March 6, 2023

News and notes

Before looking at more Pleistocene cat fossils from North America, let's look at some news items that I thought were interesting.

Research

- New Mineral Names: Arsenic and Lead.
- Sedimentology research: Hundred million years of landscape dynamics from catchment to global scale; Phys.org summary here.
- More sedimentology: Systematic vertical organization of matrix-rich and associated matrix-poor sandstones in ancient deep-marine slope and basin-floor deposits.
- Scientists solve mystery of salt deserts' unusual honeycomb patterns; Geology In summary here.
- New insights into the age and origin of two small Cretaceous seamount chains proximal to the Northwestern Hawaiian Ridge.

Paleontology

- A Devonian Fish Tale: A New Method of Body Length Estimation Suggests Much Smaller Sizes for *Dunkleosteus terrelli* (Placodermi: Arthrodira); Phys.org summary here.
- The easternmost record of the largest anguine lizard that has ever lived – *Pseudopus pannonicus* (Squamata, Anguidae): new fossils from the late Neogene of Eastern Europe.
- Dammam Formation: Saudi fossil find unearths secrets millions of years in the making.
- Attention shoppers: Rare Jurassic-Era Insect Discovered at Arkansas Walmart.

Glaciers and Climate Change

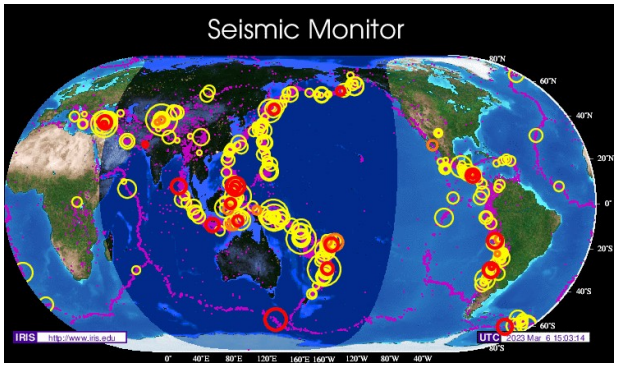
- Climate record in a Wisconsin cave: Decadal warming events extended into central North America during the last glacial period; Phys.org summary here.
- Holocene climate and oceanography of the coastal Western United States and California Current System; Science Daily summary here.
- New insights into the climate of northern Iberia during the Younger Dryas and Holocene: The Mendukilo multi-speleothem record.

Mining and Energy

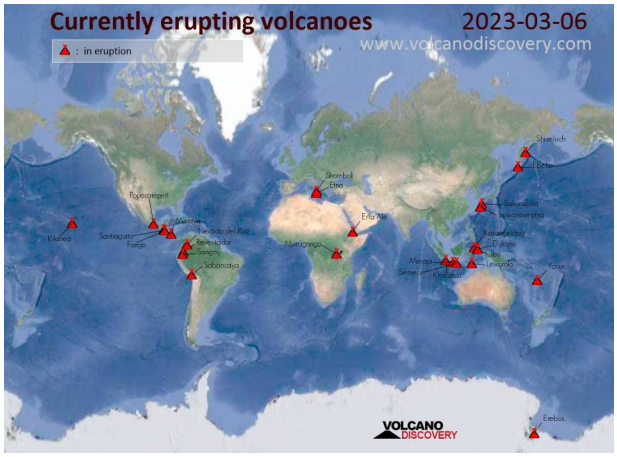
- Shortage of metals for EVs is rising up the agenda in automakers' C-suites.
- Crooked dealings: UK regulator launches enforcement probe into LME nickel trading halt.
- Are We Finally on the Cusp of Commercial Asteroid Mining?

- Freegold Demonstrates Robust Mineral Resource Estimate at Golden Summit Using $1,650 Au 11.9 Moz indicated & 7.5 Moz inferred in Primary Resource.
- Spod Lithium Provides Exploration Update on Northwestern Ontario Lithium Projects.
- Digging up minerals for your electronics: Climate Child labor- Who cares?
- Vale to turn Amazon mining waste into high-grade iron ore.
- Phosphate mining in Florida: Florida's Love-Hate Relationship With Phosphorus.
- Helium resources: Primary N2–He gas field formation in intracratonic sedimentary basins; Science Daily summary here.
- U.S. oil & gas rig count falls for third week in a row – Baker Hughes.
- From the United States Energy Information Information Administration (USEIA): Colorado refinery outage is causing higher gasoline prices in Rocky Mountain region.
- Sinochem Oil Workers Taken Hostage As Protests In Colombia Rage On.
- Canadian Oil Sands Back On Track With More Record Profits.
- Geothermal energy research: Strata temperatures and geothermal resource evaluation in the Dongpu Depression, Bohai Bay Basin, North China.
- New batteries: Sustainable and biocompatible Zn-based batteries.
- How's that green energy working out? By 2050, Used Wind Turbine Blades Will Exceed 43 Million Tons Of Waste Every Year.

