

March 7, 2022

News and views

Before going on to a look at plant life during the Pennsylvanian Period, here are some news items that I thought were interesting.

Geopolitics and Resources

The tragedy in Ukraine continues and we should expect many knock-on effects from the conflict. Here are a few articles on it. Keep in mind that during time of war, no information sources can be entirely trusted, so take these articles with a grain of salt.

- From the Economist: [The economic consequences of the war in Ukraine](#); behind a paywall.
- From CNBC: [A Russian oil and gas embargo is in the cards. And analysts warn it will have huge consequences.](#)
- From the United States Energy Information Administration (USEIA): [Crude oil prices increase above \\$100 per barrel following Russia's invasion of Ukraine](#) ; here are the [current oil prices.](#)
- From Forbes: [After The Ukraine Invasion: Energy Realism Emerges In Germany While The US Doubles Down.](#)
- Searching for a safe place to put your money: [Gold climbs as haven demand gains on shelling of nuclear plant](#); here are the [current precious metals prices.](#)
- [Iron ore](#) and [copper](#) prices also increase due to war.
- Situation reports can be found at [understandingwar.org](#)

Plate Tectonics

- [Plate tectonic chain reaction revealed by noise in the Cretaceous quiet zone.](#)
- [Balkanatolia: Forgotten Continent Discovered by Team of Paleontologists and Geologists.](#)
- [Drifting apart: New study explains the driving force behind continental drift.](#)
- [History of earthquakes along the creeping section of the San Andreas fault, California, USA.](#)
- [Mountain-sized chunk of rock hiding under Japan is channeling earthquakes.](#)

Research

- [Traces of life in the Earth's deep mantle.](#)
- [Behold The Most Up-to-Date Scientific Reconstruction of a Prehistoric Ichthyosaur.](#)
- End of the Permian: [Machine learning identifies ecological selectivity patterns across the end-Permian mass extinction.](#)

- Modelling, they still have to deal with the problem of garbage in /garbage out: [New geoscientific modeling tool gives more holistic results in predictions.](#)
- On the Hadean/Archean transition: [Confessions of a former fireball: How Earth became habitable.](#)
- Banded Iron formations, one of my favourites: [2470 million-year-old banded iron formation reveals a climatic oscillation consistent with the Gleissberg solar cycle.](#)
- Stable isotope analysis: [Zn-, Mg- and O-isotope evidence for the origin of mantle eclogites from Roberts Victor kimberlite \(Kapaavaal Craton, South Africa\).](#)
- From the Pleistocene: [Young Impact Crater Uncovered in Yilan, China.](#)
- Mining Research: [Decreasing Ore Grades in Global Metallic Mining: A Theoretical Issue or a Global Reality?](#)
- [110-million-year-old Lizard Rhetinosaurus Found in Amber.](#)

Geoscience Debate

Here is a good example of debate in the world of geoscience:

- Original article: [Zircon \(U-Th\)/He thermochronology reveals pre-Great Unconformity paleotopography in the Grand Canyon region;](#)
- Here is a [comment on the original article;](#) and the [reply to the comment.](#)

Volcanoes

- [Nealtican lava flow field, Popocatepetl volcano: A window to the past and future hazards.](#)
- Hunga Tonga-Hunga Ha'apai: [Tonga Volcano Eruption To Have Smaller Cooling Impact on Climate Change Than First Thought.](#)
- [Worldwide Volcano News and Updates.](#)

Conservation

- Hunters have known this for a long time: [Hunting Can Be Good for Wildlife Populations – If Managed Correctly;](#) keeping the population within the carrying capacity of the land.

Upcoming Events

- The International Fossil Coral and Reef Society [2022 Spring Lecture Series.](#)

