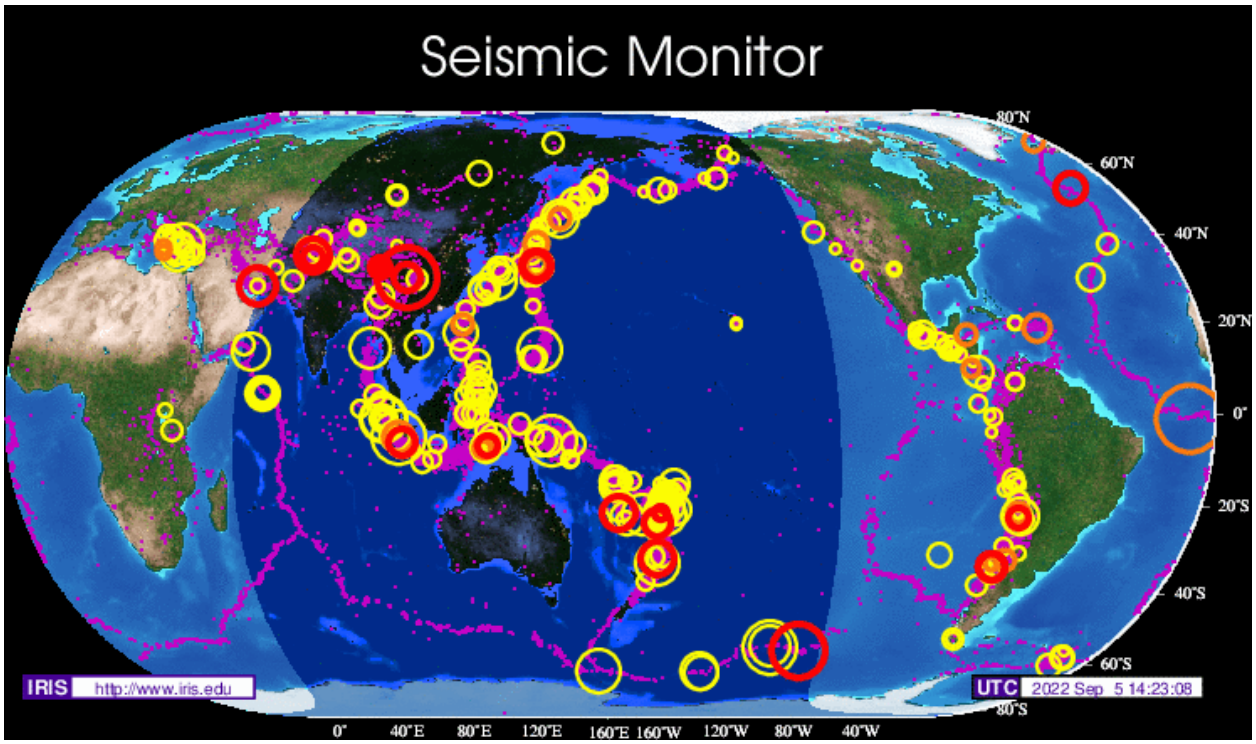
September 5, 2022

News and notes

It's Labour Day in Canada and the United States today, so for those of you with a day off from paid work, enjoy your well earned rest. Before going on to take a look at plant fossils from the Paleogene Period, here are some news items that I thought were interesting.

