***December 5, 2022***

## News and notes

Before going on to look at horses during the Neogene Period, here are some news items that I thought were interesting.

### Geologists in the News

- European Geosciences Union announces its 2023 awards and medals!

### Research

- From Eureka Alert: New Geology articles published online ahead of print in November.
- From the American Mineralogist: New Mineral Names.
- Where did the Earth's oxygen come from? Formation of oxidized sulfur-rich magmas in Neoarchaean subduction zones; Phys.org summary here.
- Ooh, shiny: Diamonds, dunites, and metasomatic rocks formed by melt/rock reaction in craton roots; Phys.org summary here.
- Glacial geology: The extreme yet transient nature of glacial erosion; Eureka Alert summary here.
- Ancient bubbles of sea water: Pushing the limits: Resolving paleoseawater signatures in nanoscale fluid inclusions by atom probe tomography; summary from the University Of California, Riverside here.
- Geophysics: Near-Surface Geophysical Characterization of Lithologies in Corfu and Lefkada Towns (Ionian Islands, Greece).

### Paleontology

- End Permian Mass Extinction: High temperature methane emissions from Large Igneous Provinces as contributors to late Permian mass extinctions; Phys.org summary here.
- The geologically oldest specimen of *Pterodactylus*: a new exquisitely preserved skeleton from the Upper Jurassic (Kimmeridgian) Plattenkalk deposits of Painten (Bavaria, Germany).

### Sedimentology

- Book announcement, from Eureka Alert: An Introduction to Hydraulics of Fine Sediment Transport (2nd Edition).
- Sedimentology and plate tectonics: Sponge-rich sediment recycling in a Paleozoic continental arc driven by mélange melting.
- Dating a marker bed: Detrital glass in a Bering Sea sediment core yields a ca. 160 ka Marine Isotope Stage 6 age for Old Crow tephra.

## Environmental Geology and Hydrogeology

- From Phys.org: California set for another year of brown lawns, tight water restrictions.
- Consequences: Impacts of the Desiccation of the Aral Sea on the Central Asian Dust Life-Cycle; Phys.org summary here.
- Assessment of pollution and risks associated with microplastics in the riverine sediments of the Western Ghats: a heritage site in southern India.

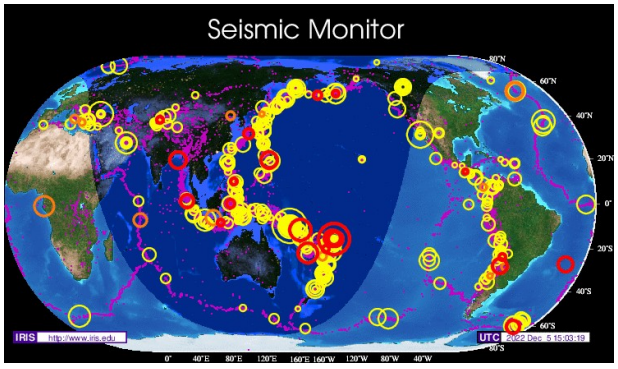
## Climate Studies

- From Science China Earth Sciences: Regional climate dynamical downscaling over the Tibetan Plateau—From quarter-degree to kilometer-scale; Phys.org summary here.
- From the Conversation and Phys.org: Satellites detect no real climate benefit from 10 years of forest carbon offsets in California.

## Coastal Geology

- From Phys.org: 'Sand is like gold.' The pricey race to restore Florida beaches before the next hurricane.
- Also from Phys.org: Sea floor evidence from millennia of Atlantic storms is not good news for the coast.
- From Louisiana State University: Coastal wetland area change for two freshwater diversions in the Mississippi River Delta; Eureka Alert summary here.

