September 18, 2023

News and notes

For this week's posting I am going to pause my series on geopolitics to show some pictures from a recent field trip and discuss the geological context of the pictures. However, first let's look at some news items that I thought were interesting.

Humour

- Ignoble Awards 2023; this year's Chemistry and Geology Prize was for Eating fossils or why geologists lick rocks.

Research

- Ruizhongite, (Ag2□)Pb3Ge2S8, a thiogermanate mineral from the Wusihe Pb-Zn deposit, Sichuan Province, Southwest China.
- Earth, Planets and Space: Special issue "DynamicEarth: Earth's interior, surface, ocean, atmosphere, and near space interaction; research articles here, here, here and here.
- The genesis of calcite and dolomite carbonatite-forming magma by liquid immiscibility: a critical appraisal.
- The low permeability of the Earth's Precambrian crust.
- Textural complications of banded iron formation and the potential production of nano-magnetite: a case study from the Central Eastern Desert of Egypt.
- In-situ $\delta^{18}O$ and $^{87}Sr/^{86}Sr$ proxies in an unconformable clastic unit at the Ordovician–Silurian transition.
- Sedimentology: Linking source and sink: The timing of deposition of Paleogene syntectonic strata in Central Asia.
- Plate tectonics: A daisy chain method to quickly determine lithosphere, asthenosphere, and mantle properties from the loading history of an area.

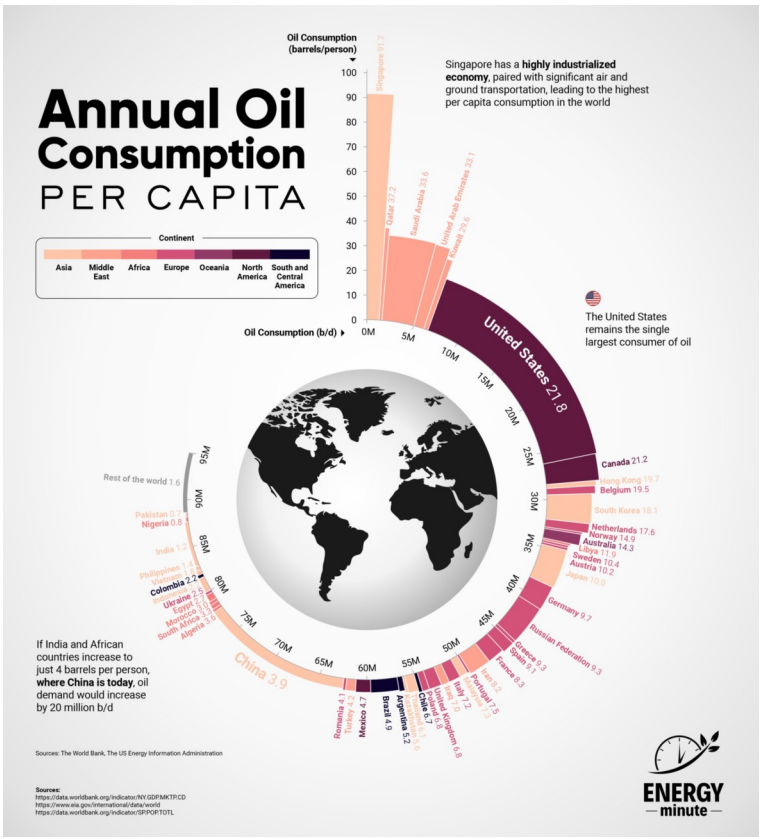
Paleontology

- Museums, Fossil fuel: Cape Breton Fossil Centre receives 'life-changing' grant.
- Cranial osteology of the Brazilian dinocephalian *Pampaphoneus biccai* (Anteosauridae: Syodontinae); behind a paywall, Phys.org summary here.
- No phylogenetic evidence for angiosperm mass extinction at the Cretaceous–Palaeogene (K-Pg) boundary; Phys.org summary here.
- Bayesian analyses indicate bivalves did not drive the downfall of brachiopods following the Permian-Triassic mass extinction; Phys.org summary here.