Volcanoes, Earthquakes and Geohazards



Seismic Monitor Link

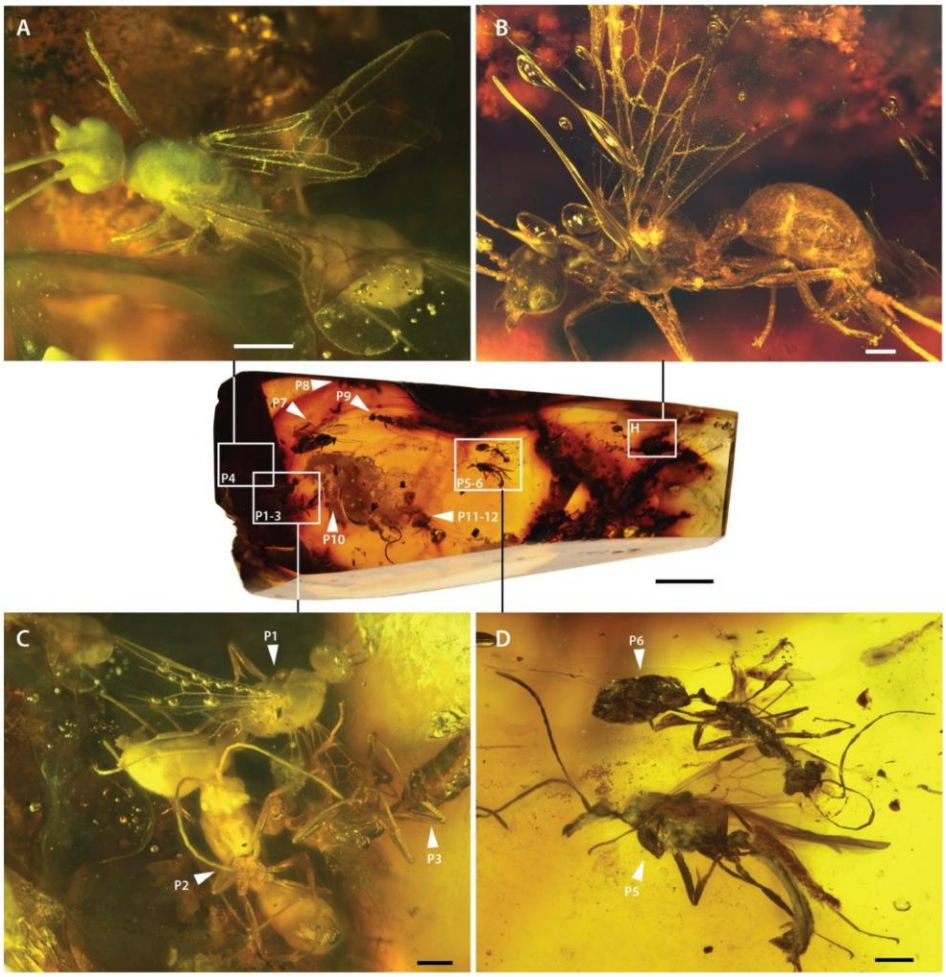
- Detecting Pre-seismic Signals in GRACE Gravity Solutions: Application to the 2011 Tohoku M_w 9.0 Earthquake; Phys.org summary here.
- Geohazards and coastlines: Coastal Hazard Wheel; Phys.org summary here.
- Faults, fluid pressure, and earthquakes, from Nature communications: Geological constraints on dynamic changes of fluid pressure in seismic cycles.
- M 6.9 Earthquake on the central Mid-Atlantic Ridge.
- From Volcano Discovery: Worldwide Volcano News and Updates and Latest Quakes

Research

- Eureka Alert: New Geology articles published online ahead of print in August.
- Climate change: Enhanced ocean oxygenation during Cenozoic warm periods; Phys.org summary here.

- Plate tectonics: Composition of continental crust altered by the emergence of land plants; Phys.org summary here.
- From Nature communications: Evolution of tropical land temperature across the last glacial termination.
- UCalgary scientist studies Mars' geology for signs the planet could have once supported life.

Paleontology



Photograph of entire amber piece MAIG 6016, with indication of type specimens (labeled H for holotype, P1–P12 for paratypes) of †Desyopone hereon gen. et sp. nov., and with detailed views of seven of them (A–D). (A) paratype 4; (B) holotype; (C) paratypes 1–3; (D) paratypes 5–6. Scale bars: 0.5 mm.

Credit: Figure 1 in Boudinot *et al*, 2022
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- Ants in amber: Genomic-Phenomic Reciprocal Illumination: *Desyopone hereon* gen. et sp. nov., an Exceptional Aneuretine-like Fossil Ant from Ethiopian Amber (Hymenoptera: Formicidae: Ponerinae); Eureka Alert summary here.

