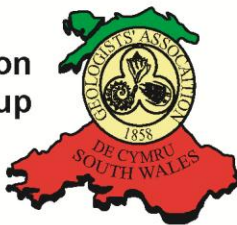


The Geologists' Association
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Carboniferous Fossil Plants



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Examples of seed fern fronds and their pinnae

Mariopteris

Alethopteris

Neuropteris

Examples of fern pinnae

Sphenopteris

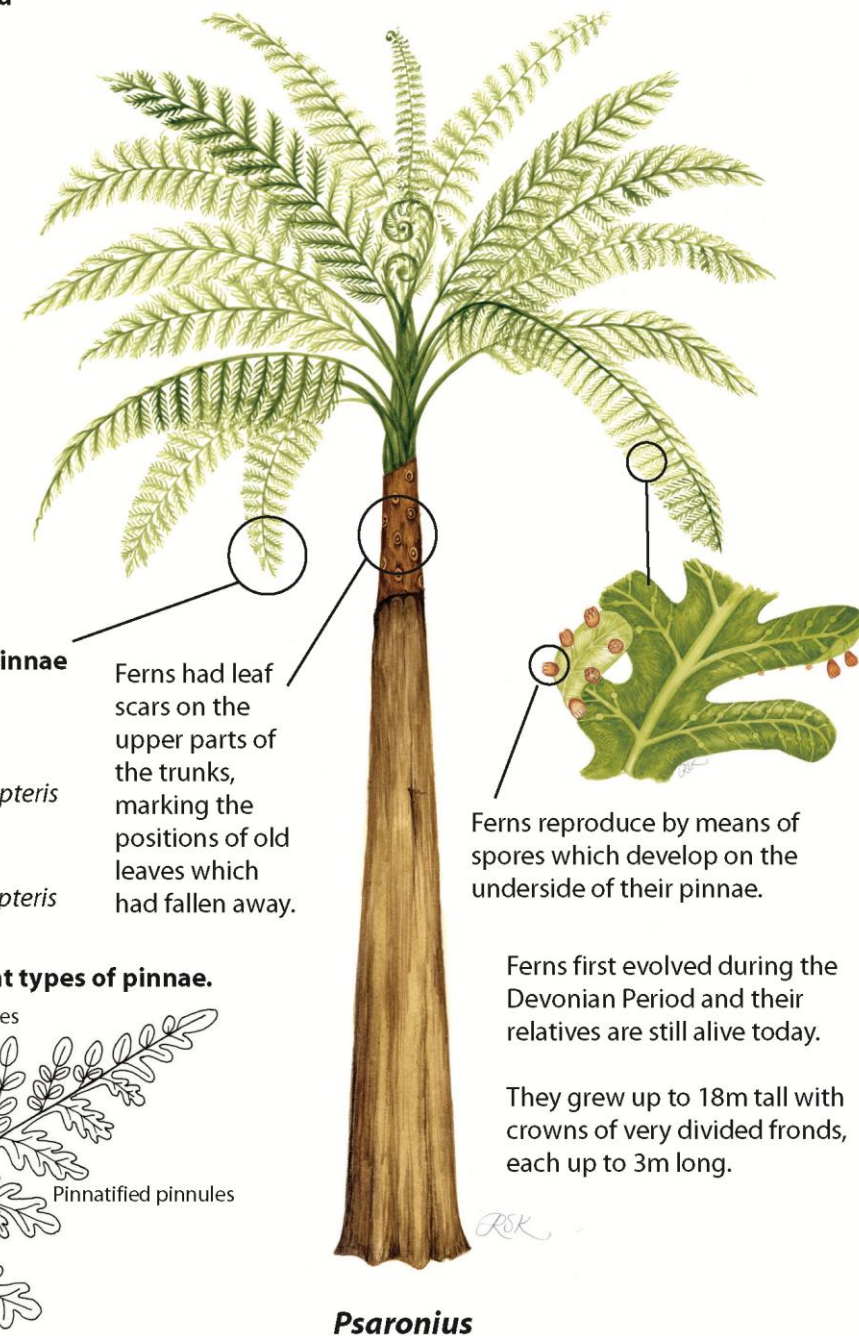
Pecopteris

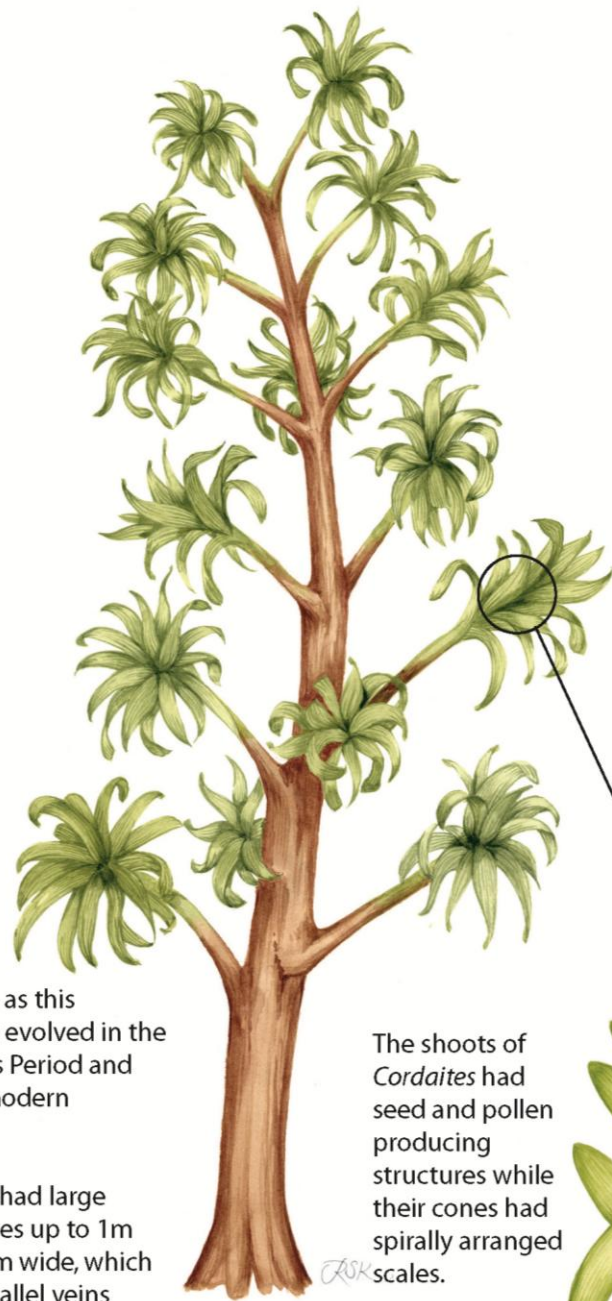
Structure of different types of pinnae.

Individual Pinnules

Pinnatifid pinnules

Rachis





Cordaites

Conifers, such as this *Cordaites*, first evolved in the Carboniferous Period and gave rise to modern conifers.

