THE MINERAL VEIN

Official Newsletter of

THE MINERAL SOCIETY OF MANITOBA

MARCH 2016

FEBRUARY PRESENTATION SUMMARY

By Marjorie Turton

We had the pleasure of having Kathryn Laponski present the Paleontology Highlights in Manitoba. She is in Industrial and Specialty Minerals at the Manitoba Geological Survey. She is a Sedimentary Geologist looking at the paleontology of Manitoba's amazing fossil finds.

She has had the good fortune to visit Churchill several times. The good fortune is due to the availability of so many fossils. The shore at Hudson Bay (including Churchill) has the imprint of ancient shores where the largest Trilobite fossil was found.

Manitoba has many diverse rocks. However the two areas under discussion were the Williston Basin and the Hudson Bay Basin (part of Superior Province). Within these, the main interest was sedimentary rocks. Here the fossils are found only in sedimentary rocks. Note that all vertebrate fossils belong to the province and under the Heritage Act one needs a permit to collect and/or own one.

Sedimentary rocks are only a thin veneer over a crust consisting mainly of igneous and metamorphic rocks. It is initially a thin veneer of loose sediment, and then, the rock is made as layers of this debris get compacted and cemented together. Sedimentary rocks are called secondary, because they are often the result of the accumulation of small pieces broken off of pre-existing rocks. These particles are transported to the place of deposition by water, wind, ice, mass movement, or glaciers.

Kathryn Laponski holding a fossilized cephalopod

The study of the sequence of sedimentary rock strata is the main source for scientific knowledge about the Earth's history, including paleogeography and the history of life. Manitoba's sedimentary rocks provide a picture of the series of mass extinction and rebound of life. Metamorphic and sedimentary rocks exist from Morden to Swan River in the province.

An extinction event is a widespread and rapid decrease in the amount of life on Earth. Such an event is identified by a sharp change in the diversity and abundance of multicellular organisms. It occurs when the rate of extinction increases with respect to the rate of speciation. **(Continued on page 3)**

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The Mineral Vein is published monthly from September to June.

Meetings are held on the first Wednesday of each month from September to May inclusive at the Manitoba Museum in room P47 on the Planetarium level. They begin at 7:30 PM and feature announcements, an invited speaker and a raffle. Members are encouraged to bring along any new, interesting specimens, or specimens appropriate to the speaker's topic.

Field Trips take place from May to September to interesting sites in Manitoba or neighbouring provinces and states.

Membership: A single membership is $15 while a family membership is $20. Memberships run from October to October.

Table of Contents

UPCOMING EVENTS

March 2, 2016: MSM regular monthly meeting begins at 7:30 p.m. at the Manitoba Museum. This meeting will feature guest speaker **Cornel Rock** who will be doing an interactive workshop on gold.

March 23 to 27: "A Taste of Tucson" Mineral Show by Jacobs Trading – Ye Olde Rock Shop, Brokenhead River Community Hall, 320 Veterans Lane, Beausejour.

April 6, 2016: MSM regular monthly meeting begins at 7:30 p.m. at the Manitoba Museum.
Speaker to be announced.

April 22, 2016: Earth Day—Manitoba Geological Survey Open House .

May 4, 2016: MSM regular monthly meeting begins at 7:30 p.m. at the Manitoba Museum.
Speaker to be announced.

Founded in 1971, the Mineral Society of Manitoba is dedicated to promoting the study of minerals, rocks and fossils for their scientific and recreational value.

The Mineral Society of Manitoba hosts monthly meetings covering a variety of mineral related topics. In addition, the Mineral Society organizes summer field trips to collecting localities, and hosts educational exhibits about minerals and fossils.

FEBRUARY PRESENTATION (CONT.)

Because the majority of diversity and biomass on Earth is microbial, and thus difficult to measure, recorded extinction events affect the easily observed, biologically complex component of the biosphere rather than the total diversity and abundance of life. That is why we look at a plentitude of fossils, their disappearance and when they are supplanted by other life forms.