- *Vectidromeus insularis*, a new hypsilophodontid dinosaur from the Lower Cretaceous Wessex Formation of the Isle of Wight, England; Phys.org summary here.
- New fossils of Abelisauridae (Dinosauria: Theropoda) from the upper Maastrichtian of Morocco, North Africa; behind paywall, Phys.org summary here.
- Calcite-aragonite seas as a driver of echinoderm evolution? Experimental insight and deep-time decoupling.
- *Ochotopteris*—An Endemic Fern of the Mid-Cretaceous Arctic.

Mining and Energy

- From the Karlsruher Institut Für Technologie (KIT): Challenges and Opportunities for Lithium Extraction from Geothermal Systems in Germany—Part 3: The Return of the Extraction Brine; Eureka Alert summary here.
- More research on lithium extraction: Spatially separated crystallization for selective lithium extraction from saline water; Sci Tech Daily summary here.
- Uranium price makes fresh decade high as forecasts grow (even) rosier.
- Dryden Gold bullish on attracting a major mining company.
- "Green" mining: Difficult decisions to open a new all-electric mine in Sudbury.
- Human rights violation claims lobbed at B.C. company over Central Africa copper mine.
- Election promises: Manitoba declares itself Canada's 'critical metals Costco'.
- Ore deposits: Geology of Porphyry Cu-Au and Epithermal Cu-Au-Ag Mineralization at Filo del Sol, Argentina-Chile: Extreme Telescoping During Andean Uplift.
- Ore geology: The Age and Origin of the Ruwai Polymetallic Skarn Deposit, Indonesia: Evidence of Cretaceous Mineralization in the Central Borneo Metallogenic Belt.
- Diagenetic History and Timing of Cu and Zn-Pb Sulfide Mineralization in the Permian Kupferschiefer System, Saale Subbasin, Eastern Germany.
- The geochemistry, origin, and hydrothermal alteration mapping associated with the gold-bearing quartz veins at Hamash district, South Eastern Desert, Egypt.
- Natural Gas Prices Forecast: Futures Rise Amid Weather, Output Drops, Geopolitics.
- Exploration: U.S. Drillers Add Most Oil and Gas Rigs Since November – Baker Hughes.
- Nuclear power in Ontario: Government Plans to Expand the World's Largest Nuclear Power Plant: '[It'll Bring] Really Good Things For … Working People'.



INFOGRAPHIC: Oil Consumption Per Capita – ENERGYminute

Environmental Geology and Hydrogeology

- Remediation research: Breakdown of polyethylene therepthalate microplastics under saltwater conditions using engineered *Vibrio natriegens*; Phys.org summary here.
- More remediation research: Bioremediation of n-alkanes, polycyclic aromatic hydrocarbons, and heavy metals from wastewater using seaweeds.
- USA Superfund sites: The importance of shining a light on hidden toxic histories.
- Efficacy of green infrastructure in reducing exposure to local, traffic-related sources of airborne particulate matter (PM); Phys.org summary here.
- Flowing artesian wells: Widespread aquifer depressurization after a century of intensive groundwater use in USA.

Glaciers and Climate Change

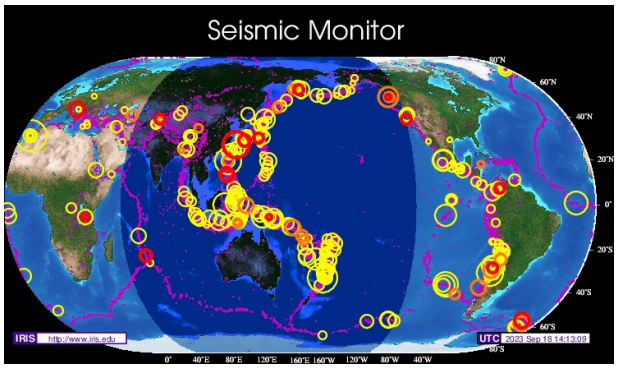
- Inventory of glaciers and perennial snowfields of the conterminous USA.
- Antarctica: Brief Communication: Rapid acceleration of the Brunt Ice Shelf after calving of iceberg A-81; Phys.org summary here.

