March 13, 2023

News and notes

Before taking a look at more fossils from the Pleistocene, here are some news items I thought were interesting.

Research

- Rock exposures: A Pleistocene origin of the strandflat coastal platform in southwestern Scandinavia.
- Landscape evolution: Bedload-Bedrock Contrasts Form Enigmatic Low-Relief Surfaces of the Pyrenees.

Geophysics

- At the Earth's core: Ab Initio Melting Temperatures of Bcc and Hcp Iron Under the Earth's Inner Core Condition; Phys.org summary here.
- Geophysics research, drilling and rock/sediment characterization: Digitalization of hydraulic rotary drilling process for continuously mechanical profiling of siliciclastic sedimentary rocks.
- More geophysics: Shear-Wave Anisotropy Measurements in the Crust from Receiver Functions: An Interplay of Lower and Upper Crustal Anisotropy.

Petrology

- Petrology research: I-type and S-type granites in the Earth's earliest continental crust.
- More petrology: Pyroxenite melting at subduction zones.

Sedimentology

- Deep sea sediments: Dating rare earth element enrichment in deep-sea sediments using U-Pb geochronology of bioapatite.
- Sedimentology of the Mississippi Delta: Land loss due to human-altered sediment budget in the Mississippi River Delta; Phys.org summary here.
- More sedimentology research: By studying sediment, UTA researcher will help stabilize Texas shorelines.
- Origin of loess deposits in China: Stepwise increased spatial provenance contrast on the Chinese Loess Plateau over late Miocene-Pleistocene.

Glaciers and Climate Change

- The life and death of a subglacial lake in West Antarctica.
- Climate record: A 1000-Year Record of Temperature From Isotopic Analysis of the Deep Critical Zone in Central China.

Paleontology

"Death and decay in the Pennsylvanian": A doomed cluster of the sea anemone *Essexella* is inundated by an underwater sediment avalanche, which kills and buries them. A previously killed anemone lies rotting on the sea floor, while the jellyfish *Anthracomedusa* and *Octomedusa*, soon to also be buried, swim above. Artwork by Julius Csotonyi.

Life and death in the Pennsylvanian

It looks like some fossils that were thought to be jellyfish are in fact sea anemones. A paper published in Papers in Palaeontology by Roy E. Plotnick, Graham A. Young, and James W. Hagadorn called "An abundant sea anemone from the Carboniferous Mazon Creek Lagerstätte, USA".

The paper describes the re-analysis of a Pennsylvanian fossil, *Essexella*, and the evidence indicates that it is not a jellyfish but is in fact a sea anemone. (Wikipedia still calls it a jellyfish). This is not a really grave misidentification since sea anemones are basically upside down jellyfish and both are Cnidaria.

The fossils of *Essexella* came from a lagerstatte in Illinois called the Mazon Creek fossil beds.

Read the whole thing!

More Paleontology

- More mistaken identities: *Protomelission* is an early dasyclad alga and not a Cambrian bryozoan; summary from Durham University here.
- Mass extinctions and the Bakken Shale: Basin-scale reconstruction of euxinia and Late Devonian mass extinctions; Phys.org summary here.
- Dwarfism and gigantism drive human-mediated extinctions on islands; behind a pay wall, Phys.org summary here.

Environmental Geology and Hydrogeology

- Heavy metal contamination: Irreversible and Large-Scale Heavy Metal Pollution Arising From Increased Damming and Untreated Water Reuse in the Nile Delta; Phys.org summary here.

- Groundwater Volume Loss in Mexico City Constrained by InSAR and GRACE Observations and Mechanical Models.