The geologic history of the Earth is broken up into hierarchical chunks of time. From largest to smallest, this hierarchy includes eons, eras, periods, epochs, and ages. What is presented here dwelt on epochs, although some periods and epochs seem to be intermingled:

Holocene -11.7 Mya to present

Pleistocene – 2.59 to 11,700 Mya

Pliocene – 5.3 to 2.6 Mya

Miocene – 23 to 5.3 Mya

Oligocene – 33.9 to 23 Mya

Eocene – 55.8 to 33.9 Mya

Paleocene – 65.55.8 Mya

Cretaceous – 145.5 to 65.5 Mya Dinosaurs and other reptiles dominate; seed-bearing plants appear

Jurassic – 199.6 to 145.5 Mya Many seagoing reptiles; early large dinosaurs; later, flying reptiles (pterosaurs), earliest known birds Many seagoing reptiles; early large dinosaurs; later, flying reptiles (pterosaurs), earliest known birds

Triassic – 251 to199.6 Mya In the oceans are Ichthyosaurs, Modern corals, fish, and crocodilian appear

Permian – 299 to 251 Mya Marine life flourishes in warm shallow reefs; brachiopods, bivalves, all abundant. Permian-Triassic extinction event occurs, 251 Mya: 95% of life on Earth becomes extinct, including all trilobites, graptolites, and blastoids.

Carboniferous – 359.2 to 299 Mya Highest-ever atmospheric oxygen levels. Brachiopods, bivalves, and corals plentiful in the seas and oceans. First reptiles and coal forests, ferns, club trees, giant horsetails, etc. Maximum coal formation in swampy forests; insects, amphibians, reptiles; fishes, clams, crustaceans

Devonian – 416 to 359.2 Mya Trilobites and armoured agnates decline, while jawed fishes (placoderms, lobe-finned and ray-finned fish, and early sharks) rule the seas. Numerous fishes, other sea life; many plants, first trees; wingless insects

Silurian – 443 to 416 Mya First jawed fishes as well as many armoured jawless fish populate the seas Coral reefs; giant scorpions; first jawed fish

Ordovician – 488.3 to 443.7 Mya Invertebrates diversify into many new types (e.g., long straight-shelled cephalopods. Early corals, articulate brachiopods, bivalve s, nautiloids, trilobites, crinoids, starfish, etc. all common. Diverse marine life, including vertebrates; vascular plants

Cambrian – 542 to 488.3 Mya Major diversification of life occurs in the Cambrian explosion. Numerous fossils; most modern animal phyla appear. First chordates appear, along with a number of extinct, problematic phyla. Reef-building abundant; then vanish. Trilobites, priapulid worms, sponges, inarticulate brachiopods (unhinged lampshells), and numerous other animals Invertebrate sea life proliferating during this and the following period

Proterozoic – 2650 +- 150 Mya Oxygen build-up; multicelled organisms

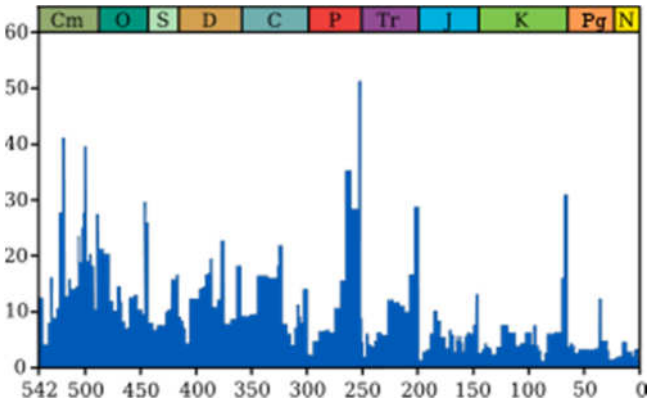
Archaean – even older Formation of oceans, atmosphere, and continents; bacteria

Mya = **million years ago**

FEBRUARY PRESENTATION (CONT.)