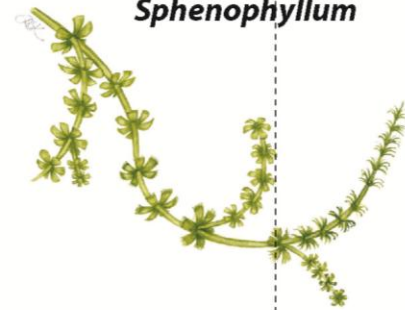
Early conifers had large strap-like leaves up to 1m long and 15cm wide, which had many parallel veins running along their length.

The shoots of *Cordaites* had seed and pollen producing structures while their cones had spirally arranged scales.



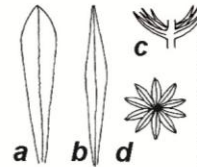
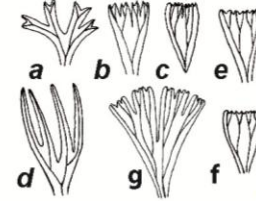
a: *S. trichomatosum*, b: *S. saxifragaefolium*,
c: *S. oblongifolium*, d: *S. myriophyllum*,
e: *S. emarginatum*, f: *S. majus*

Sphenophyllum



Sphenophyllum was a small trailing form of horsetail with stems up to 2cm across and frequently branched with fan-shaped leaves.