Volcanoes, Earthquakes and Geohazards



Seismic Monitor



Active Volcanoes

- Volcano mineralogy: Mineralogy and bulk geochemistry of a fumarole at Hverir, Iceland: Analog for acid-sulfate leaching on Mars; sorry, behind a paywall.
- Volcanic gasses: Discriminating carbon dioxide sources during volcanic unrest: The case of Campi Flegrei caldera (Italy): Phys.org summary here.
- Ominous Forecast: 'Mega-Thrust' Earthquake May Hit US West Coast This Week.
- Earthquake reporting: Physics-informed deep learning approach for modeling crustal deformation; Phys.org summary here.
- Why is Britain experiencing so many earthquakes? Experts weigh in as tremors hit Wales, Cornwall.
- Simulating Landslide Generated Tsunamis in Palu Bay, Sulawesi, Indonesia.

Pretty Shiny Things

- From geology In: Vanadinite: Gemmy Mineral

Upcoming Events

The Fen carbonatite complex, Norway: a world-class REE deposit?

Sven Dahlgren

Geological Advisor, Vestfold and Telemark County Council and Njord Center - Physics of Geological Processes, Department of Geosciences, University of Oslo, Norway

The Fen complex in southern Norway is of key importance to understanding rare-earth deposits in carbonatite complexes. It is the type locality for carbonate igneous rocks (calcite and dolomite carbonatites), alkali-rich contact metasomatic rocks (fenites) and several other unusual rock types known for their enrichment in lanthanides, niobium and other rare elements. In the 1950s, carbonatites at Fen were used as one of the earliest commercial sources of niobium. The present talk will summarize key aspects of the general geology of the Fen complex, and its role in the development of carbonatite science. Some rocks within the complex contain elevated levels of rare-earth elements (REE) and are presently explored as a potential critical metal deposit. Preliminary results suggest a resource of at least 50 million tons of total REE oxide.

When? 1 pm, March 23, 2023

Where? Rm 223 Wallace, 125 Dysart Rd, UM Fort Garry campus

Note: access to the Wallace guest parking is temporarily via Dysart Rd, then Sidney Smith St (first right), then Ralph Campbell Rd (first left, past the parkade), then Sifton Rd going SW and past Wallace Bldg, and back on Dysart Rd (keep left) into the K lot

- Second International Conference on Climate Change and the role of Nuclear Power 2023: Atoms4NetZero, 9–13 October 2023, Vienna, Austria.

