

*December 12, 2022*

## News and notes

Before going on to look at some more mammals from the [Neogene Period](#), here are some news items that I thought were interesting.

## Research

- From the American Mineralogist: [Oxidation of arcs and mantle wedges: It's not all about iron and water](#); has a link to request the full text.
- Fluvial sedimentary geology, from the United States National Research Council of Science & Technology: [Predicting the future landscape of a river](#).
- More on fluvial geology: [Explaining the climate sensitivity of junction geometry in global river networks](#).
- Mountain building: [A new biologic paleoaltimetry indicating Late Miocene rapid uplift of northern Tibet Plateau](#); behind a paywall, Phys.org summary [here](#).

## Paleontology

- Really old DNA: [A 2-million-year-old ecosystem in Greenland uncovered by environmental DNA](#); Eureka Alert summary [here](#).
- Ice ages and plant evolution: [Ancestral area analyses reveal Pleistocene-influenced evolution in a clade of coastal plain endemic plants](#); Eureka Alert summary [here](#).

## Glaciology

- [Summertime surface mass balance and energy balance of Urumqi Glacier No. 1, Chinese Tien Shan, modeled by linking COSIMA and in-situ measured meteorological records](#); behind a paywall, Phys.org summary [here](#).
- Periodicity of ice ages: [West Antarctic ice volume variability paced by obliquity until 400,000 years ago](#); Phys.org summary [here](#).
- Greenland glaciers: [Holocene ice-stream shutdown and drainage basin reconfiguration in northeast Greenland](#); Phys.org summary [here](#).

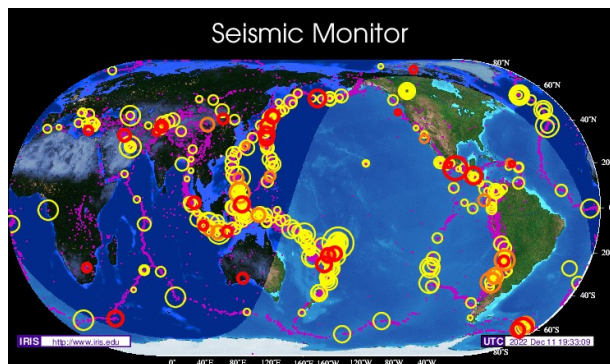
## Environmental Geology and Hydrogeology

- From the University of Gothenburg, Sweden: [Evolutionary and ecological effects of metal pollution on coastal diatoms](#); Eureka Alert summary [here](#).
- [A Pivotal New Approach to Groundwater Quality Assessment](#): Phys.org summary [here](#).
- Whiskey is for drinking, water is for fighting: [Sustainable management of groundwater extraction: An Australian perspective on current challenges](#); Phys.org summary [here](#).

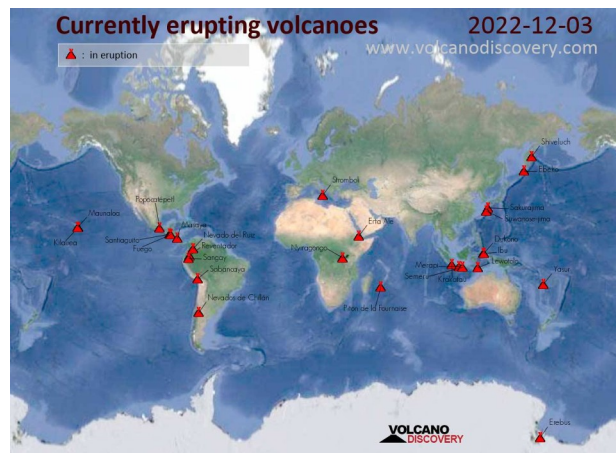
## Mining and Energy

- [Keystone Oil Pipeline to Attempt Partial Restart After 14,000-Barrel Spill](#); related, [Keystone spill prompts scrutiny of permit allowing pipeline to run faster](#).
- From Mining.com: [Low-cost, high-capacity sodium-sulphur battery expected to be gamechanger for clean energy economy](#).
- Geopolitics, something to think about: [Assessment of Undiscovered Continuous Oil and Gas Resources in the Dnieper-Donets Basin and North Carpathian Basin Provinces, Ukraine, Romania, Moldova, and Poland, 2015](#).