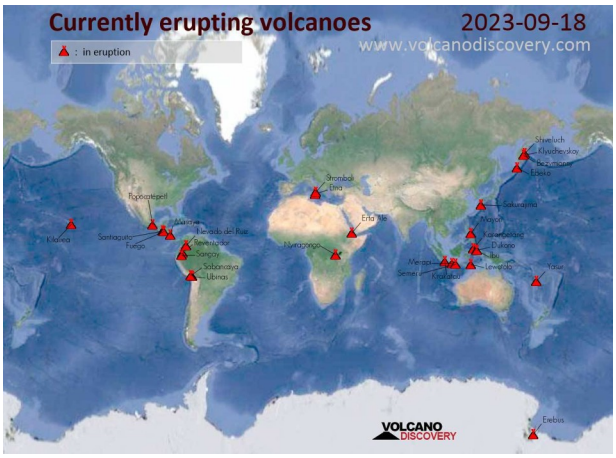
- From Stockholm University: Kebnekaise´s southern peak continues to melt – and so do other Swedish glaciers.
- The magnitude and source of meltwater forcing of the 8.2 ka climate event constrained by relative sea-level data from eastern Scotland; Phys.org summary here.

Geological Videos

- Kilauea Volcano Eruption Update, New Summit Lava Mapped (Sep. 12, 2023).
- Kīlauea caldera downdropped block and Halema‘uma‘u crater, looking west.
- Quenched mafic inclusions: The Bizarre Rocks and Landscape of Chaos Jumbles, Lassen Volcanic National Park, California.

Volcanoes, Earthquakes and Geohazards





Seismic Monitor **Active Volcano Map**

- United States Geological survey (USGS) Volcano Watch: Another Kīlauea summit eruption, another opportunity to learn.
- Smithsonian / USGS Weekly Volcanic Activity Report.
- Excess explosivity driven by melt inclusions during the 946 CE Plinian eruption of Baekdusan.
- Local Infrasound Monitoring of Lava Eruptions at Nyiragongo Volcano (D.R. Congo) Using Urban and Near-Source Stations.
- What caused Morocco’s earthquake? A geologist studying the Atlas mountains explains.
- From Judith Hubbard’s website: The earthquake that cracked a mountain? Aftershocks of the Morocco earthquake; Magnitude 5.0 earthquake in Myanmar.
- Why was the Morocco earthquake so deadly?
- Why the earth quakes – a closer look at what’s going on under the ground.

September 18, 2023

Field Trip – Souris River and Gravel Pits

Figure 1 – Confluence of the Souris and Assiniboine Rivers
Photo by Author, September 14, 2023

Last week, my friend Brian Scott asked me to accompany him on a field trip to the confluence of the Souris and Assiniboine rivers. Brian was looking for agates among the pebbles and cobbles at this location; this had been a good place to find agates in the past. I wanted to look at the landforms and the general geology of the place. We also planned to look into a nearby gravel pit, also for agates and the general geology.

Location

The confluence of the Souris and Assiniboine rivers is at 49°39'56.25"N, 99°33'58.07"W in southwestern Manitoba. It is about 2.6 kilometres (km) east of the Treesbank Ferry and 11.25 km northeast of Wawanesa. Access is via privately owned land, so you will have to get permission from the land owner to cross his land to visit the site. Alternatively, you can access the site via a boat or canoe that you could launch at the ferry crossing.

1.9 km south of the confluence of the Souris and Assiniboine rivers is a gravel pit owned by the Municipality of Glenboro-South Cypress. Access is off of a municipal road, but since it is an active site, you need to be careful of heavy equipment if you visit the gravel pit.

Figure 2 shows the location of the site.

Figure 2a - General Location
Credit: Google Earth

Figure 2b - Location of River Confluence, Gravel Pit and Treesbank Ferry
Credit: Google Earth

Geological Context

We didn't find any agates in the gravel beds of the Souris River, although Brian did find a piece of petrified wood. On the other hand, Brian found a few good agate pebbles in the municipal gravel pit and I saw some interesting stratigraphy in the gravel pit.