There have been many life extinction events since life evolved about 540 Million years ago. An extinction event is a widespread and rapid decrease in the amount of life on earth. Because the majority of diversity and biomass on Earth is microbial, and thus difficult to measure, recorded extinction events affect the easily observed, biologically complex component of the biosphere rather than the total diversity and abundance of life. Extinction occurs at an uneven rate. Marine fossils are mostly used to measure extinction rates because of their superior fossil record and stratigraphic range compared to land organisms.

The Great Oxygenation Event was probably the first major extinction event. Since the Cambrian five further major mass extinctions have occurred. The most recent and debatably best-known, the Cretaceous-Paleogene extinction event, which occurred approximately 66 million years ago (Ma), was a large-scale mass extinction of animal and plant species in a geologically short period of time. In addition to the five major mass extinctions, there are numerous minor ones as well and the ongoing mass-extinction caused by human activity is sometimes called the sixth extinction. After a mass extinction, life explodes in number as it invades all available niches.



Extinction intensity through the years

Manitoba's climate used to be tropical. Oceans levels were much higher. Most of North America would have been flooded. Manitoba's ancient life fossils are marine fossils. This is especially evident in the Williston and Hudson Bay basins.

In the Williston basin, 540 Mya, we have shallow waters with lots of evaporation, with some salt formation.

This becomes our Tindal stone or fossiliferous rock – coral, brachiopods, crinoids, etc. Paleozoic fossils contain fish, solitary corals, and giant birds with teeth, giant turtles, large bivalves and belemnite (squids used to study ocean changes similar to tree rings). Petrified logs were found at Souris. At Swan River, wave ripple marks are found cress crossing each other, indicting change in wave direction over time. Fish were bigger than present day sharks. There existed a large diversity of life. Many of the life forms were large, example Bruce the largest Mosasaur in Canada. Hudson Basin contains fantastic fossils. Metamorphic and sedimentary rocks exist from Morden to Swan River in the province.

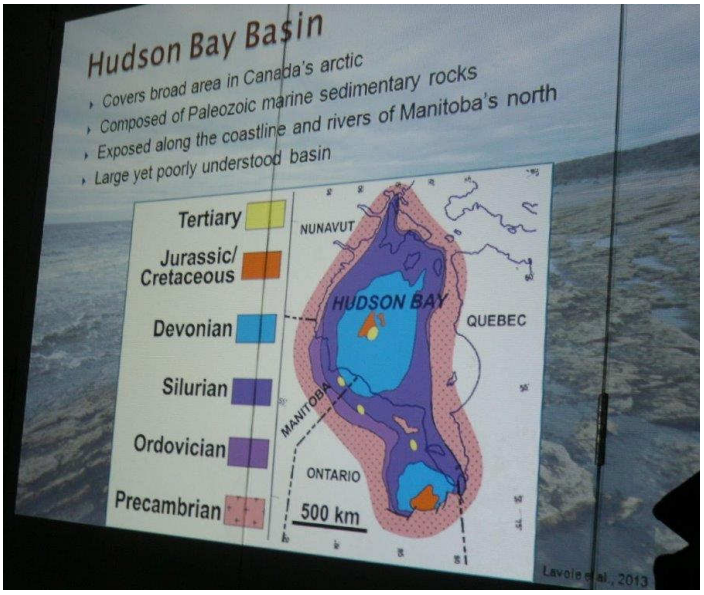
Diverse fossils samples from Manitoba

End of Ordovician period was the peak of diversification and continents were moving towards the North Pole. Ice glaciers started to form. The Hudson and Williston basins drained. Animals died off. It wasn't till the Silurian period before recovery began.

At the Red Head Rapids formation one can see the evidence of extinction. The Dolo-mudstone is devoid of fossils. That is the dark rock in the picture.

Peroxidation – high diversity – cephalopods, gastropods, trilobites, etc. Extinction – sea bed drop, no fossils, mud cracks, ripples, blue grey hard mud. Post extinction – bio recovery, water reappears, virgiana (brachiopods), coral.

