receptaculites*," width 15 cm.

Figure 27. SAIT; detail of Figure 24, "*Receptaculites*" cut at right-angles to the surface of the spheroidal skeleton, showing the pillars that separate the inner and outer walls. This is same fossil as Figure 28 but cut at a different angle.

Figure 28. SAIT; detail of Figure 2, "*Receptaculites*" cut nearly parallel to the surface of the spheroidal skeleton. Here the pillars separating the inner and outer wall are visible in cross-section, forming the characteristic "sunflower" pattern.

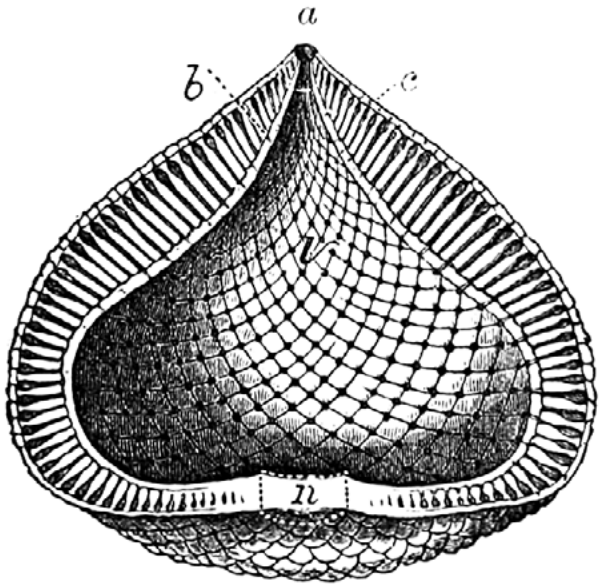

Figure 29. Reconstruction of "*Receptaculites*" from Billings, 1865 (his figure 373, p. 378). a = aperture, b = inner wall, c = outer wall, v = internal cavity. Note pillars (white) between inner and outer walls.

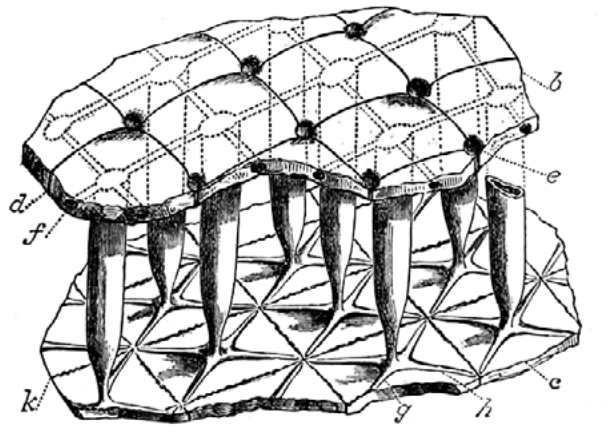

Figure 30. Reconstruction of the wall structure of "*Receptaculites*" from Billings, 1865 (his figure 357, p. 382). The important features to note are the inner (top) and outer walls, supported by pillars, characteristic of this fossil.

Figure 31. SAIT; A large *Maclurina* gastropod (snail).

Acknowledgements

This article is based on the guide to APS field trip 2020-4, held September 12, 2020. I was inspired to organize this trip when I read an article by APS member **Dr. Clint Tippett**, retired Shell Canada geologist and Past President of the Canadian Society of Petroleum Geologists (CSPG) in the CSPG *Reservoir* magazine, November/December 2018 issue. The article was titled *Geology in Your Neighborhood*, wherein he described various fossil localities in Calgary including the fossiliferous Tyndall Stone on the north side of the historic AGT building, downtown.

I owe a big thank-you to **Dr. Brian Pratt**, Professor of Geology at the University of Saskatchewan (Saskatoon), who was more than generous with his time and knowledge in many detailed email discussions, identifying fossils seen in the photographs.

Thanks also to APS member **Dan Quinsey**, author of the book *Moose Mountain, Alberta: Exploring the Natural History of Canyon Creek and Area* for his help with identifying fossils and for general advice. Furthermore, **Howard Allen**, Editor of the *Bulletin* was very helpful in significantly contributing to the text of this article and editing photos of the fossils.