## Volcanoes, Earthquakes and Geohazards

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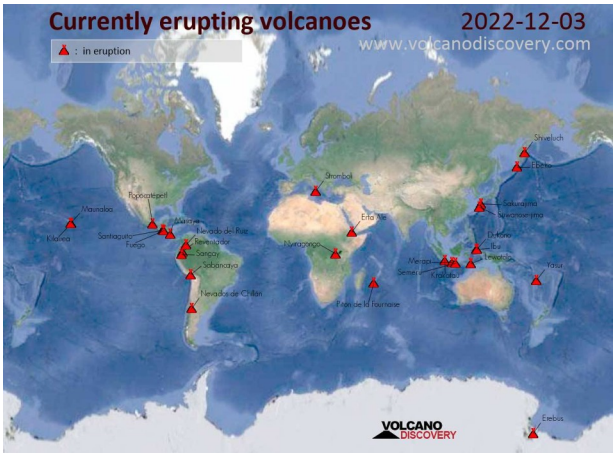
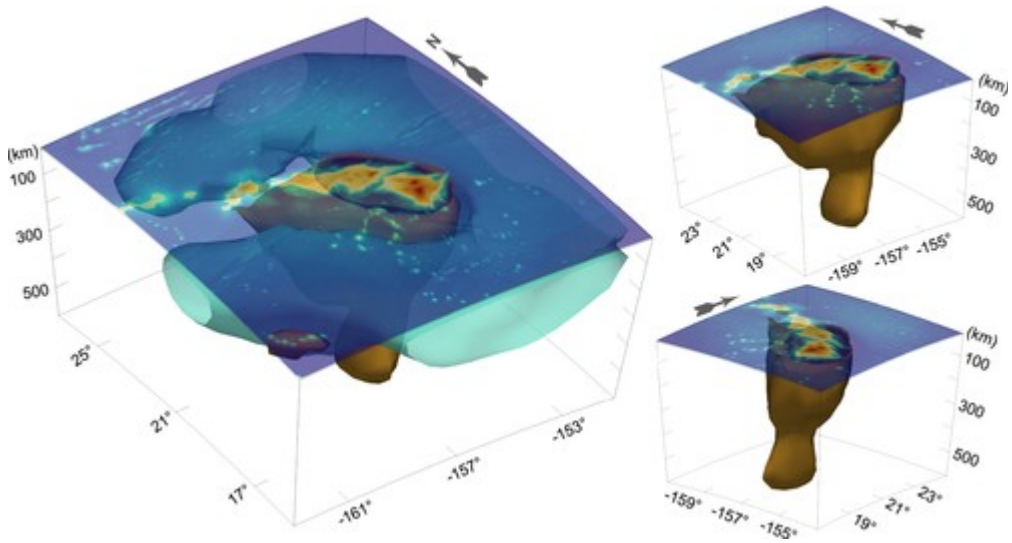



**Link**

- Both Mauna Loa and Kilauea are erupting in Hawaii, from the United States Geological Survey (USGS) Hawaiian Volcano Observatory; Mauna Loa live stream here.
- Geophysical imaging of the Hawaiian volcanoes: Robust Seismic Images of the Hawaiian Plume.




**3-D views of Vs tomography beneath Hawaii. The brown and blue iso-surfaces of velocity anomalies are rendered where Vs perturbation is −1% and 2%, respectively. Credit: Figure 4 in Ye *et al*, 2022**

- Volcanic hazards: Lateral Extent of Pyroclastic Surge Deposits at Ubehebe Crater (Death Valley, California) and Implications for Hazards in Monogenetic Volcanic Fields; Phys.org summary here.
- Japanese volcano research: Long-term ash dispersal dataset of the Sakurajima Taisho eruption for ashfall disaster countermeasure.
- Volcanoes and society: Recession or resilience? Long-range socioeconomic consequences of the 17th century volcanic eruptions in northern Fennoscandia.
- From the Smithsonian: A Surprising Amount of Magma Is Under Yellowstone's Supervolcano.
- Earthquakes and volcanoes: Deep low-frequency earthquake activity associated with the 2018 eruptions in the Kirishima volcanic complex, Japan.
- Earthquakes in Alberta: 6 Earthquakes Hit Alberta & One Could Be The Province's 'Largest Earthquake Ever Recorded'; see also Earthquakes Canada.
- Earthquakes and landslide risks: Triggering and recovery of earthquake accelerated landslides in Central Italy revealed by satellite radar observations; Phys.org summary here.
- Simulating earthquakes in the lab: Creep fronts and complexity in laboratory earthquake sequences illuminate delayed earthquake triggering; Phys.org summary here.
- Earthquake engineering: Damage Mechanism and Load-Carrying Capacity at Girder End of Existing Steel Girder Bridge Under Seismic Lateral Force; Eureka Alert summary here.
- From the Landslide Blog: Casamicciola: drone footage of the deadly landslide at Ischia in Italy.
- Modelling a tsunami: Quasi-Linear Model of Tsunami Run-Up on a Beach with a Seafloor Described by the Piecewise Continuous Function.