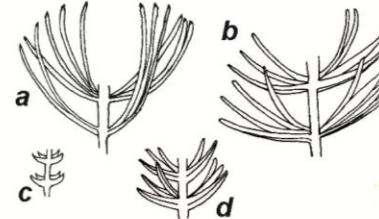
Sphenophyllum leaves



Annularia leaves

a: *A. stellata*, b: *A. radiata*, c: *A. microphylla*,
d: *A. galioides*, e: *A. sphenophylloides*

Asterophyllites leaves



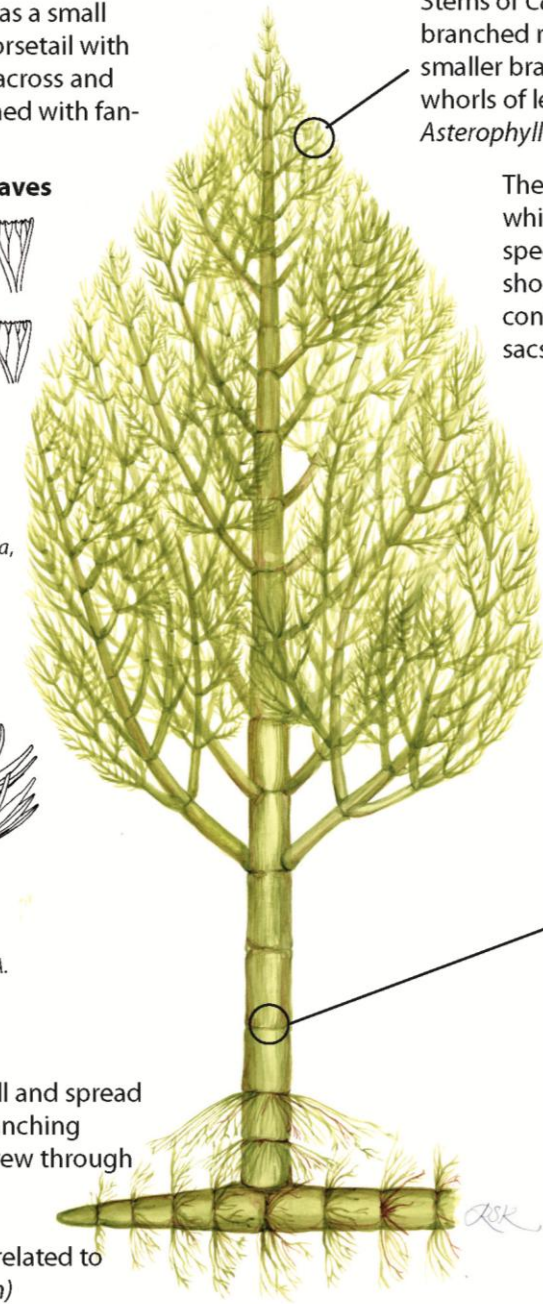
a: *A. longifolius*, b: *A. equisetiformis*, c: *A. charaeformis*, d: *A. grandis*

Horsetails grew up to 20m tall and spread to form dense thickets by branching underground stems which grew through the soft delta sediments.

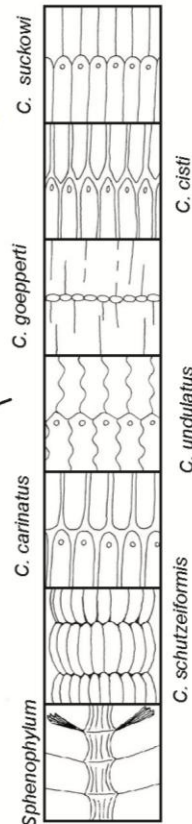
Carboniferous horsetails are related to modern horsetails (*Equisetum*)

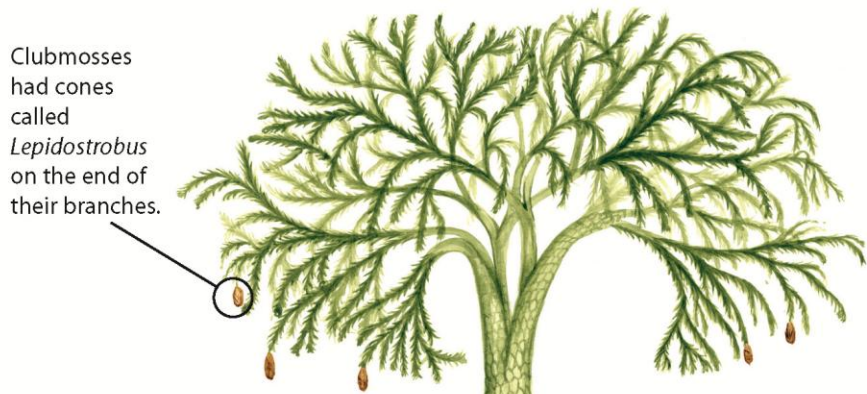
Stems of *Calamites* branched regularly and the smaller branches had whorls of leaves called *Asterophyllites* or *Annularia*.

