Early Life Tour

Complied by Emily Bamforth

**1. The *Coelophysis*: A Very Early Dinosaur**

As you go up the stairs from the first floor, you’ll pass a mount of a very early dinosaur called***Coelophysis*** (pronounced ‘see-lo-fie-sis’). Having evolved in the Triassic period (250 – 200Ma) before the supercontinent Pangaea split up, *Coelophysis* is geographically widespread and appears to have been very successful as a small predator. Although the cast we have here is from New Mexico, early dinosaurs like *Coelophysis* can be found in Canada, in a province most visitors wouldn’t guess – Nova Scotia! The Triassic aged rocks around Parrsborro, Nova Scotia contain fragmentary fossils of very early dinosaurs including *Coelophysis* and the large prosauropod *Plateosaurus*.

***Cool things to point out about the Redpath’s specimen:***

–       Note there are a large amount of tiny bones inside the animal’s gut cavity. Analyses of these bones revealed that these were the remains of a baby *Coelophysis*, suggesting that these dinosaurs may have been cannibalistic!

–       Also note the way the head is curled over the back in the classic dinosaur ‘death pose’. This death pose is assumed after the animal dies, when the tendons along the neck desiccate and shrink, pulling the head back over the body.

**2. Fossil Trackways**

Much of what we know about early animal behavior comes, not from body fossils, but from trace fossils like trackways, footprints, burrows and feeding traces. The study of trace fossils is called**ichnology**, and is very important in understanding paleoecology and evolution. Much of the time, paleontologists don’t find the actual animal that makes a particular trace fossil, therefore the trace is categorized as an ‘ichnofossil’ and is given its own name.

***Cool things to note about the Redpath’s specimens:***

–       Two examples of ichnofossils are displayed on the largest block on the first landing: one is called *Climactichnites* (thought to be produced by a worm-like animal) and the other is called*Protichnities* (thought to be produced by a horseshoe crab-like animal).

–       As you climb the steps up to the Douglas fir, there is another trace fossil mounted on the wall to your left. This icnofossil represents one of the world’s oldest terrestrial trackways known, dating back 480-500 million years. This fossil (which is life-sized) was found in a quarry near Kingston, Ontario and is thought to have been made by an early arthropod called a euthycaconoid.

**3. Stromatolites**

For more than four billion years after the formation of Earth, the world was dominated by single-celled organisms. However, don’t go thinking that they were all tiny and microscopic! Some of the world’s oldest **Precambrian** (4000 -542Ma) fossils come in the form of stromatolites – structures built by microbes that could literally grow to be as tall as mountains! Amazingly, stromatolites can still be found in the world today, although they are typically limited to harsh environments like the hyper-saline (super salty) Shark Bay in eastern Australia.

‘Stromatolite’ means ‘layered rock’, and they only grow underwater. Stromatolites form when a sticky bacterial mat grows onto a hard substrate. This mat is then covered by a thin veneer or layer of mud. The bacteria then grow up through the muddy sediment to reform the bacterial mat, but are eventually covered by mud again. It is these cycles of bacterial mat and mud layers that give the structure its layered appearance.

***Cool things to note about the Redpath’s specimens:***

-In the case closest to the door of the Dawson gallery are some of the oldest stromatolites in the world. These stromatolites, which come from Australia, date back 4.35 billion years and represent the oldest macroscopic fossils known.

– On the other side of the same case, you’ll be able to see some more very old stromatolites from right here in Quebec. These fossils, which are an impressive 2.5 billion years old, come from near the town of Jovtel. Because we don’t know what species of bacteria created the stromatolites, these fossils are grouped and named based on their different forms. Paleontologists call these groups ‘form taxa’. The stromatolites from Jovel belong to a form taxa called *Conella*.

**4. The Ediacaran Biota**

About 580 million years ago, there came a critical point in the history of life when a world that had been dominated by single-celled organisms for four billion years suddenly discovered multicellularity. Although there are many theories as to what caused the sudden appearance of multicellular life, many paleontologists and geoscientists believe it had to do with the end of ‘Snowball Earth’ – a period in Earth’s history when it was so cold that glaciers spread down to and across the equator. The massive deglaciation that followed Snowball Earth may have caused a huge flux of oxygenated water into the oceans, thus triggering the evolution of multicellular life.