***December 5, 2022***

# Terrestrial Vertebrates of the Neogene – Mammals, Part 2, Horses

While modern horses are restricted to a single genus, *Equus*, the family Equidae includes many, many genera from throughout the Cenozoic and especially the Neogene Period. For this week's posting we'll look at examples of these marvelous creatures from the Neogene.

## *Anchitherium*

**Figure 1 – *Anchitherium* mandibles**
**Credit: PePeEfe, Creative Commons Attribution-Share Alike 3.0 Unported license**

First appearing in North America during the Miocene Period, three toed horses of the genus *Anchitherium* later dispersed to Asia and Europe. *Anchitherium* was a relatively small horse, about 60 centimetres (cm) high at the shoulder. Its teeth suggest that it was a browser; i.e. it ate leaves from the trees that grew in the forest where it lived.

**Figure 2 – *Anchitherium* reconstruction**
**Credit: Fransaurus centurion, CC-BY-SA**

*Anchitherium* fossils are widespread, and have been found in China, Germany, Japan, Panama, Spain, Turkey and the United States (Florida).

Hermann von Meyer first described *Anchitherium* in 1844 in *Über die fossilen Knochen aus dom Tertiär-Gebilde des Cerro de San Isidro bei Madrid*. Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefakten-Kunde 1844:289–310 (not on line). There are 14 species in the genus: *A. ezquerrae* (type), *A. alberdiae, A. aurelianense, A. australis, A. castellanum, A. clarencei, A. corcolense, A. cursor, A. gobiense, A. hippoides, A. matritense, A. navasotae, A. parequinum,* and *A. procerum.*