They also had cones which developed on specialised side shoots and contained spore sacs.



Calamites





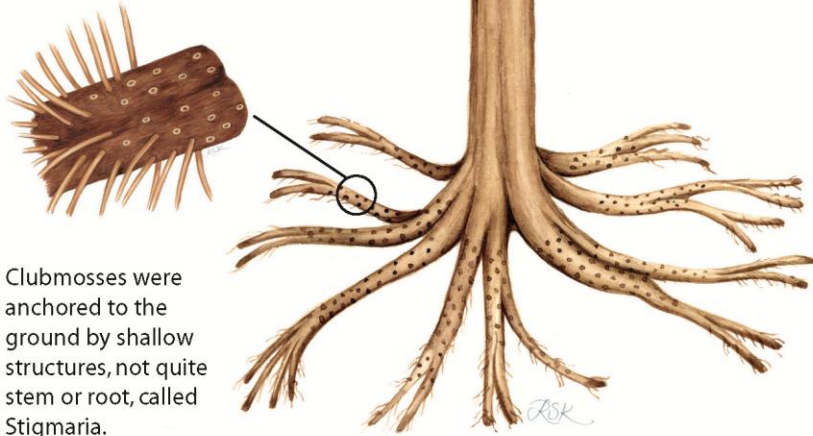
Clubmosses had cones called *Lepidostrobus* on the end of their branches.

Clubmosses (also known as lycophytes) have the longest fossil record of any living group of plants with relatives alive today.

Some clubmosses, like *Lepidodendron*, grew to over 40m tall, only branching when they were almost fully grown, to form a leafy crown. Others, like *Sigillaria* grew up to 30m tall and branched only a few times.

Lepidodendron grew in flat, waterlogged ground whilst *Sigillaria* grew on the drier margins of the swamps.

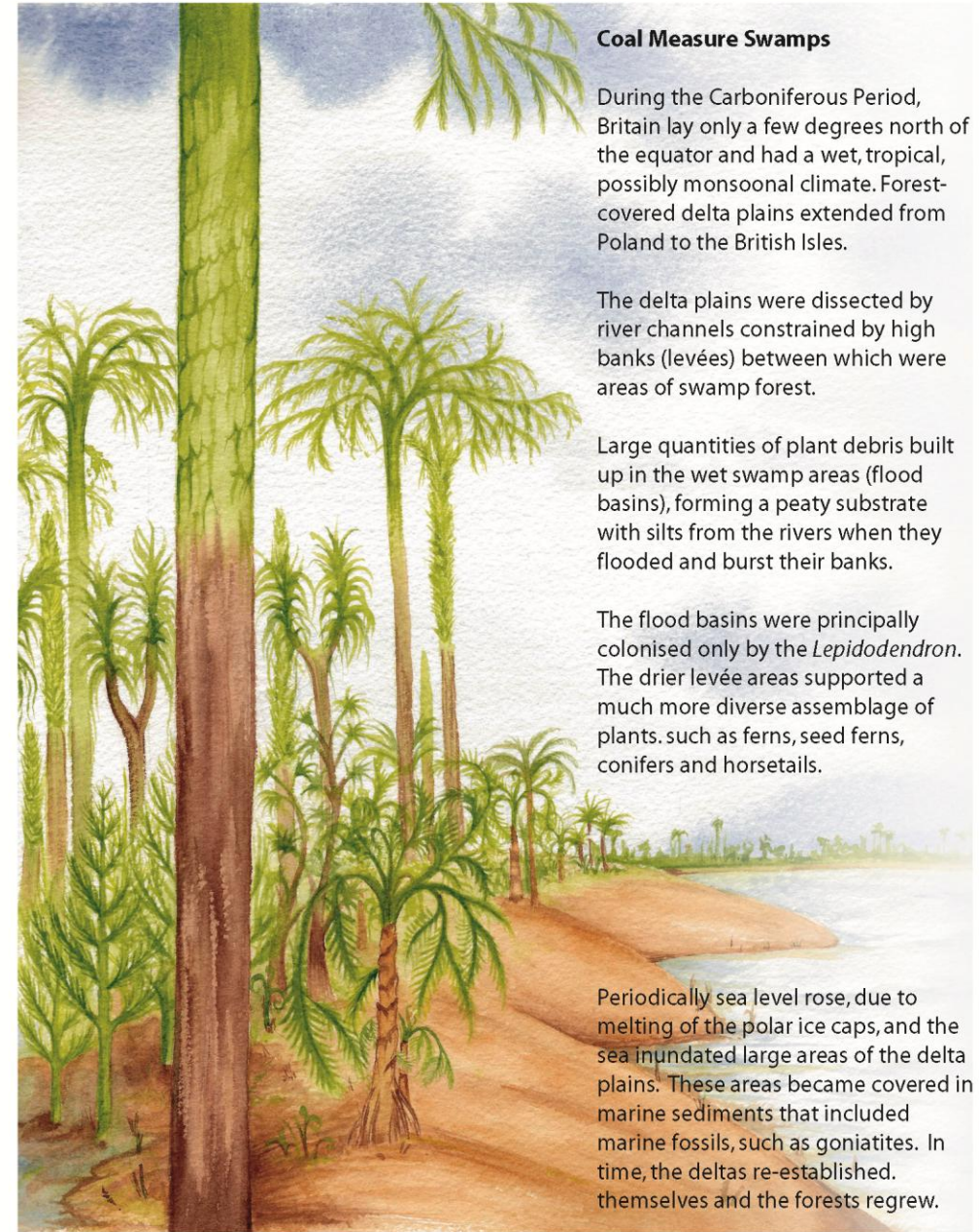
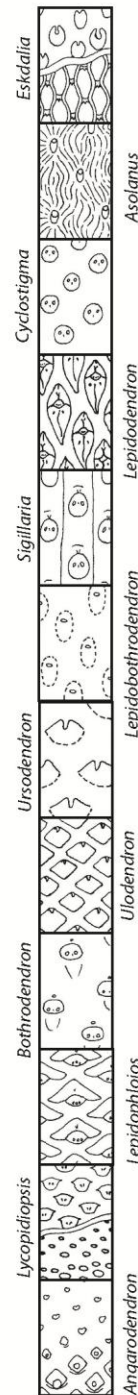
Clubmoss stems were covered with leaves with swollen bases where they attached to the stems. When the leaves were shed, the leaf cushions remained forming distinctive patterns used to identify species.