In addition, I would like to recognize APS member **Dr. Les Eliuk**, retired Shell Canada geologist and carbonate specialist now living in Lunenburg, Nova Scotia, for his recommendation to me to check out the Tyndall Stone fossils at SAIT. I live in the community of Rosedale and live within six streets of SAIT. I have walked many times past the buildings mentioned herein but I had never noticed the many beautiful fossils on the sides of the buildings there. I have had a lifetime interest in palaeontology and have searched for fossils worldwide whenever the opportunity arose. I was flabbergasted to learn that, after having spent a half-century searching for fossils, the most interesting fossils I have discovered in the world are within one kilometre of my backyard!

About the Author

Tako Koning is Holland-born but Canada-raised and has over four decades of experience working as a geologist in the oil industry in Canada and in Indonesia, Nigeria and Angola. He has a B.Sc. in Geology (1971) from the University of Alberta and a B.A. in Economics (1981) from the University of Calgary. Tako is a registered Professional Geologist with the Association of Professional Engineers & Geoscientists of Alberta (APEGA). This is the first time he has led a field trip for APS. He gave a presentation to APS on *Algal Stromatolites: from Precambrian to Present Day* in April, 2019 at Mount Royal University.

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Fossils in the News

New fossil discovery suggests dinosaurs traveled across oceans. Cretaceous hadrosaur found in Morocco: how did it get there? Did they swim? **https://www.cnn.com/2020/11/05/world/dinosaur-ocean-crossing-intl-scli-scn/index.html**

Dinosaurs would have continued to thrive had it not been for the asteroid, researchers say. A dog-bites-man story: nothing new here, just more supporting evidence. **https://www.cnn.com/2020/11/18/world/dinosaur-extinction-intl-scli-gbr-scn/index.html**

The first flying dinosaurs were a failed evolutionary experiment. Membrane-winged dinosaurs found in China were a dead-end on the dino family tree, outcompeted by feathered dinosaurs. **https://www.newscientist.com/** [search "first flying dinosaurs"]

Doctors diagnose advanced cancer—in a dinosaur. A team including APS member **Darren Tanke** describe an Alberta centrosaur bone with osteosarcoma (bone cancer). **https://www.sciencemag.org/news/2020/08/doctors-diagnose-advanced-cancer-dinosaur**

A perfectly preserved Ice Age cave bear has been found in Russia—even its nose is intact. The headline says it all; photos included. **https://www.cnn.com/2020/09/14/europe/preserved-cave-bear-scn-scli-intl/index.html**

Mysterious Antarctic fossil identified as giant egg. 29 cm-long object from Late Cretaceous rocks was possibly layed by a large marine reptile. **https://www.cbc.ca/news/technology/giant-egg-antarctica-1.5619145**

[*Thanks to Phil Benham and Gilles Fournier.*] ❑

Cone-in-cone a Remarkable and Confounding Pseudofossil

From the Fossil Collection

By Howard Allen, Acting Curator

Figure 1. Largest fragment of the Kris and Megan Stanley donation. Note fine, horizontal growth lines on sides of cones. Width of view = 12.5 cm.

Periodically, members of the APS Executive receive email requests from the general public to identify fossils and other curiosities. One of the more frequent curiosities we're asked to explain are *cone-in-cone structures*, which are not uncommon in sedimentary rocks of all ages, but present a real brain-teaser for all who encounter them. To the layperson they seem to be obvious fossils, given their striking combination of features and their common occurrence in fossiliferous rocks. To us geologists cone-in-cone structures are familiar but frustrating because we're usually left in the uncomfortable position of grasping for an explanation that sounds convincing. The bottom line is, we don't really know why they form—just that they do, and they're not fossils.

If you read the literature on these things (Wikipedia is a good enough place to start) you'll find some common threads in the hypotheses for

Figure 2. Another fragment showing well-developed, intergrown cones. Width of view = 9.8 cm.

Figure 3. Side view of a broken fragment showing nested cones that give the structure its name. Width of view = 4.5 cm.

their origin. It's generally agreed that microscopic crystallization of minerals like calcite and gypsum under rock overburden pressure in very fine-grained sediments is responsible in the broadest sense, but ideas to explain the cone shapes and the nesting of the cones are less convincing. It's one of many things in geology that remain "a subject for further study."