The **Ediacaran biota** (also sometimes called the ‘Vendozoa’) are an enigmatic group of soft-bodied fossils found worldwide. They represent a foray into the world’s first multicellular organisms. Most of these organisms were neither plant, nor fungi, nor animals, but a ‘failed experiment’ in Earth history.

**Cool things about the Redpath’s specimens:**

–       The oldest Ediacaran fossils, and therefore the **oldest complex multicellular life** on the planet, are found right here in Canada. **Mistaken Point, Newfoundland** is so important to paleontology that it is a candidate UNESCO World Heritage Site. Mistaken Point, which preserves hundreds of thousands of Ediacaran organisms in their life positions, has been called ‘the Ediacaran Pompeii’ – so called because the fossils are preserved under successive layers of fossilized volcanic ash.

–       McGill is one of the only universities in Canada to have a slab of Mistaken Point rock. This slab (the largest one in the case #4) displays some of the more enigmatic Ediacaran species, like the frond-like *Charnia* and the spindle-shaped *Fractofusus*. These organisms have no modern relatives, or even any modern analogues.

**5. The Burgess Shale**

One of Canada’s most well-known and internationally acclaimed fossil sites is the Burgess Shale, found on the flank of Burgess Pass in Yoho National Park, British Columbia. Fossils from this UNESCO World Heritage Site date back to the Cambrian period (520Ma), representing some of the **world’s oldest animals** preserved in exquisite detail. Although these weird and wonderful creatures may not look like anything in the oceans today, they are thought to be the very earliest ancestors of modern animal groups. The Burgess Shale’s famous ‘Walcott Quarry’ was discovered in 1909 by Charles Doolittle Walcott, and proved to be one of the most important paleontological finds of the twentieth century. The Burgess Shale fossils reshaped our understanding of the evolution of animals and, through the writings of Stephan Jay Gould and Simon Conway-Morris, changed the way the we think about evolution itself.

**Cool things about the Redpath’s specimens:**

-The Redpath Museum is exceptionally fortunate to have some of the very rare Burgess Shale collection. One of the most interesting fossils the Museum has is a claw from the large, early predatory arthropod, ***Anomalocaris***. The Redpath’s specimen looks like what the first fossil hunters found of the animal. Thinking that it looked like a weird kind of crustacean, paleontologists called it*Anomalocaris –*which literally means ‘strange shrimp’. Also found at the same time was a pineapple-shaped fossils interpreted to be a jellyfish, and a large sponge-like organism. It wasn’t until all three fossils were found in association that it was realized that these were all parts of the same animal – the ‘shrimp’ was a claw, the ‘pineapple’ was the camera-shutter mouth, and the ‘sponge’ was the body!

6. **Famous Canadian Fossil ‘Firsts’: Miguasha, Horton Bluff and Joggins**

Canada is a wonderful place to be a paleontologist! This country is home to no less than five UNESCO World Heritage sites that have been designated based on the importance of the fossils they contain. These sites are Dinosaur Provincial Park in Alberta, the Burgess Shale in British Columbia, Miguasha in Quebec, the Fossil Cliffs at Joggins in Nova Scotia, and Mistaken Point in Newfoundland. All of these sites, along with Horton Bluff, Nova Scotia and several others, are showcased in the Dawson Gallery. Be sure to encourage visitors to take the time to explore the amazing displays for themselves.

**Cool things about the Redpath’s displays:**

–       We have several excellent specimens from **Miguasha**, in the Gaspé region right here in Quebec. This site is one of the best places in the world to find fossils from the Silurian and Devonian periods (443 – 360Ma). These fossils include the world’s **oldest land plants** (see the display case which showcases the fossils), as well as some of the **world’s oldest tetrapods**. These fossils capture the point in the history of life when lobe-finned fish first started to move onto land to evolve into amphibians.

–       Horton Bluff, Nova Scotia is a great site to find some of the world’s earliest tetrapod footprints. These trace fossils, which are surprisingly large, date back to the Late Carboniferous (280Ma) and were probably made by some of the world’s oldest reptiles.

–       The Fossil Cliffs at Joggins is a site that is very near and dear to the Redpath Museum’s heart. It was here that the Museum’s founder, Sir John William Dawson, did much of his early geological work and fossil collecting. This site is home to the world’s oldest known amniote, *Hylonomus lyelii*, which was found in a fossilized tree stump. Dawson collected and named the specimen and brought it back to Montreal. This type specimen of *Hylonomus* lived in the museum’s collections until it was moved to the Natural History Museum in London in the 1960s.