March 7, 2022

Terrestrial Plant Life in the Pennsylvanian

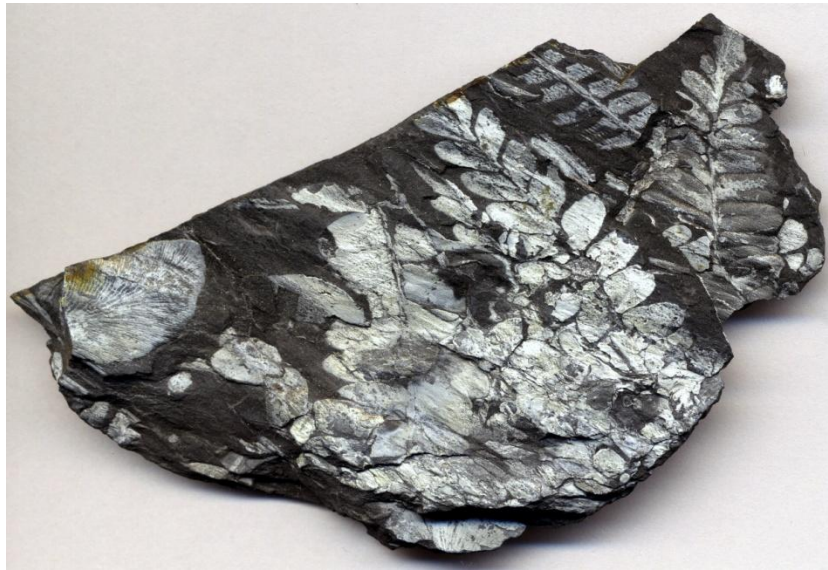


Figure 1- Fossil Plants in Carbonaceous Shale

Credit: [James St. John](#), [Creative Commons Attribution 2.0 Generic license](#)

This week we'll look at terrestrial plant life during the [Pennsylvanian Period](#) (a.k.a Late [Carboniferous](#)). Next week we will go on to animal life during that time.

The abundant coal deposits of the Pennsylvanian Period are testimony to an important event in the history of life on Earth: the development of true forests, at least in lowland, coastal sites. The plants in these forests included: [Lycophytes](#), [Calamitaceae](#) horsetails such as [Calamites](#), [Marattiales ferns](#), [seed ferns](#), and early [gymnosperms](#) such as the [cordaites](#). Let's look at a few examples of these plants in the Pennsylvanian.

Lycophytes



Figure 2 - [Lepidostrobus variabilis](#), a Pennsylvanian Lycophyte

Credit: [Verisimilus](#), [Creative Commons Attribution 3.0 Unported license](#)

Modern Lycophytes are represented by [club mosses](#), small plants that are generally only a few

inches tall. However, during the Pennsylvanian Period lycophytes grew huge, up to 30 m (100 feet) tall. Lycophytes reproduce by spores. Examples of lycophytes from the Pennsylvanian include *Lepidostrobus variabilis* and *Lepidodendron sp.*

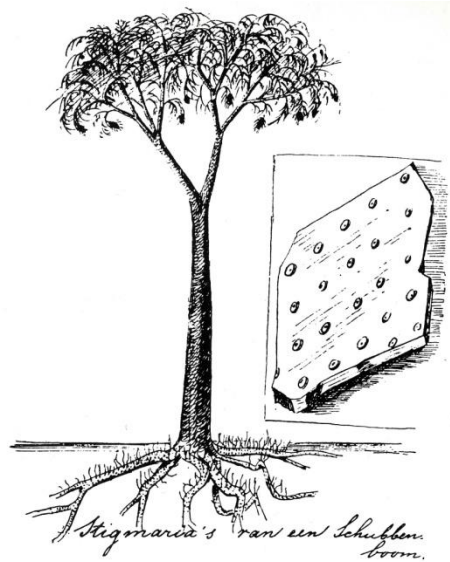


Figure 3 - Reconstruction (1911) of [Lepidodendron sp.](#)
Credit: Eli Heimans (1861-1914), Dutch conservationist, [public domain](#)

Horsetails, *Calamites*



Figure 4 - Calamitaceae - [Annularia stellata](#)
Credit: [Hectonichus](#), [Creative Commons Attribution 3.0 Unported license](#)

Related to, and possibly ancestral to modern horsetails, [Equisetaceae](#), the Calamitaceae family, of which *Calamites* and *Annularia stellata* are part of, first arose in the [Mississippian Period](#), flourished in the Pennsylvanian and went extinct in the Lower [Permian](#). Calamitaceae trunks

were segmented, similar to bamboo and had vertical ribbing. It had needle like leaves arranged in whorls on the branches, with up to 25 leaves per whorl. Like modern Equisetaceae, Calamitaceae reproduced by spores.