## Volcanoes, Earthquakes and Geohazards



[Link](#)



[Link](#)

- From Phys.org: [Are volcanoes impacted by climate change? Or is it the other way around?](#)
- From Phys.org: [More magma found below Yellowstone Caldera than expected](#); lined to two research papers [here](#) and [here](#).
- From Phys.org: [Some Native Hawaiians believe volcanoes should be treated like people, with distinct rights and responsibilities](#).
- From Phys.org: [Lessons from Cianjur: Earthquake-prone Indonesia does not have seismic mitigation plan](#).
- [Three-dimensional stress state above and below the plate boundary fault after the 2011 Mw 9.0 Tohoku earthquake](#); Phys.org summary [here](#).
- Earthquake prediction: [Supervised Machine Learning of High Rate GNSS Velocities for Earthquake Strong Motion Signals](#); Phys.org summary [here](#).
- Earthquake studies from Japan: [Statistical study on the regional characteristics of seismic activity in and around Japan: frequency-magnitude distribution and tidal correlation](#).

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## Terrestrial Vertebrates of the Neogene – Mammals, Part 3: Artiodactyla and Proboscidea

This week we'll look at a couple of more orders of mammals from the [Neogene Period](#): the [Artiodactyla](#) or even-toed ungulates and the [Proboscidea](#) or elephants. Next week we will windup the Neogene with a look at carnivores and primates and finish up the year with a year-end posting on December 26<sup>th</sup>.

### Artiodactyla

Artiodactyls is an order of mammals that includes camels ([Tylopoda](#)), pigs ([Suina](#)), ruminants ([Ruminantia](#)), hippopotamuses ([Hippopotamidae](#)) and whales ([Cetacea](#)). We looked at the cetaceans in our [October 17<sup>th</sup> posting](#) when we looked at marine mammals of the Neogene and Paleogene. This week, we'll look at camels, pigs, ruminants, and hippos from the Neogene.