## *Desmatippus*

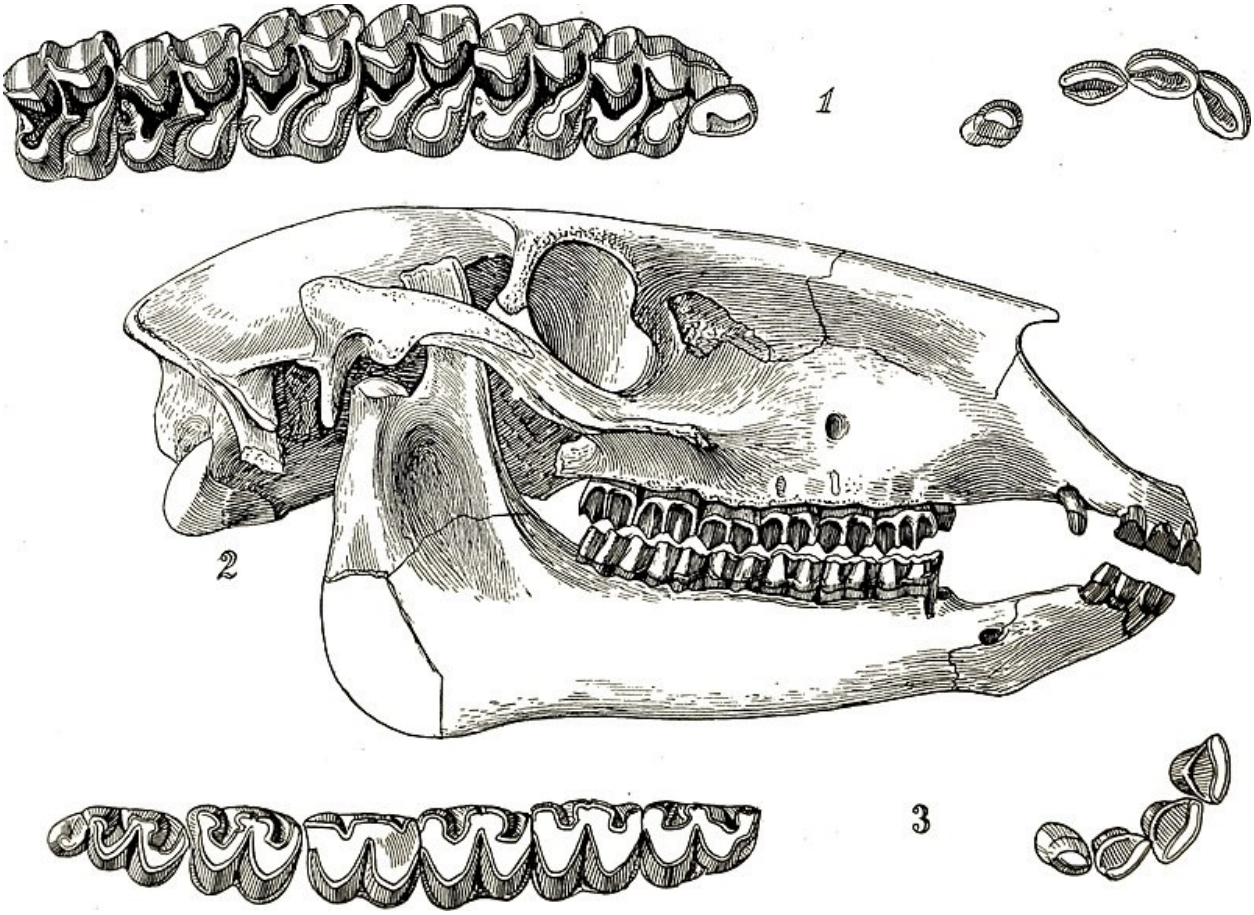



**Figure 3 – *Desmatippus* from the *Annals of the Carnegie Museum***
**Credit: Carnegie Museum of Natural History, public domain see Flikr, The Commons**

Related to *Anchitherium* was another three toed horse from the Miocene, *Desmatippus*, which lived in North America from the Oligocene to the Quaternary. *Desmatippus* was another relatively small horse, about 60 cm in height and weighing around 20 kilograms (kg). It was also a browser.

William B. Scott first described *Desmatippus* in 1893 from specimens recovered from the Deep River Beds of Montana. Earlier, in 1874, bone warrior O. C. Marsh described a fossil that was later included in the genus *Desmatippus.* There are two species of the genus: *D. avus* and *D. crenidens* (type).

## *Hipparion*

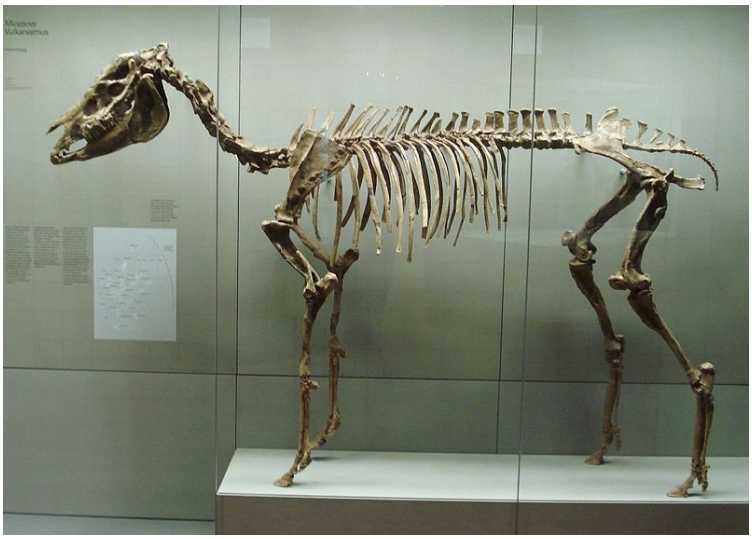


**Figure 4 – *Hipparion* Skeleton, Staatliches Museum für Naturkunde Stuttgart**
**Credit: Ghedoghedo, Creative Commons Attribution 3.0 Unported license**

A widely successful horse genus that lived from the Miocene through to the Pleistocene, *Hipparion* (Greek for pony) lived in North America, Asia, Europe and Africa. It resembled modern horses except that it had two vestigial toes on either side of its main hoof. *Hipparion* generally stood at about 1.4 m tall at the shoulder and weighed about 450 kg. Like modern horses, it was a herbivore adapted to living on short-grass prairies and steppes.