- Zimbabwe: Africa's oldest dinosaurs reveal early suppression of dinosaur distribution; Phys.org summary here.
- Plant evolution from algae: A phylogenomically informed five-order system for the closest relatives of land plants; Phys.org summary here.
- No sh!t: Fossil Biomarkers and Biosignatures Preserved in Coprolites Reveal Carnivorous Diets in the Carboniferous Mazon Creek Ecosystem; Phys.org summary here.
- Competition for limiting resources in evolution: Struggle for phosphorus and the Devonian overturn; Phys.org summary here.
- After the asteroid, from Eos: A Post-Impact Deep Freeze for Dinosaurs.
- Dinosaurs banging their heads together: The appendicular myology of *Stegoceras validum* (Ornithischia: Pachycephalosauridae) and implications for the head-butting hypothesis.
- Had to wait till the geologist died: Enormous fossil collection donated to University of Portsmouth.

Environmental Geology and Hydrogeology

- Assessing groundwater pollution: Accuracy assessment of inverse distance weighting interpolation of groundwater nitrate concentrations in Bavaria (Germany).
- Cholera detection: Improving environmental monitoring of Vibrionaceae in coastal ecosystems through 16S rRNA gene amplicon sequencing.

Mining and Energy

- Helping hands: Stranded Tourist with Dead Electric Car Helped by West Virginia Coal Miners.
- Norway's last coal mine extends life to feed European industry.
- From the United States Energy Information Administration (USEIA): Pre-Labor Day retail gasoline prices are the highest in the United States since 2014.
- Also from the USEIA: Record numbers of solar panels were shipped in the United States during 2021.
- Shale oil in China, from Phys.org: New study suggests lacustrine shale reserves can bolster China's energy independence; original research here, in Chinese.
- Canada's largest oil and gas pipeline operators embrace renewable energy.
- Commentary: Canada Did Not 'Miss' Its LNG Window – It Was Nailed Shut.
- U.S. Rig Count Slips Amid Retreat In Crude Prices.
- Geopolitics can get nasty: Nordstream Becomes 'No Stream': EU gas markets brace for price surge after latest Russia gas cut.
- Really nasty: Here are the Russian oil executives who have died in the past nine months.
- Renewed Clashes In Tripoli Threaten Libyan Oil Production.
- France's EDF Vows To Restart All Nuclear Reactors By Winter.

- Commentary: Nuclear Power Could Cut Global Emissions By Half.
- Eavor to drill the deepest and hottest directional geothermal well in history: Eavor-Deep™
- Geology of the Noranda District ore system: The implications of crustal architecture and transcrustal upflow zones on the metal endowment of a world-class mineral district.
- The formation of massive sulfide deposits: Iron isotopes constrain sub-seafloor hydrothermal processes at the Trans-Atlantic Geotraverse (TAG) active sulfide mound.
- Modelling lead/silver deposits: A New Alpine Metallogenic Model for the Pb-Ag Orogenic Deposits of Macôt-la Plagne and Peisey-Nancroix (Western Alps, France).

Pretty shiny rocks

Credit: Lucapa Diamond

- Lucapa finds Angola mine's sixth-largest white diamond.

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Paleogene Plants

Figure 1 - Flowering Plants Flourished and Diversified During the Paleogene
Credit: James St. John, Creative Commons Attribution 2.0 Generic license

Plants are important in ecosystems as the primary producers, converting sunlight, minerals, and carbon dioxide into vegetation that is consumed by herbivore animals. Recent research even suggests that plants have affected the composition of the Earth's crust. The fossil record suggests that by the Paleogene Period, flowering plants (angiosperms) continued to be the most common type of plant although gymnosperms (conifers, cycads, ginkgos, and gnetophytes) and other plant groups continued. Let's look at some examples.

Flowering Plants

Grasses

Among the angiosperms, the Paleogene is marked by the flourishing and evolution of grasses. While the earliest fossils of grasses are from the Maastrichtian of the Late Cretaceous, simple grasses, with shallow roots, flourished during the Paleogene. More complex grasses, with deep roots, arose later during the Neogene. Grasses are important in ecosystems since they provide a lots of the food eaten by herbivores.