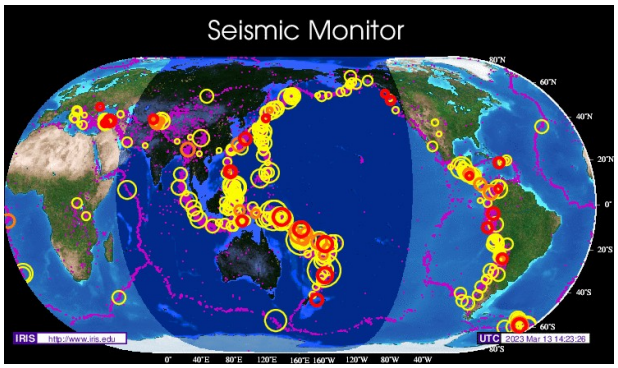
Energy

- Natural gas seepage research: Hydrocarbon production reduces natural methane seeps in the Santa Barbara channel; Phys.org summary here.

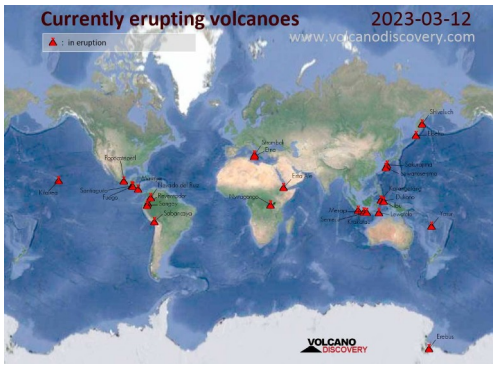
- Trans Mountain Pipeline Construction to be Completed in 2023 But Costs Balloon Again, This Time to $30.9B.

- Source rock research: An Integrated Approach for the Thermal Maturity Modeling Re-Assessment of an Exploration Well in the Hellenides Fold and Thrust Belt.

Volcanoes, Earthquakes and Geohazards



Seismic Monitor



Active Volcano Map

- Volcano research: Hydrothermal Fluids and Where to Find Them: Using Seismic Attenuation and Anisotropy to Map Fluids Beneath Uturuncu Volcano, Bolivia; Phys.org summary here.

- Mt. Etna: Insights into magma dynamics at Etna (Sicily) from SO2 and HCl fluxes during the 2008–2009 eruption.

- The Yellowstone Caldera: Thumping Cycle Variations of Doublet Pool in Yellowstone National Park, USA; Phys.org summary here.

- Earthquake research: Segmentation characteristics of deep, low-frequency tremors in Shikoku, Japan using machine learning approaches.

- What Turkey's earthquake tells us about the science of seismic forecasting.

- Sandstorms: Mechanisms of the formation of wind-blown sand hazards; behind a pay wall, Phys.org summary here.

March 13, 2023

More Fossil Animals from the Pleistocene

We've looked at Pleistocene fossils from the Palearctic and Nearctic Eco-zones over the past few weeks. This week we'll look at a few Pleistocene fossils from Australasia, and Indomalaya. There are few Pleistocene fossils from the Oceania, and Antarctic Eco-zones, so we won't bother with them. Next week we'll look at the Afrotropic and Neotropic during the Pleistocene.

Australia in the Pleistocene

Figure 1 – Australasian Eco-zone
Credit: carol, Creative Commons Attribution-Share Alike 3.0 Unported license

Many Australian megafauna, both past and present, are often found nowhere else and are inherently interesting. The uniqueness comes from Australia's long separation from other continents, having diverged from Gondwanaland 132.5 to 96 million years ago (Mya) during the Cretaceous Period.

For most of the Pleistocene, there were no humans in Australia. However by about 70,000 to 65,000 years ago, humans arrived in Australia and began hunting the wildlife. Some believe that over hunting led to the demise of at least some of the megafauna that died out in Australia at the end of the Pleistocene. Others dispute that theory, blaming climate change for the extinctions. What is not disputed s that the extinctions happened. Let's take a look at a few fossil animals from the Australian Pleistocene.