#### Camels: *Hemiauchenia*

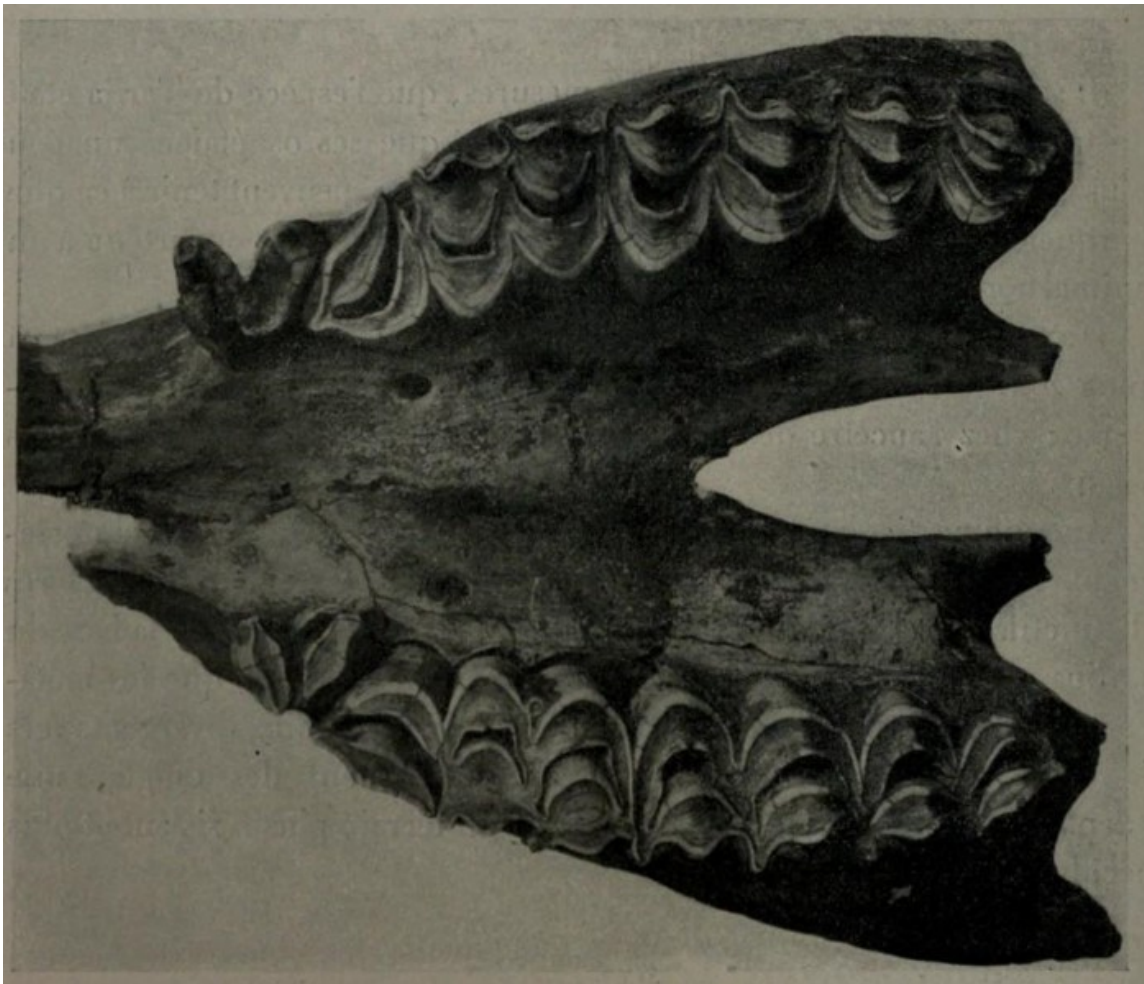


Figure 1 - Fossil maxilla of *Hemiauchenia*  
Credit: [Marcellin Boule \(1861 – 1942\)](#), public domain

An extinct genus related to modern llamas, *Hemiauchenia* lived from the Miocene to the end of the Pleistocene. The genus evolved in North America during the Miocene and migrated to South America during the Pliocene and Pleistocene.



Figure 2 – *Hemiauchenia* reconstruction  
Credit: [DeadMonkey8984](#), CC-BY-SA

Fossils of *Hemiauchenia* come from Argentina, Canada, Chile, El Salvador, Mexico and the United States. Paul Gervais and Florentino Ameghino first described *Hemiauchenia* in 1880. There are eight species of *Hemiauchenia*: *H. macrocephala*, *H. minima*, *H. blancoensis*, *H. vera*, *H. paradoxa* (type), *H. seymourensis*, *H. edensis*, and *H. guanajuatensis*.

**Pigs: Sanitherium**

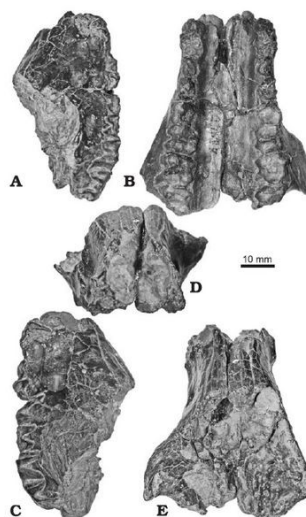


Figure 3 – Sanitheriid mammal *Diamantohyus africanus*  
Credit: [Pickford, M., Miller, E.R., and El-Barkooky, A.N.](#)  
[Creative Commons Attribution-Share Alike 4.0 International](#) license

[Sanitheriid](#) mammals were a family of suoids (pigs) that lived from the [Oligocene](#) to the [Middle Miocene](#) in Africa, Europe, and South Asia. Among the genera of sanitheriids was [Sanitherium](#) (also called *Diamantohyus* and *Xenochoerus*). While modern pigs are primarily omnivores, the teeth of sanitheriids suggest that they leaned towards a carnivorous diet.

[Hermann von Meyer](#) first described *Sanitherium* in 1865; there are seven species in the genus: *Diamantohyus africanus*, *Diamantohyus nadirus*, *Sanitherium cingulatum*, *Sanitherium masticum*, *Sanitherium nadiurum*, *Sanitherium schlagintweiti* (type), and *Xenochoerus leobensis*. [George G. Simpson](#) defined the Sanitheriidae family in 1945.

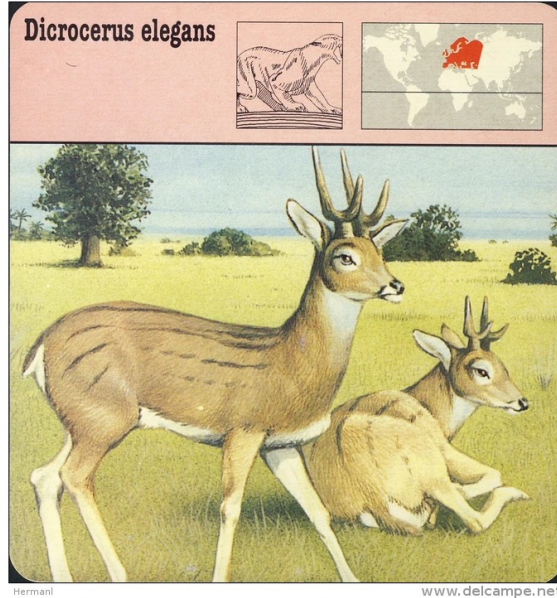
#### Ruminants: *Dicrocerus*



**Figure 4 – *Dicrocerus elegans* skull at the [Natural History Museum in London, England](#)  
Credit: [Emőke Dénes](#), [Creative Commons Attribution-Share Alike 2.5 Generic](#) license**

Ruminants are a large suborder of mammals that includes [bovines](#), [goats](#), [sheep](#), [giraffes](#), [deer](#), [gazelles](#), and [antelopes](#). Among the deer of the Neogene was the genus *Dicrocerus*, which lived during the Miocene of Europe and Asia.