One example from the fossil record is *Eograminis balticus* described in 2021 by researchers George Poinar Jr. and Robert J. Soreng from fossilised grass in Paleogene aged Baltic amber.

Figure 2 - *Eograminis balticus*
Credit: Fig. 1 in Poinar and Soreng, 2021

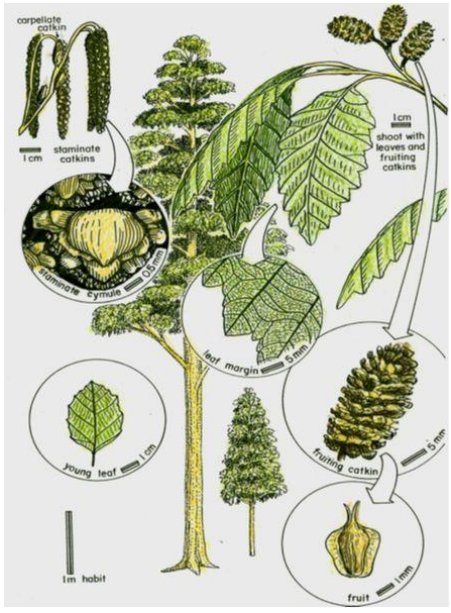
Eograminis balticus appears to have lived in a warm temperate habitat similar to today's mixed deciduous and conifer forests. Examination of the fossil suggests that it is related to the ancestors of modern Arundinoideae family of grasses.

Maples - Acer chaneyi

Figure 3 - Fossil Leaf of an Oligocene Maple, *Acer chaneyi*
Credit: F.H. Knowlton, public domain

Found in Oligocene to Miocene sediments from Alaska, Idaho, Nevada, Oregon and Washington, *Acer chaneyi* is an extinct species of maple. The species was named by Frank Knowlton in 1926.

Alders - Alnus heterodonta



Described by Gregory J. Retallack, Erick A Bestland and J. Fremd Theodore in their 1996 paper, fossils of *Alnus heterodonta* came from the Oligocene Big Basin Member of the John Day Formation of Picture Gorge district of Oregon.

Like modern alders, *Alnus heterodonta*, appears to have lived in a cool temperate habitat and to have been one of the first species to establish itself on disturbed ground, for example, after a fire.

Figure 4 - *Alnus heterodonta* Reconstruction
Credit: Retallack, Creative Commons Attribution-Share Alike 4.0 International license

Malvaceae -Florissantia, A Small Flower

Figure 5 - *Florissantia quilchenensis*
Credit: Kevmin, Creative Commons Attribution-Share Alike 4.0 International 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license

Leo Lesquereux first described *Florissantia* in 1883 from fossils found in the Eocene aged Florissant Formation of Colorado. Lesquereux originally described it as a member of the morning glory family, calling it *Porana*. Frank Knowlton coined the name *Florissantia,* naming the flower after the formation in which the fossils were first found. Fossils of the genus have been found in Alaska, British Columbia, Colorado, Montana, Oregon, Utah, Washington, Wyoming and the Russian far east.

There are four species of the genus *Florissantia: F. ashwillii, F. quilchenensis, F. sikhote-alinensis,* and *F. speirii.* It is a member of the Malvaceae family.