Figure 3 – Stratigraphy in Municipal Gravel Pit
Photo by Author, September 14, 2023

The deposits appear to be the result of at least three distinct phases of deposition:

1. At the top are coarse cobbles, pebbles and sand indicative of deposition in a very fast flowing stream;

2. Below the top layer, a layer of sand with a few pebbles, indicating a period of slower moving water; and

3. At the bottom, a layer of gravel, becoming finer upward, indicating a period of very fast moving water.

So what are we seeing here?

The clues are in the deposits we see in the rivers and the gravel pit. Rivers carry sediments eroded from the deposits they flow through. The bedrock formations in southwestern Manitoba are various members of the Pierre Formation, mostly shale.

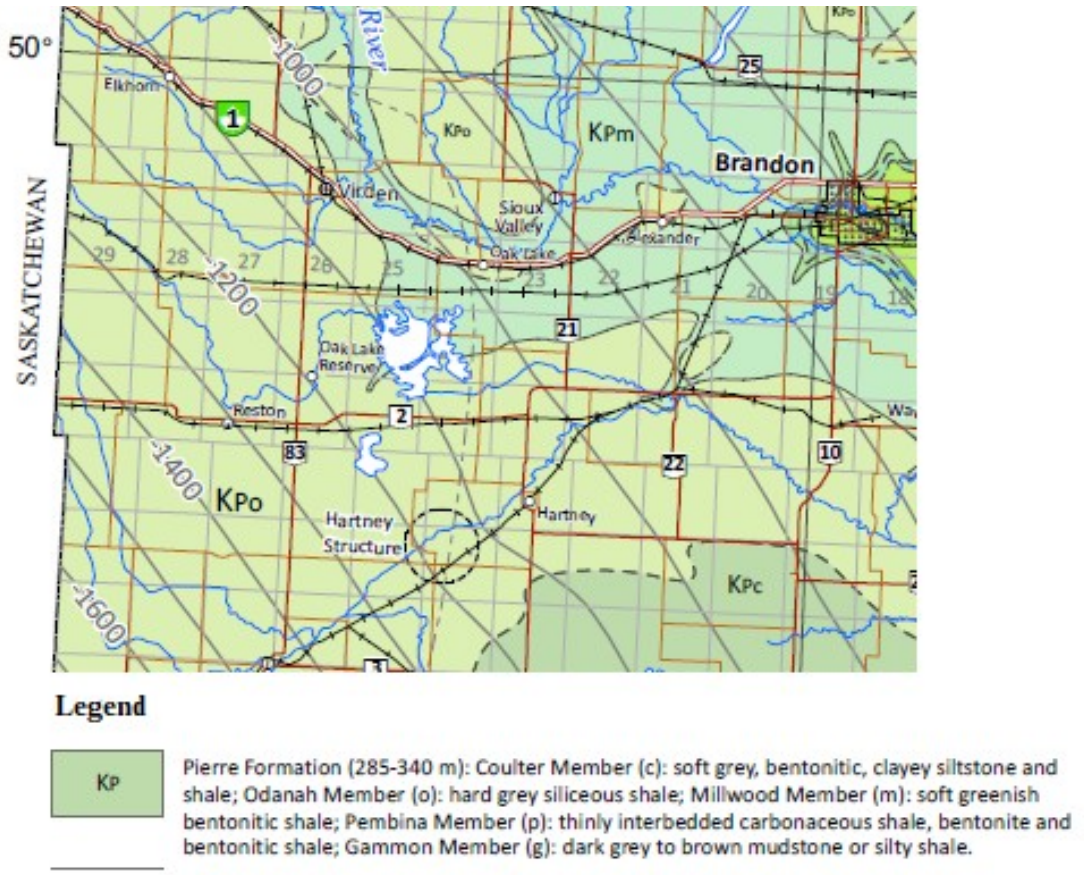


Figure 4 – Bedrock Geology SW Manitoba
Credit: Extracted from The Geology of Manitoba, public domain

The pebbles and cobbles in the river are mostly shale, so they probably came from the Pierre Shale. But what about the other clasts? The other pebbles and cobbles include limestone, quartzite, igneous rocks and Brian's favourite, agates. This mix of lithologies is found in the various gravel beds that the river erodes, but where did they come from? The answer to this question lies in the more recent geologic history of southwest Manitoba.