Clubmosses were anchored to the ground by shallow structures, not quite stem or root, called *Stigmaria*.

Lepidodendron

Clubmoss leaf cushions



Coal Measure Swamps

During the Carboniferous Period, Britain lay only a few degrees north of the equator and had a wet, tropical, possibly monsoonal climate. Forest-covered delta plains extended from Poland to the British Isles.

The delta plains were dissected by river channels constrained by high banks (levées) between which were areas of swamp forest.

Large quantities of plant debris built up in the wet swamp areas (flood basins), forming a peaty substrate with silts from the rivers when they flooded and burst their banks.

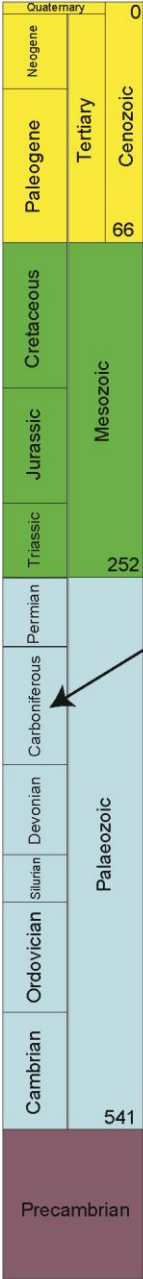
The flood basins were principally colonised only by the *Lepidodendron*. The drier levée areas supported a much more diverse assemblage of plants, such as ferns, seed ferns, conifers and horsetails.

Periodically sea level rose, due to melting of the polar ice caps, and the sea inundated large areas of the delta plains. These areas became covered in marine sediments that included marine fossils, such as goniatites. In time, the deltas re-established themselves and the forests regrew.

Clubmosses (Lycophytes)

Coal measure swamps

Geological Timescale



Coal seams at Ffos-y-fran opencast coal site, south Wales

References and further reading

The text and illustrations shown in this guide are all adapted from the work of other authors and artists which are listed here:

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Thomas, B.A. and Cleal, C.J. 1993. The coal measure forests. *National Museum of Wales*.

If you want to know more about rocks, fossils and the geology of south Wales, contact the Geologists' Association South Wales Group / Cymdeithas y Daearegwyr Grŵp De Cymru, Dept of Geology, National Museum of Wales, Cardiff CF10 3NP. You can also find us at www.swga.org.uk