Diprotodon – A Giant Wombat

A giant marsupial, *Diprotodon* lived in the through Australia from the Miocene until the Pleistocene, going extinct some 40,000 years ago. *Diprotodon* was the largest known marsupial to have ever lived, growing as large as 1.8 m at the shoulders, over 4 m long from head to tail, and almost 3,500 kg. Females were smaller than males. A herbivore, *Diprotodon* had the teeth pf a browser and probably lived a similar life to modern large animals like elephants. *Diprotodon* apparently engaged in the seasonal migrations, probably to feed its huge appetite. The comparison with modern elephants seems to extend to their apparent behavior where males and females generally lived separate lives and separate herds.

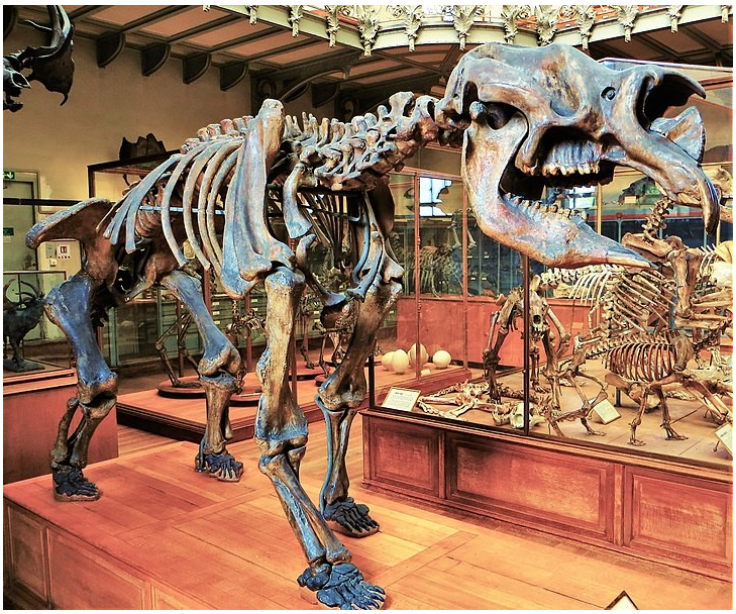


Figure 2 – *Diprotodon* in the Muséum national d'histoire naturelle, Paris, France
Credit: Ghedoghedo, Creative Commons Attribution-Share Alike 3.0 Unported license

Australian Aborigines drew rock art that may have depicted *Diprotodon*, however, it's open to interpretation. The Aborigines have a legend of a creature, the bunyip, that may be a folk memory of *Diprotodon.* The earliest modern description of *Diprotodon* bones was by English geologist Richard Owen who proposed the genus name in an 1838 paper contained within a larger volume edited by Major Thomas Mitchell, Surveyor General of New South Wales. Mitchell recovered the *Diprotodon* fossil bones from Wellington Caves in 1830 having been alerted to the bones by a local farmer, George Ranken. There is one recognized species in the genus, *D. optatum* with eight synonyms in the literature.

Figure 3 – An artist's illustration of *Diprotodon optatum*
Credit: Peter Trusier, CC-BY-SA

Dromornis – A Really Big Bird

Figure 4 – *Dromornis stirtoni*
Credit: Kevmin, Creative Commons Attribution-Share Alike 3.0 Unported license

Living in Australia from the Miocene until about 30,000 years ago during Middle Pleistocene, *Dromornis* was one of the biggest birds that ever lived. Originally thought to be related to the Giant Moas of New Zealand, more recent studies indicate that Australian *Dromornis* is distinct from the New Zealand giant Moas. *Dromornis* appears to be more related to modern galliformes (chickens) than modern ratites (emus). All species of *Dromornis* were herbivores. All species of *Dromornis* were big birds. *D. murrayi*, for example, was about 1.5 metres high and weighed up to 250 kilograms and *D. stirtoni* grew taller than 3 m and weighed around 500 kg.