During the Pleistocene, continental glaciers covered most of northern North America. The glaciers moved and carried rocks from far distances such as igneous rocks from the Canadian Shield, quartzite from the Athabasca Sandstone, as well as sedimentary rocks from shale, sandstone and limestone formations. As for the agates, they could also have come from any of a number of sedimentary rocks and may be related to the agates found in Montana.

At the end of the Pleistocene, the continental glaciers melted and created vast meltwater lakes such as Lake Agassiz, Lake Hind, Lake Souris and Lake Regina. These lakes did not drain evenly. Often, they

drained suddenly and catastrophically. Figure 5 shows the glacial lakes and drainage spillways in southwest Manitoba, southeast Saskatchewan and North Dakota.

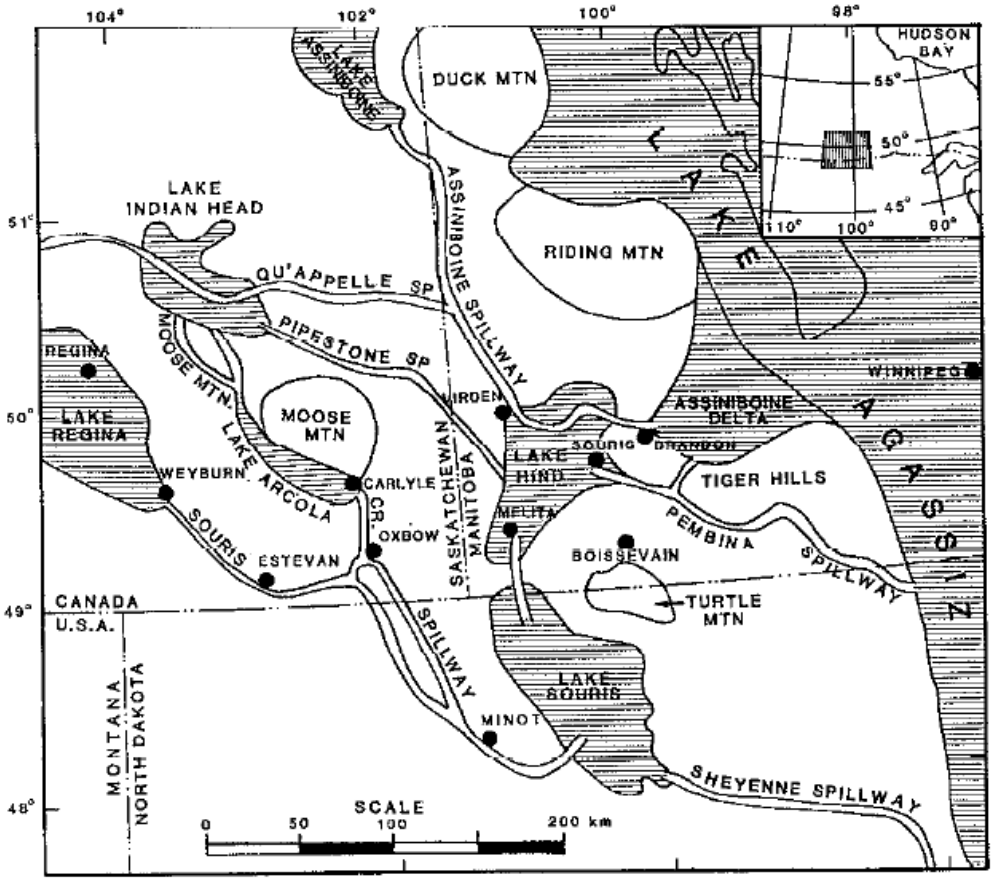


Figure 5 – Glacial Lakes
Credit: Figure 1 in Sun & Teller, 1996

In these catastrophic outflows of glacial meltwater are the origins of the gravel deposits. One such postulated outflow began at Lake Regina, flowed into Lake Souris and overflowed into the Assiniboine and Pembina River spillways. Along the way, the water flow picked up sand and gravel from the glacial till and underlying bedrock eventually depositing it in the gravel beds. One such famous one is near Souris Manitoba, access information for this site is here.

There is a lot to be seen in a gravel pit and an alluvial point bar.

Standard Caveat

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.