About 70 centimetres (cm) high at the shoulder, *Dicrocerus* lived in forest environments. [Fossils of \*Dicrocerus\*](#) have been found in China, France, Germany, Portugal, Russia, Serbia, Slovakia, and Ukraine. It died out during the Pliocene without leaving any descendants. It was among the [earliest deer](#) to have a set of antlers.



**Figure 5 – *Dicrocerus elegans* Reconstruction**  
**Credit: [DeadMonkey8984](#), [CC-BY-SA](#)**

[Edouard Lartet](#) first described *Dicrocerus* in 1837 from fossils he found near [Sansan](#), France. (reference: Lartet, E., 1837, *Sur les débris fossiles trouvés à San-san, et sur les animaux antédiluviens en général*, Comptes Rendus de la Academie des Sciences de Paris. 5: 158-159, not online). There are four species of the genus *Dicrocerus*: *D. belometchetkense*, *D. elegans* (type), *D. grangeri*, and *D. Salomeae*,

**Ruminants: *Ugandax***



**Figure 6 – *Ugandax* Reconstruction**  
**Credit: [Apokryltaros](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license**

A bovine ruminant from East Africa, [Ugandax](#) lived from the Miocene till the Pleistocene. *Ugandax* may be the ancestor of modern [African buffaloes](#) and it represents the earliest bovine in the African fossil record. Fossils of [Ugandax come from](#) Ethiopia, Kenya and Malawi.

[H. Basil S. Cooke](#) and [Shirley Coryndon](#) were the first to [describe Ugandax](#) in 1970. There are two species in the genus *Ugandax*: *U. gautieri* (type) and *U. coryndonae*.

### **Hippopotamuses: *Hexaprotodon***



**Figure 7 – *Hexaprotodon palaeindicus* skull**

**Credit: [Ghedoghedo](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license**

A hippopotamus from Asia, the genus [Hexaprotodon](#) lived from the Miocene till the end of the Pleistocene. Sometimes described as a variety of [pygmy hippopotamus](#), which it strongly resembles, *Hexaprotodon* is now considered a distinct genus. The earliest fossils of *Hexaprotodon* came from Late Miocene deposits in the [Siwalik Hills](#) of India and the [youngest fossils](#) came from the [Narmada River](#) valley in central India.

[Hugh Falconer](#) and [Proby Cautley](#) were the [first to describe](#) *Hexaprotodon* in 1836. There are 16 species in the genus *Hexaprotodon*: *H. bruneti*, *H. crusafonti*, *H. hipponensis*, *H. imagunculus*, *H. iravticus*, *H. karumensis*, *H. mingo*, *H. namadicus*, *H. palaeindicus*, *H. pantanellii*, *H. primaevus*, *H. protamphibius*, *H. sculus*, *H. sinhaleyus*, *H. sivajavanicus* and *H. sivalensis* (type). There is also the Myanmar hippopotamus, thought to be a species of *Hexaprotodon* but it has not yet been assigned a species name.



Figure 8 – Modern Pygmy Hippopotamuses, *Choeropsis liberiensis*  
Credit: [Raimond Spekking, Creative Commons Attribution-Share Alike 4.0 International](#) license