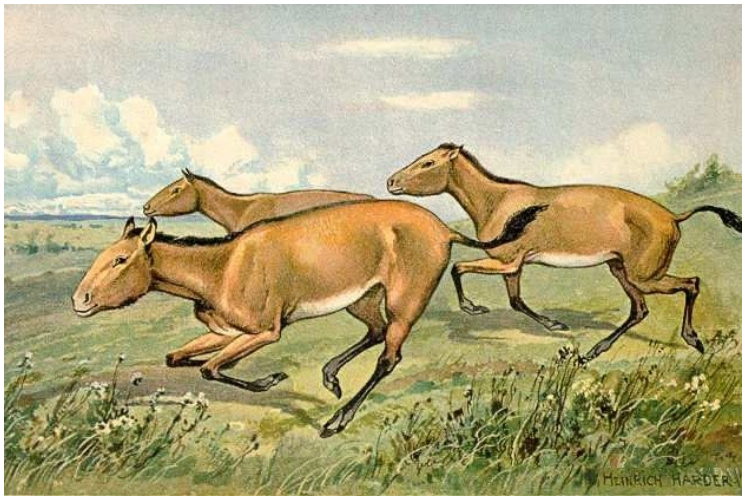



**Figure 5 – *Hipparion***
**Credit: Heinrich Harder (1858-1935), public domain**

French geologist Jules de Christol was the first to describe *Hipparion* in 1832 from fossils that he found in France. There are 28 species of *Hipparion: H. chiai, H. concudense, H. condoni, H. crassum, H. dietrichi, H. fissurae, H. forcei, H. gromovae, H. laromae, H. longipes, H. lufengense, H. macedonicum, H. matthewi, H. mediterraneum, H. molayanense, H. minus, H. periafricanum, H. philippus, H. phlegrae, H. prostylum* (type), *H. rocinantis, H. sellardsi, H. shirleyae, H. sithonis, H. sitifense, H. tehonense, H. theniusi,* and *H. venustum.*

## *Hypohippus*

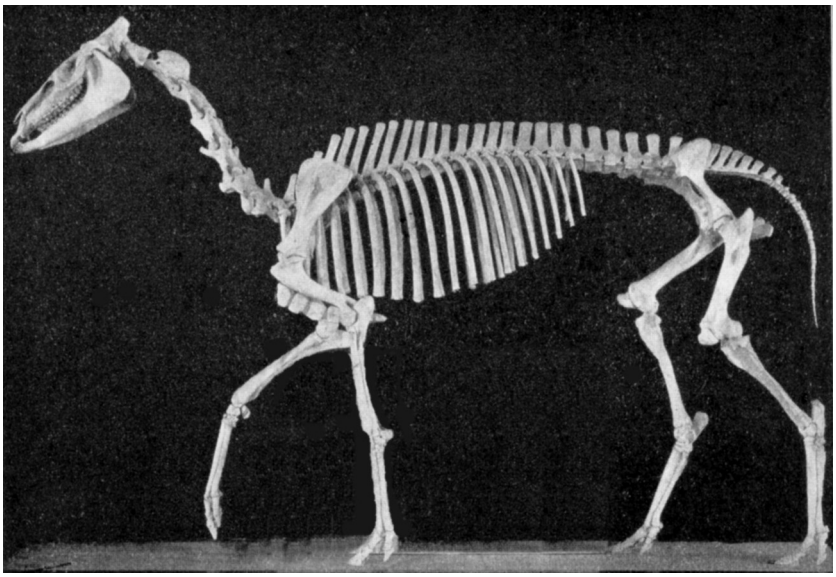


**Figure 6 – *Hypohippus osborni* skeleton**
**Credit: Osborn, public domain**

Yet another relative of *Anchitherium*, *Hypohippus* lived during the Miocene 17 to 11 million years ago (Mya) in what is now Nebraska, Colorado, and Montana. The largest of the anchitherine horses, *Hypohippus* was about the size of a modern horse, weighing between 400 and 600 kg.