Richard Owen first described the fossils of *Dromornis* in 1872. There are four species of *Dromornis: D. australis (*type species*), D. murrayi, D. planei,* and *D. stirtoni.*

Figure 5 – *Dromornis stirtoni*
Credit: Nobu Tamura, Creative Commons Attribution-Share Alike 3.0 Unported license

Meiolania – A Giant Tortoise

Figure 6 – *Meiolania platyceps* in the Lord Howe Island Museum
Credit: Fanny Schertzer, Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license

Meiolania was a giant tortoise that lived in Australia and New Caledonia from the Miocene until the Calabrian Stage of the Pleistocene (15.97 to 0.012 Mya). A herbivore, *Meiolania* had a carapace length of 1 to 2 m. It also had "horns" on its skull.

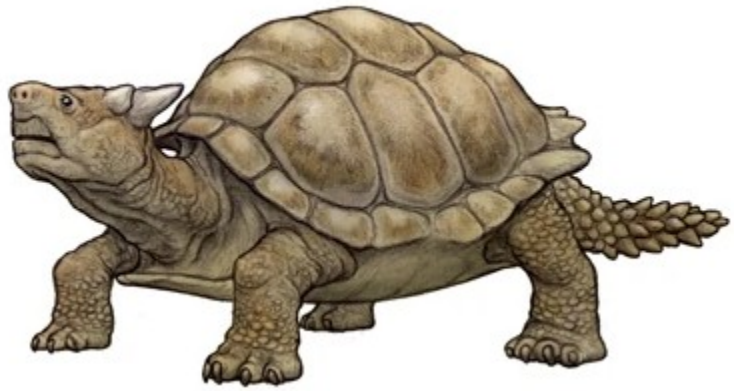


Figure 7 – *Meiolania brevicollis*
Credit: Logo8th, CC-BY-SA

Richard Owen first described *Meiolania* in 1886 based upon fossils found on Lord Howe Island, New South Wales. There are four species of *Meiolania*: *M. brevicollis, M. platyceps* (type), *M. mackayi*, and *M. damelipi.*

Indomalayan Eco-zone in the Pleistocene

Figure 8 – Indomalayan Eco-zone
Credit: MPE, Creative Commons Attribution-Share Alike 3.0 Unported license

The Indomalayan Eco-zone includes the Indian Subcontinent, Indochina, Indonesia, Malaysia and the Philippines. There is some overlap with the Palearctic Eco-zone, with unique species developing in the Indomalayan zone from Palearctic immigrants. Let's look at some of the Pleistocene fauna from Indomalayan Eco-zone.

Palaeoloxodon namadicus – Asian Straight-tusked Elephant

The Asian Straight-tusked Elephant, *Palaeoloxodon namadicus*, lived from the early Middle to Late Pleistocene on the Indian subcontinent. *Palaeoloxodon namadicus* was closely related to the European Straight-tusked Elephant (*Palaeoloxodon antiquus*) and some consider the Asian Straight-Tusked Elephant to be a subspecies of the European one. While most fossils attributed to the Asian Straight-tusked Elephant are from India, it may also have lived in Southeast Asia and China as well as the Indonesian island of Sulawesi.

Analysis of the fossils suggests that the Asian Straight-Tusked Elephant was about 5.2 m tall at the shoulder and weighed about 22,000 kg. It may have been the largest Asian elephant ever. Like all elephants, *Palaeoloxodon namadicus* was a herbivore and it tended towards a grazing diet.

Figure 9 – *Palaeoloxodon namadicus*
In the Indian Museum, Kolkata, India
Credit: Royroydeb, Creative Commons Attribution-Share Alike 4.0 International license

Hugh Falconer and Proby Cautley first described *Palaeoloxodon* in 1846, originally calling it *Elephas*. Hikoshichiro Matsumoto coined the genus name *Palaeoloxodon* in 1924 and *Elephas* was subsequently assigned to the genus in 2019.