Malvaceae - Tilia johnsoni

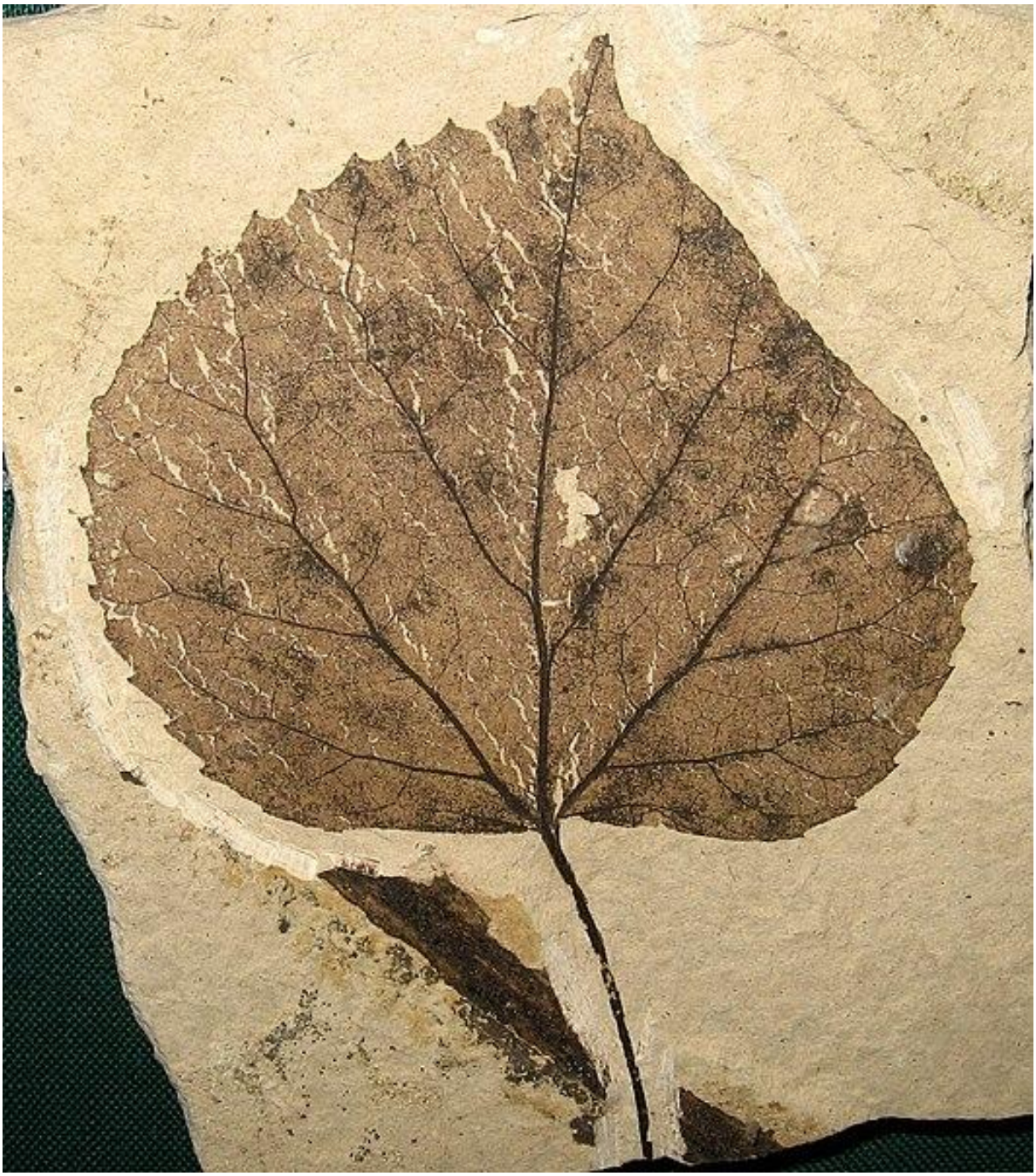


Figure 6 - Fossil Leaf of *Tilia johnsoni*
Credit: Kevmin, Creative Commons Attribution-Share Alike 3.0 Unported license

First described by , J.A. Wolfe and W.C. Wehr in 1987, the fossil leaf of *Tilia johnsoni*, shown in Figure 6, came out of 49 Mya Eocene (Ypresian) deposits in the Klondike Mountain Formation Washington state. *Tilia johnsoni* fossils were also found in the Allenby Formation near Princeton, at the Falkland fossil site near Falkland, the McAbee Fossil Beds near Kamloops, the Hat Creek Amber and Driftwood Canyon Provincial Park near Smithers.

The genus *Tilia* continues to live today and includes some 30 species of trees such as basswood and linden (or lime) all of which live in temperate climates. *Tilia* is also a member of the Malvaceae family.