**Figure 7 - *Hypohippus***
**Credit: Heinrich Harder (1858-1935), public domain**

Joseph Leidy first described *Hypohippus* in 1858. There are two species in the genus: *H. affinis* and *H. osborni*.

## *Neohipparion*

**Figure 8 – *Neohipparion* skeleton at the Natural History Museum of Los Angeles County**
**Credit: Jonathan Chen, Creative Commons**

*Neohipparion* lived in North and Central America during the Miocene and Pliocene. It was about 1.4 to 1.5 m long. Fossils of *Neohipparion* have been found in Canada, Honduras, Mexico and the United States. *Neohipparion* has longer legs than its relative *Hipparion*, perhaps as an adaptation to the changing landscape of the Late Miocene where grassy plains were replacing forests and fast moving predators were emerging.

**Figure 9 - *Neohipparion* Reconstruction**
**Credit: Jacksonwarrier, CC-BY-SA**

James W. Gidley first described *Neohipparion* in 1903 from specimens he collected during his expedition to Texas on behalf of the American Museum of Natural History 1899 to 1901. Earlier Joseph Leidy (in 1869) and Edward D. Cope (in 1893) described fossils that were later included in the genus. There are five species in the genus: *N. affine* (type), *N. eurystyle*, *N. gidleyi*, *N. leptode*, and *N. trampasense*.

## *Pliohippus*

**Figure 10 – *Pliohippus*, Natural History Museum, Karlsruhe**
**Credit: Ghedoghedo, Creative Commons Attribution-Share Alike 4.0 International license**

Fossils of the genus, *Pliohippus* come from Miocene aged rocks in North America. It was adapted to eating grasses and living on the Miocene prairie. While it was once thought to be an ancestor of modern horses, the curved shape of its teeth mark it as very different from the straight teeth of modern horses. However, the shape of its hooves, with greatly reduced side toes, show that the evolutionary forces that led to the single toe of *Equus* was acting on other species as well.

*Pliohippus* fossils come from deposits in the Great Plains including Colorado, Nebraska, North and South Dakota as well as in Alberta and Saskatchewan. Noted localities include the Ashfall Fossil Beds of Nebraska.

**Figure 11 – *Pliohippus* Reconstruction**
**Credit: Jacksonwarrier, CC-BY-SA**

O. C. Marsh first described *Pliohippus* in 1874. There are seven species in the genus: *P. castilli, P. fossulatus, P. mirabilis, P. nobilis, P. pernix, P. tantalus,* and *P. tehonensis.*

## *Equus simplicidens*


**Figure 12 – *Equus simplicidens* in the Natural History Museum of Utah**
**Credit: Daderot, public domain**

Also called the Hagerman horse or the American Zebra, *Equus simplicidens* was the earliest example of its genus in the fossil record. It lived from the Pliocene until the Pleistocene. A grazing animal of the plains, *Equus simplicidens* fossils come from deposits in the Great Plains of the United States as well as Mexico.

**Figure 13 – Reconstruction of *Equus simplicidens* (fossil Hagerman horse)**
**Credit: James St. John, CC BY 2.0 license**

Edward Cope first described fossils of *Equus simplicidens* in 1892. Earlier, in 1865, Joseph Leidy described a fossil now considered to be *Equus simplicidens.* James W. Gidley gave it the common name, the Hagerman horse, from fossils recovered by rancher Elmer Cook on this land in Hagerman, Idaho. The

site that later became known as the Hagerman Fossil Beds, which are now an American National Monument.

## Wrapping it Up

Many people are fascinated by horses. Besides the few shown in this posting, there are lots more examples of fossil horses. If this interests you, start with the link to the Equidae or you can look into these two links.

- Miocene horses
- Pliocene horses

## 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.