March 6, 2023

Pleistocene Cats of The Nearctic Eco-zone, North America

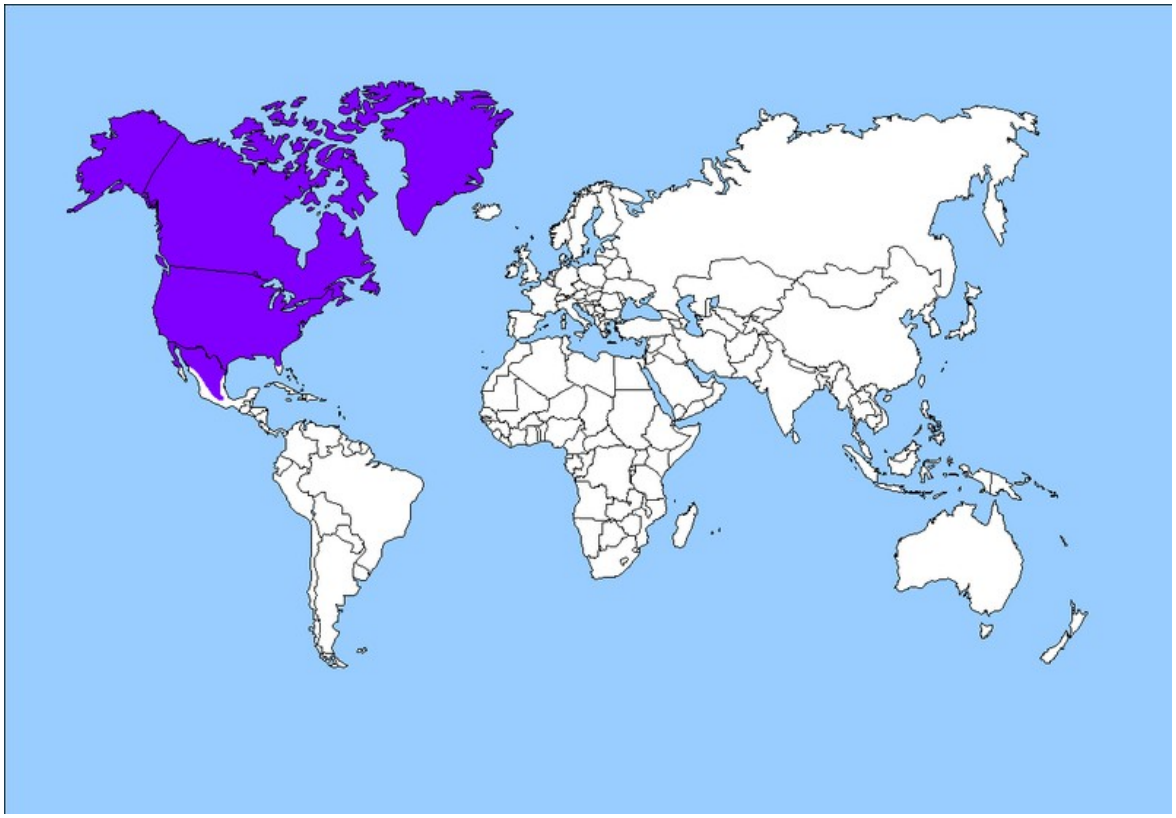


Figure 1 – The Nearctic Eco-zone
Credit: MPE, Creative Commons Attribution-Share Alike 3.0 Unported license

In last week's posting we looked at some of the animals that lived during the Pleistocene Epoch in the Nearctic Eco-zone. This we week we'll look at big cats that lived during that Epoch. Next week we'll look at some other animals that lived during the Pleistocene from other eco-zones.

Big Cats and the American Serengeti

We usually associate animals like the lion and cheetah with the African Serengeti, however during the Pleistocene, lions and cheetahs related to the modern cats hunted on the North America plains.

The comparison to the African Serengeti is not too far-fetched. The open plains of North America hosted a diverse range of large fauna such as giant sloths (*Megatherium*), California tapirs, giant jaguar (*Panthera onca augusta*), giant condors, saber-toothed cats such as *Homotherium*, the dire wolf, bison, camels, horses, and pronghorns. With the same range of large animals as the African Serengeti, it is not surprising that a similar eco-system would arise. Even with the great culling of animal species in the Late Pleistocene during the Quaternary Extinction Event, the eco-system of the North American plains resembled the African Serengeti to the pint that some people advocate re-wilding the plains to restore the ecosystem.

American Lion – *Panthera atrox*

Figure 2 – Skeleton of *Panthera atrox* from the La Brea Tar Pits
Credit: Ed Bierman, Creative Commons Attribution 2.0 Generic license

Not to confused with the modern mountain lion, the American Lion, *Panthera atrox*, lived in on the open grasslands of North America from about 340,000 to 11,000 years ago. Fossils identified as American Lion have been found in Alberta, Canada, Mexico, Peru, and the United States (Arizona, California, Florida, Idaho, Kansas, Maryland, Mississippi, Nebraska, South Carolina, Texas, Virginia, and Wyoming). Peruvian fossils identified as *Panthera atrox* may in fact be an unusually large jaguar (*Panthera onca*).

The American Lion was a big cat. Fossil evidence suggest that it was 1.6 to 2.5 m long and adult maled weighed 256 kg to 351 kg, this was about 25% grater than modern African lions. *Panthera atrox* was closely related to cave lions, *Panthera spelaea* and the modern African ion, *Panthera leo*.

William Henry Huntingtion first announced the discovery of fossils later assigned to *Panthera atrox* to the America Philosophical Society in 1836 when he donated the fossils to the collection of the Academy of Natural Sciences in Philadelphia. Huntingtion collected the fossils from a ravine near Natchez, Mississippi. Based upon these fossils, American paleontologist Joseph Leidy scientifically described the fossils, calling the cat *Felis atrox*. In 1941, George Simpson assigned the species to *Panthera*.

The genus *Panthera*, first described by Lorenz Oken in 1816 contains five living species and about 10 extinct species.