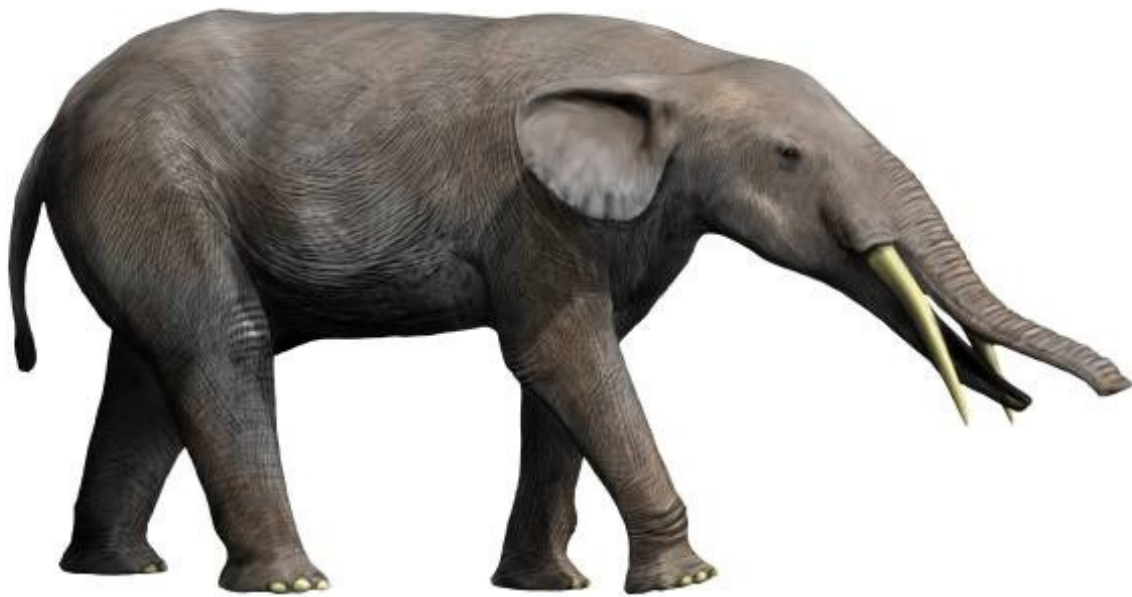
## Elephants

### *Gomphotherium*



Figure 9 – *Gomphotherium productum*  
Credit: [Ryan Somma, Creative Commons Attribution-Share Alike 2.0 Generic](#) license

[Gomphotherium](#) was a genus of elephant that lived Eurasia, Africa, North America and South America from the Oligocene till the Pleistocene. The genus evolved in North America and migrated to Asia and Africa. Fossils of *Gomphotherium* [have been found](#) in Austria, Chile, China, the Czech Republic, Egypt, Ethiopia, France, Germany, India, Kenya, Macedonia, Mexico, Namibia, Pakistan, Panama, Poland, Portugal, Romania, Russia, Saudi Arabia, Spain, Switzerland, Thailand, Tunisia, Turkey, Ukraine, and the United States. *Gomphotherium* were large creatures, about 2.5 m tall and 4600 kg in weight.



**Figure 10 – *Gomphotherium***

**Credit: [Nobu Tamura](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license**

[Hermann Burmeister](#) first described *Gomphotherium* in 1837 in the *Handbuch der Naturgeschichte* [Part 2] xii + pp. 369–858. Enslin, Berlin (not online). There are 14 species in the genus *Gomphotherium*: *G. anquirvalis*, *G. angustidens* (type), *G. brewsterensis*, *G. connexus*, *G. emmonsi*, *G. gratum*, *G. nebrascensis*, *G. ngorora*, *G. productum*, *G. pygmaeus*, *G. rugosidens*, *G. shensiensis*, *G. simplicidens*, and *G. wimani*. The type species, *G. angustidens*, was first described by [Georges Cuvier](#) in 1817.

## *Stegodon*



Figure 11 – *Stegodon miensis* skeleton in the [Mie Prefectural Museum](#), Japan  
Credit: [Miyuki Meinaka](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

*Stegodon* lived in Asia and Africa from the Late Miocene until the Pleistocene. *Stegodon* were generally fairly large, one specimen was 3.87 m tall and probably weighed 12.7 tonnes (12,700 kg). Some of the species found on islands showed dwarfism. Fossils of *Stegodon* [have been found](#) in Chad, China, Congo (Kinshasa), Ethiopia, Greece, India, Indonesia, Israel, Japan, Kenya, Myanmar, Nepal, Pakistan, the Philippines, South Africa, Syria, Taiwan, Thailand, Uganda, and Vietnam.



Figure 12 – *Stegodon*  
Credit: [Jacksonwarrier](#), [CC-BY-SA](#)

Hugh Falconer and Proby Cautley [first described](#) *Stegodon* in 1847. There are 15 species in the genus *Stegodon*: *S. aurorae*, *S. elephantoides*, *S. florensis*, *S. ganessa* (type), *S. kaisensis*, *S. luzonensis*, *S. miensis*, *S. mindanensis*, *S. orientalis*, *S. sompoensis*, *S. sondaari*, *S. trigonocephalus*, and *S. zdanskyi*. The type species, *Stegodon ganessa* is named after the Hindu elephant god, [Ganessa](#).

## Wrapping it Up

There are lots of other mammals from the Neogene. If this interests you, followup on the links above and you can also look into these two links for a start:

- [Pliocene mammals](#)
- [Miocene mammals](#)

## 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.