There are thirteen species in the genus *Palaeoloxodon*, divided into mainland species and island dwarf species. The mainland species are: *P. recki* (Synonym: *Elephas recki*) (East Africa); *P. antiquus* (Synonym: *Elephas antiquus*) (Europe, Middle East, western Asia); *P. huaihoensis* (China) possibly synonymous with *P. naumanni; P. namadicus* (Synonym: *Elephas namadicus*) (Indian subcontinent, possibly also elsewhere in Asia); *P. naumanni* (Synonym: *E. namadicus naumanni*) (Japan, possibly also China and Korea), possible subspecies of *E. namadicus; P. turkmenicus* known from a single specimen found in the Middle Pleistocene of Turkmenistan, with possibly attributable remains known from Kashmir, validity uncertain. All the Mediterranean insular dwarf elephant species are almost certainly descended from *P. antiquus: P. creutzburgi* (Crete); *P. xylophagou* (Cyprus); *P. cypriotes* (Cyprus); *P. lomolinoi* (Naxos); *P. tiliensis* (Tilos); *P. mnaidriensis* (Sicily and Malta); and *P. falconeri* (Sicily and Malta).

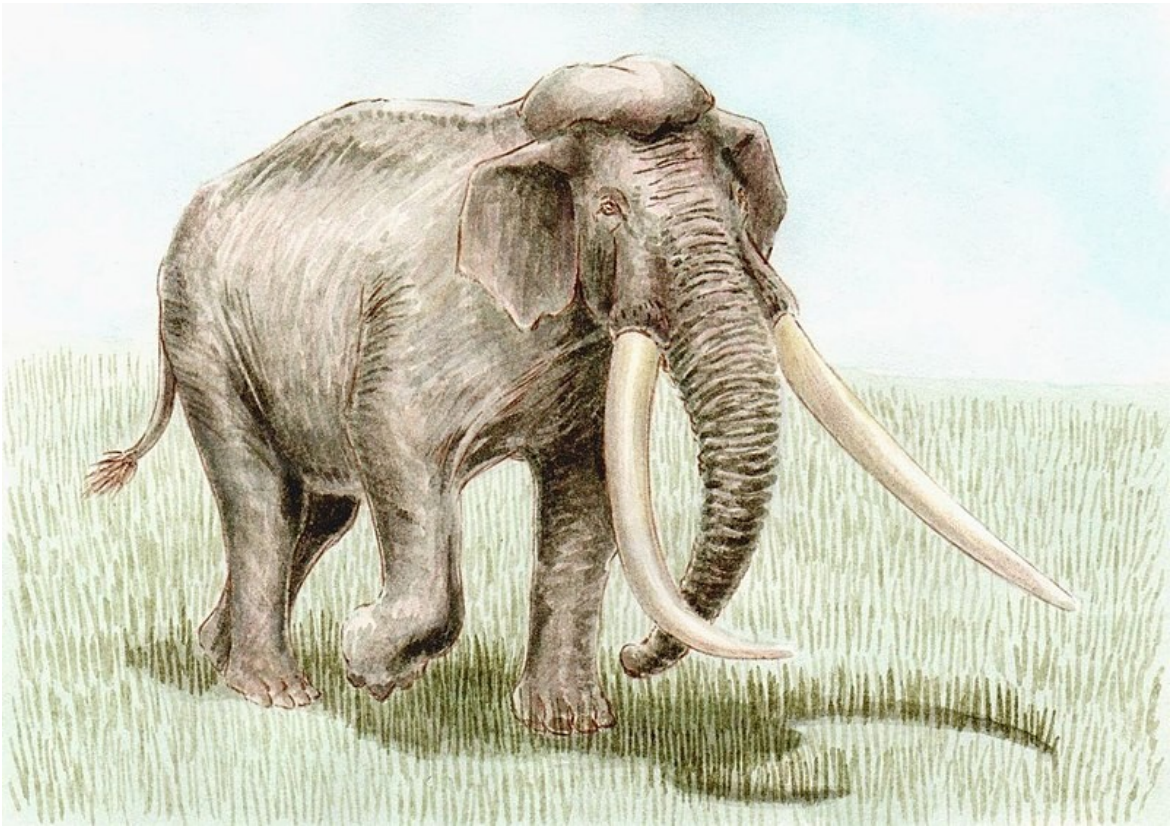


Figure 10 – Artist's Depiction of *Palaeoloxodon namadicus*

Equus namadicus – An Indian Horse

Figure 11- *Equus namadicus* skull in the Museo di Paleontologia di Firenze
Credit: Ghedoghedo, Creative Commons Attribution-Share Alike 3.0 Unported license

Excavated from Middle and Late Pleistocene deposits of the Narmada River in India, *Equus namadicus* lived until around 14,000 years ago when it went extinct. It was closely related to two other equids that lived in India: *Equus sivalensis* and *Equus stenonis*. All three Indian horses went extinct near the end of the Pleistocene.

Hugh Falconer and Proby Cautley first described *Equus namadicus* in 1849. *Equus* was first described in the scientific literature by Carl Linnaeus in 1758. There are eight living species in the genus *Equus* and 23 extinct species.

Nesorhinus philippinensis – the Filipino Rhinoceros

Figure 12 – Filipino Rhinoceros Bones
Credit: Darwgon0801, Creative Commons Attribution-Share Alike 4.0 International license

Nesorhinus is an extinct genus of rhinoceros from the Pleistocene of Southeast Asia. The genus contains two species, *Nesorhinus philippinensis* from the Philippines and *Nesorhinus hayasakai* from Taiwan. Both species were relatively small for a rhinoceros, similar in size to the modern Javan and Sumatran rhinoceros; they probably weighed between 900 and 1600 kg, with the Taiwanese rhinoceros being at the larger end of the range.