An Antarctic Water Lily - Notonuphar

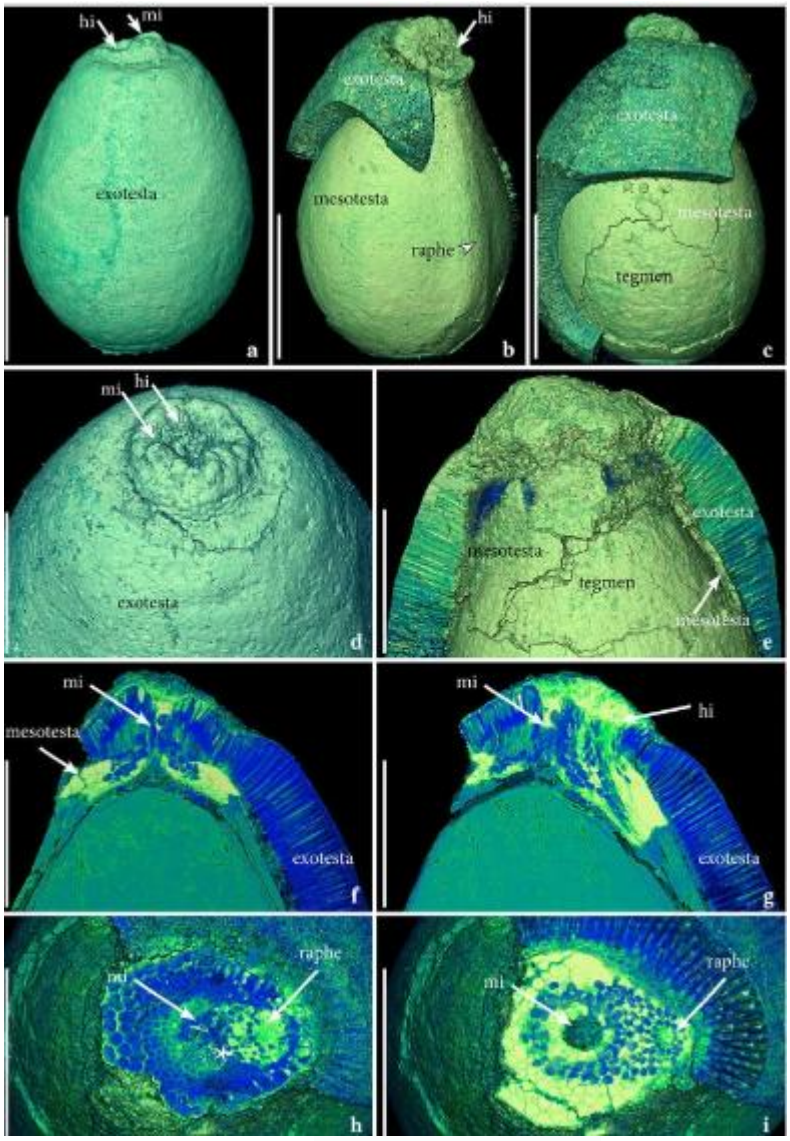


Figure 7 - ***Notonuphar antarctica***
Credit: Figure 2 in Friis *et al*, 2017

Antarctica is not a place where you would expect to find a water lily, however during the Eocene, the climate was similar to the Valdivian temperate rain forest of Chile. First described in 1987 in the paper by Friis *et al*, 2017, the team of Else M. Friis, Ari Iglesias, Marcelo A. Reguero & Thomas Mörs found fossils of *Notonuphar antarctica* in the Eocene-aged La Meseta Formation of Seymour Island, Antarctica.

Notonuphar antarctica was in the family Nymphaeaceae, a family of plants that continues to this day and includes some 70 species of wetland plants, mostly water lilies.

Winding it Up

One thing that sticks out is that if you could go back in time, the flora of the Paleogene would appear vaguely familiar to modern eyes with hardwood trees, flowers and water lilies. You could almost feel at home until you saw some of the weird animals, which we'll take a look at in the next few weeks.

I've only shown a few of the plant fossils from the Paleogene Period; there are many more. So if this intrigues you, follow up on the links and do some more reading.

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.