The Hudson Bay rocky shore line is a unique preserved example of ancient shores with all the evidence of life that existed then.



Hudson Bay Basin stratigraphy

It is in the western provinces especially Manitoba that one can see some of the changes of geological time and the affected life forms. It is in the local rock formations that time expired can be determined. Sedimentary rocks are laid down in a horizontal manner, and that younger rock units are deposited on top of older rock units gives the idea that natural geologic processes were uniform in frequency and magnitude throughout time. However, because rocks were locally described by color, texture, or even smell, comparisons between rocks. Sequences of different areas were often not possible. Fossils provided the opportunity to correlate between geographically distinct areas. This contribution was possible because fossils are found over wide regions of the Earth's crust. We turn to William Smith, a surveyor, canal builder, and amateur geologist from England. In 1815 Smith produced a geologic map of England in which he successfully demonstrated the validity of the principle of faunal succession. This principle simply stated that fossils are found in rocks in a very definite order. This principle led others that followed to use fossils to define increments within a relative time scale.

From the study of sedimentary rocks with their accompanying fossils we find in Manitoba evidence of mass extinctions.

Ordovician – Silurian, caused by normal climate change, i.e. an ice age 443 million years ago, 85% of the species extinct, 3rd largest die off, it had 2 dying peaks.

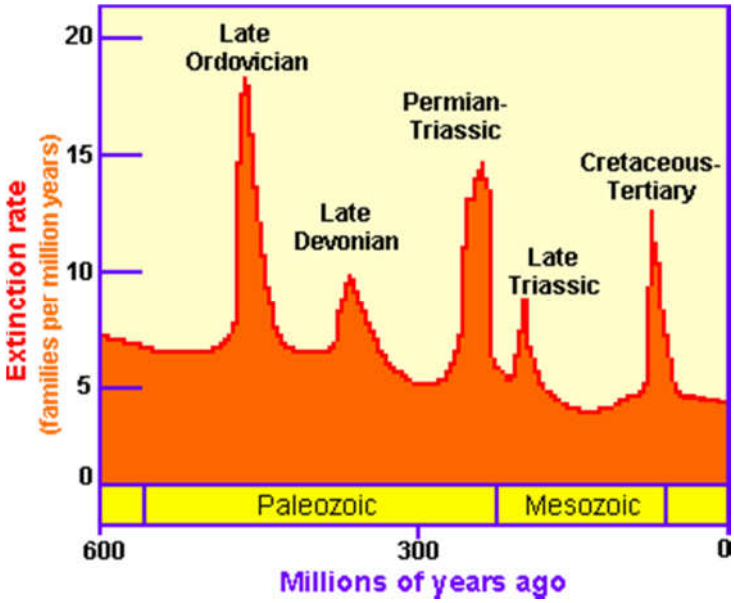
Late Devonian – probable cause impact event, meteor or comet, 359 Mya, 75% of the species gone, over millions of years

Permian Mass extinction (the great dying) – cause, catastrophic methane release, flood basalt eruptions, climate change as well, impact events also occurred, 96% of species died, 248 Mya, marine creatures were badly affected as well as insects. Several extinctions in millions of years

Triassic - Jurassic mass extinction – 200 Mya, cause flood basalt eruptions, climate change, impact event, many types of animals died out along with reptiles and amphibians, there 2 or 3 phases of mass extinction during this time period.

Cretaceous – Tertiary mass extinction, cause impact comet or asteroid, flood basalt, fall in sea level, K/T extinction, death of dinosaurs, 65 Mya, target area Yucatan Peninsula.

All the above was evidenced in sedimentary rocks and the fossils uncovered. Much of that evidence can be found in the Williston and Hudson Bay basins in Manitoba.



The five largest mass extinctions in Earth's history

It was a very informative talk and the Society members really appreciated the many fossils Kathryn brought along.