Figure 3 – Reconstruction of *Panthera atrox*
Credit: Sergiodlarosa, Creative Commons Attribution-Share Alike 3.0 Unported license

American Cheetah – *Miracinonyx*

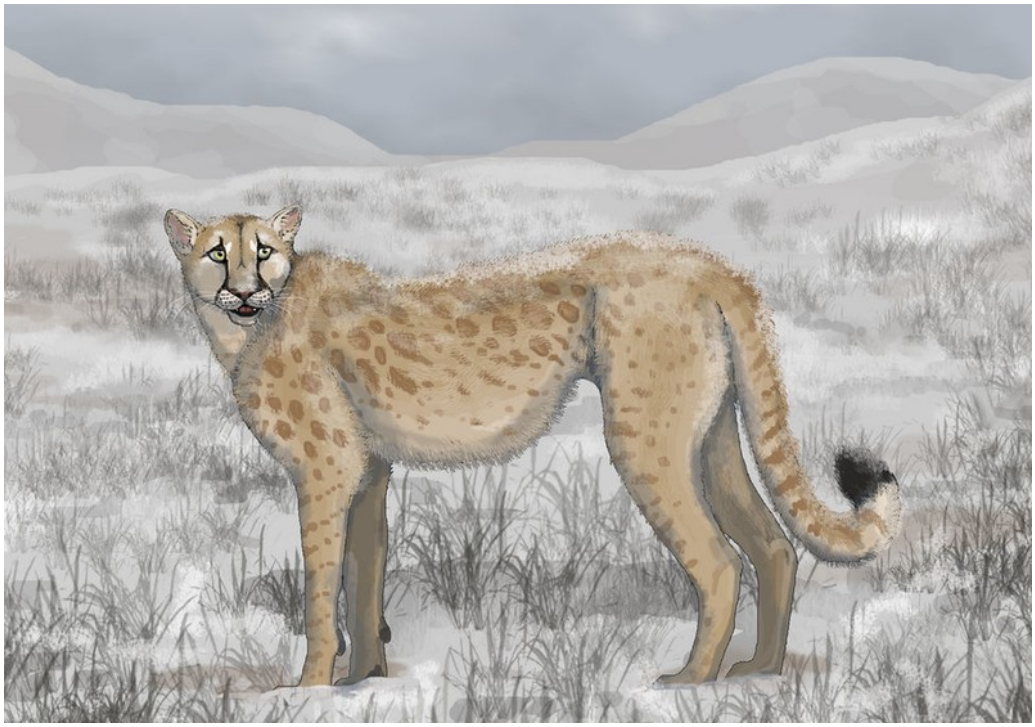


Figure 4 – *Miracinonyx*
Credit: Sheatherius, Creative Commons Attribution-Share Alike 4.0 International license

The American Cheetah, *Miracinonyx*, lived on the plains of North America from the Blancan Stage of the late Pliocene until the end of the Pleistocene. Older fossils of *Miracinonyx*, from the Blancan, have been found in Mexico and Florida and Texas in the United States while Pleistocene fossils of the American Cheetah came from sites in Arkansas, California, Colorado, Florida, Georgia, Maryland, Pennsylvania, South Carolina, Texas, West Virginia and Wyoming.

Miracinonyx was a moderately sized cat, weighing about 70 kg, with a head-and-body length of 170 cm, tail length around 92 cm (36 in), and shoulder height of 85 cm (33 in). Like old-world cheetahs, the American Cheetah was built for speed and it's prey may have included pronghorns. The cheetahs are gone from the North American plains, but pronghorns are ready should they ever return.

While superficially resembling the old-world cheetah, genetic analysis strongly indicates that *Miracinonyx* is more closely related to modern cougars. The resemblance between the American and old-world cheetahs can be chalked up to: 1. common descent and 2. parallel evolution where animals in different places develop similar characteristics based upon similar ecological pressures.

Bones now known to be *Miracinonyx* were first described by Edward D. Cope from bones found in a cave near Port Kennedy, Pennsylvania. Cope originally thought they were a hyena that he called *Crocuta inexpectata* in 1895. Later, in 1899, Cope re-examined the bones and realized they were from a cat that he thought was related to the snow leopard, so he re-named the bones *Unicia inexpectata*. More discoveries of American cheetah led to more re-naming of the genus by various researchers. In 1979, Daniel Adams coined the modern term for the genus. There are two recognized species in *Miracinonyx: M. inexpectatus,* based on Cope's original descriptions and *M. trumani* based upon descriptions by Phillip Orr in 1969 (Orr, P. C. 1969, *Felis trumani a new radiocarbon dated cat skull from Crypt Cave, Nevada* Bulletin of the Santa Barbara Museum of Natural History Department of Geology 2:1-8; not online).