Gustav von Koenigswald first excavated bones that are now identified as *Nesorhinus philippinensis* from deposits in in Cagayan province of the Philippines in 1936. Koenigswald described his finds in 1956, calling the species *Rhinoceros philippinensis*. The intervention of a war and the loss of the original specimens delayed Koenigswald's reporting. More bones of the Filipino rhinoceros were found in the Fort Bonifacio area (1965) and in Rizal, Kalinga (2014). Analysis of the bones indicated the they were Middle Pleistocene in age and that they had been butchered by some sort of hominid.

In 2021, Pierre-Olivier Antoine, Marian C Reyes, Noel Amano, Angel P Bautista, Chun-Hsiang Chang, Julien Claude, John De Vos, Thomas Ingicco published a paper in which they re-assessed the evolutionary relationship of the rhinoceros bones found in the Philippines and Taiwan. They proposed a new genus, *Nesorhinus* with two species: *N. philippinensis*, the Filipino rhinoceros and *N. hayasaki*, the Taiwanese rhinoceros. This is now the accepted name for the genus and its two species.

While the research indicates that the Filipino rhinoceros lived as far back as the Middle Pleistocene, there is not enough fossil evidence to indicate when or why they went extinct. Hunting by humans is suspected, but not proven.

Figure 13 – CGI Depiction of the Filipino Rhinoceros
Credit: GurgiFan57, CC-BY-SA

We know that the Filipino rhinoceros is extinct. However, that inconvenient fact hasn't stopped gaming enthusiasts at the fantasy site SciiFii from bringing it back to life, at least in Computer Generated Imagery (CGI). In their fantasy world: "*the Philippine rhinoceros is a common sight in the cities and suburbs of the Philippines, due to the people of the Philippines considering the native rhinos as sacred, in a manner similar to sika deer in Japan (where the deer are worshipped and allowed to live in the cities), so the Philippine rhinoceros populations are allowed to live peacefully alongside people and livestock.*" A harmless and rather pleasant fantasy.

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.