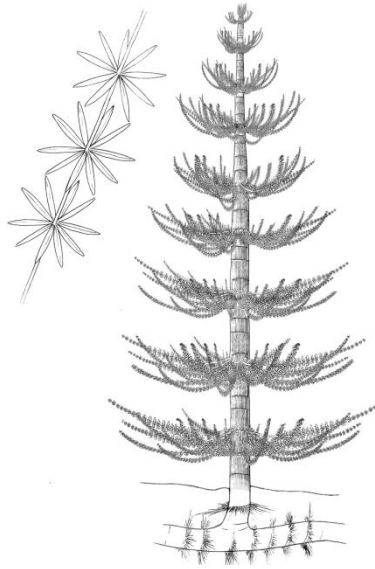


Figure 5 - Reconstruction of *Calamites*
Credit: [Falconaumann](#), [Creative Commons Attribution 3.0 Unported](#) license

Marattiales Ferns

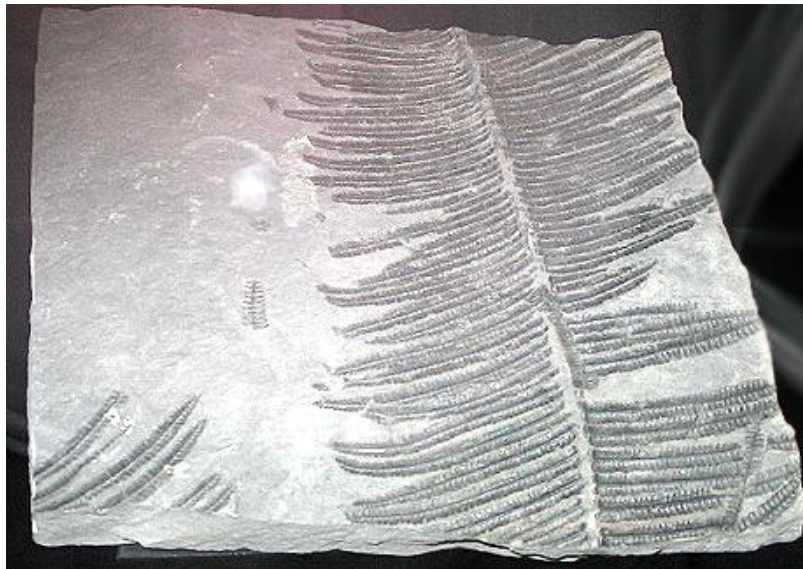


Figure 6 - Fossil *Psaronius sp.*, a Marattiales Fern
Credit: [Pablo Alberto Salguero Quiles](#), [Creative Commons Attribution 3.0 Unported](#) license

Still alive today, Marattiales ferns first appeared in the Pennsylvanian, of which *Psaronius sp.* is an example. Rarely found together, fossils of *Psaronius sp.* include fossil of the root mantles, stems,

fronds, coziars (fiddleheads), and leaves. Modern Marattiales ferns reproduce through spores and live in tropical environments.



Figure 7 - Reconstruction of *Psaronius* sp.
Credit: [Auguste Faguet](#), [public domain](#)

Seed Ferns - Pteridospermatophyta



Figure 8 - Fossil Seed Fern Leaves from Ohio
Credit: [Wilson44691](#), [public domain](#)

Seed ferns also called Pteridospermatophyta, are a group of now extinct plants that resemble ferns in their morphology but appeared to have reproduced using seeds. First appearing in the [Devonian Period](#), seed ferns flourished in the Pennsylvanian and survived until the [Eocene Epoch](#).

Early Gymnosperms- Cordaites



Figure 9 - Fossil *Cordaites lungatus*
Credit: [Jebulon](#), public domain



Figure 10 - Reconstruction of *Cordaites*
Credit: [Unger, 1850](#), [Public Domain Dedication 1.0](#) license

Among the early gymnosperms (plants related to [conifers](#) and [cycads](#)) that lived during the Pennsylvanian were cordaites. Cordaites were a diverse group that included the genera [Cordaites](#), [Cardiocarpus](#), and [Cordaianthus](#). The cordaites first appeared in the Pennsylvanian and lived until the Permian.

Cordaites inhabited a variety of environments ranging from the cool temperate forests to tropical swamps. For example, fossil [mussels](#) and [crustaceans](#) have been found among the fossil roots of *Cordaites*, suggesting a lifestyle similar to [mangroves](#). They appear to have been among the earliest cone-bearing plants on Earth and may have some relation to modern conifers.

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.