Smilodon – the Sabre-toothed Cat

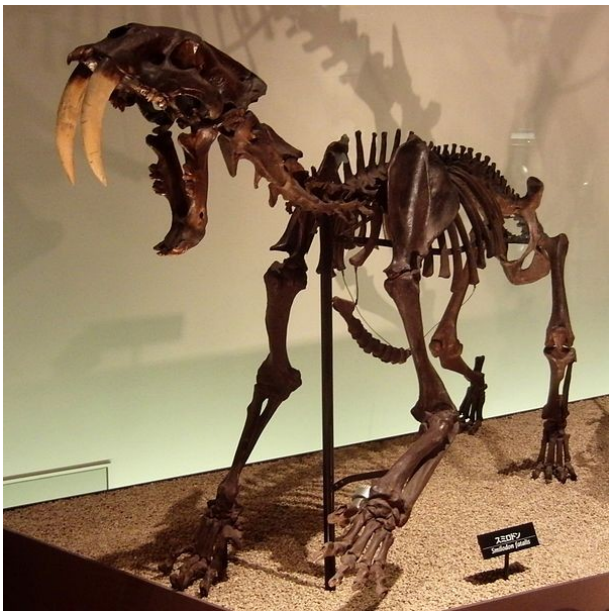


Figure 5 – *Smilodon* Skeleton at the National Museum of Nature and Science, Tokyo, Japan
Credit: Momotarou2012, Creative Commons Attribution-Share Alike 3.0 Unported license

The Sabre-toothed Cat, *Smilodon*, lived in both North and South America from the Blancan Stage of the late Pliocene until the end of the Pleistocene. Fossils of *Smilodon* have been found in Blancan aged deposits in the United States Blancan of United States (Florida, Kansas, Nebraska). Sabre-toothed Cat fossils have also been found in Pleistocene deposits in Argentina, Bolivia, Brazil, Chile, Ecuador, El Salvador, Mexico, Peru, United States (Alabama, Arkansas, California, Florida, Idaho, Indiana, Kansas, Maryland, Missouri, Nebraska, New Mexico, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Utah, West Virginia), Uruguay, and Venezuela.

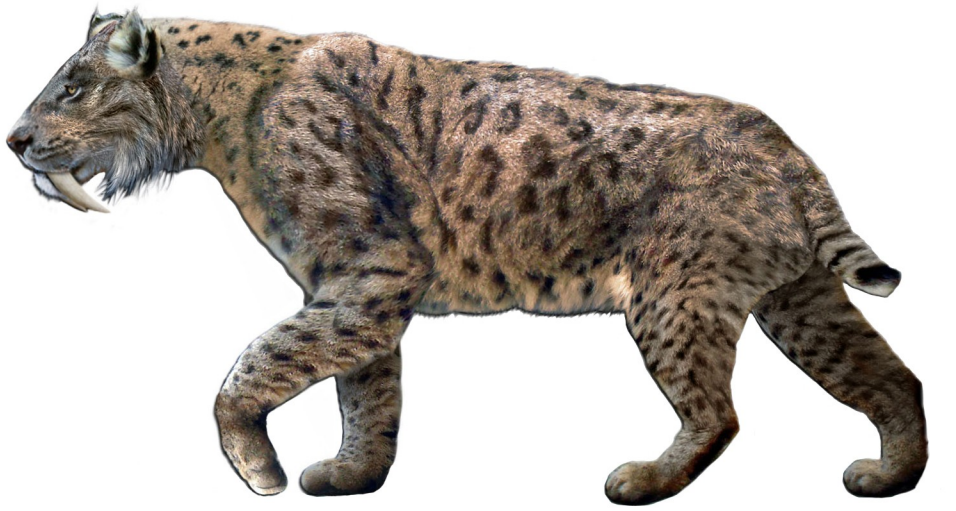


Figure 6 – *Smilodon fatalis* Reconstruction
Credit: Dantheman9758 at English Wikipedia, Creative Commons Attribution-Share Alike 3.0 Unported license

Smilodon was robustly built, with adults of different species ranging from 55 to 100 kg for *S. gracilis,* 160 to 280 kg for *S. fatalis* and 220 to 400 kg for *S. populator*. It's build suggests that it was an ambush predator, and studies suggest that it specialized in taking down large prey and that it probably lived in communal groups like modern lions. It had huge, sabre-like canids, hence the name.

Danish paleontologist Peter W. Lund was the first to describe *Smilodon* in 1842 from fossil bones he found in caves near of Lagoa Santa, Minas Gerais, Brazil. Lund initially thought he had found an extinct hyena, but further study confirmed that he had found a cat that he called *Smilodon populator,* and the name has stuck. In 1869, Leidy described a second species of *Smilodon, S. fatalis* and Cope described *S. gracilis* in 1880. As was usual in the fossil game, there was some confusion in naming these species, Leidy originally called his discovery *Felis fatalis* until Cope pointed out that it was very similar to Lund's *Smilodon.*

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.