When Calgarian and Newfoundland native **Kris Stanley** contacted us with photos of his specimens, I was gobsmacked at the quality of the specimens and delighted when he offered to donate them to the Society. On behalf of APS, I extend our thanks to **Kris and Megan Stanley** for their generosity. Kris says he collected them back in Newfoundland from an undisclosed locality that also produces trilobites. From this information it's safe to interpret that the rocks are Palaeozoic, and less safe to speculate that they're likely Cambrian or Ordovician in age

Figure 4. "Bottom" (actually the top; see footnote*) of a cluster of cones, showing concentric fractures marking the wide ends of nested cones. Width of view = 3.4 cm.

(for example, the APS collection includes a specimen of Ordovician trilobite trails from Bell Island, Newfoundland). The Stanley specimens will make a fine addition to the collection for educational purposes.

Feast your eyes on these images: you'll never see better examples of cone-in-cone structures in the field, in textbooks or on the Internet, simply because they don't get any better than this. These specimens clearly show all the features that characterize cone-in-cone structures:

- Well-developed cone shape.
- Cones forming overlapping or intergrown clusters with the cones all pointing the same direction (Figures 1, 2, 3).
- In cross-sectional view (Figure 3) the cones are seen to be nested or stacked, like a stack of paper cups; hence the name "cone-in-cone," which is often difficult to visualize in less than perfect examples.
- Closely-spaced, horizontal growth lines visible on the sides of the cones (Figures 1, 5), a result of incremental growth of the cones.
- Concentric, circular fractures on the bottom* (Figure 4) representing the wide ends of the nested cones.

Figure 5. Two loose cones popped out of the matrix. It's easy to see how these could be mistaken for fossil limpet shells or perhaps moulds of fish vertebrae. Not to scale: Left = 27 mm, right = 16 mm.

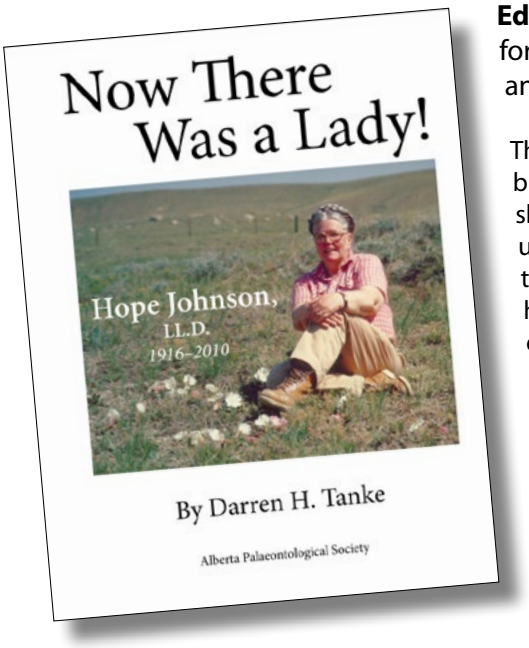
The matrix rock of these specimens is a dark grey shale, which is the most common lithology. They are found in our Alberta shale formations of almost any age, but seldom showing all the characteristic features that these specimens do so beautifully. Most often you will see vague, partial cone shapes in the rock, usually accompanied by the horizontal, parallel growth lines; they come in a range of sizes, from a few millimetres to tens of centimetres, perhaps bigger; the Stanley specimens are probably a little smaller than average. Cone-in-cone structures are also known to occur in claystones, ironstones, limestones and coal: the common denominator is very fine-grained sediment. Figure 5 shows that individual cones, popped out of their matrix, could be easily mistaken for fossil limpets with which they share only the outer cone shape. ❑

* Actually the top: human aesthetic bias prefers to see the cones pointing tip-up, like little volcanoes, limpets, or Christmas trees, which is why they're pictured wrong-way up here!

Now There Was a Lady!

Hope Johnson, LL.D. 1916–2010

By Darren H. Tanke



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The 2010 passing of Hope Johnson marked the end of an era for Alberta's vertebrate palaeontology communities. Her death affected other disciplines, too, as she travelled in many circles within the province for 65 years. How many among us can truly say they never knew her personally, saw her art work, or learned to identify Alberta prairie plants, or Late Cretaceous bones and teeth through her fossil identification books? During much of her middle and later life, and especially during the late 1950s to 1980s, Hope was a well-known and respected powerhouse in the Albertan amateur and professional vertebrate palaeontological communities. She was also heavily involved in the naturalist and visual arts communities as well as charitable organizations. This book focuses on her extensive activities in Alberta vertebrate palaeontology and provides examples of some of her fossil and botanical drawings and paintings.

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