

## CARBONIFEROUS PLANTS

*Lepidodendron* — also known as scale tree — is an extinct genus of primitive, vascular, arborescent (tree-like) plant related to the lycopsids (club mosses). They sometimes reached heights of over 30 metres (100 ft), and the trunks were often over 1 m (3.3 ft) in diameter. They thrived during the Carboniferous Period (about 360 -300 million years ago) before going extinct. Sometimes erroneously called "giant club mosses", they were actually more closely related to today's quillworts than to modern club mosses.

The name *Lepidodendron* comes from the Greek *lepidō*, scale, and *dendron*, tree.

*Lepidodendron* had tall, thick trunks that rarely branched and were topped with a crown of bifurcating branches bearing clusters of leaves. These leaves were long and narrow, similar to large blades of grass, and were spirally-arranged. The closely packed diamond-shaped leaf scars left on the trunk and stems as the plant grew provide some of the most interesting and common fossils in Carboniferous deposits. These fossils look much like tyre tracks or alligator skin.

The scars, or leaf cushions, were composed of green photosynthetic tissue, evidenced by the cuticle covering and being dotted with stomata, microscopic pores through which carbon dioxide from the air diffuses into plants. Likewise, the trunks of *Lepidodendron* would have been green, unlike modern trees which have scaly, non-photosynthetic brown or gray bark.

*Lepidodendron* has been likened to a giant herb. The trunks produced little wood, being mostly soft tissues. Most structural support came from a thick, bark-like region. This region remained around the trunk as a rigid layer that grew thicker, but did not flake off like that of most modern trees. As the tree grew, the leaf cushions expanded to accommodate the increasing width of the trunk.

The branches of this plant ended in cone-structures. *Lepidodendron* did not produce true seeds like many modern plants. Instead, it reproduced by means of elaborate, encapsulated spores. It is estimated that these plants grew rapidly and lived 10-15 years. Most species were probably monocarpic, meaning they reproduced only once toward the end of their life.

In the 19th century, due to the reptilian look of the diamond-shaped leaf scar pattern, petrified trunks of *Lepidodendron* were frequently exhibited at fairgrounds by amateurs as giant fossil lizards or snakes.

***Neuropteris*** is the name given to the foliage of a seed fern.

*Neuropteris* was a type of seed fern which grew in the tropical rainforests which covered Scotland during the Carboniferous Period (360-300 million years ago). Seed ferns grew mainly along the natural embankments of rivers and came in a variety of shapes and sizes, from small trees to scrambling creepers.

Seed ferns (Pteridosperms) are an extinct group of gymnosperms. Although their foliage resembled that of modern ferns, they reproduced by means of seeds. Modern ferns reproduce by means of spores.



*Calamites* is a genus of extinct arborescent (tree-like) horsetails to which the modern horsetails (genus *Equisetum*) are closely related. Unlike their herbaceous modern cousins, these plants were medium-sized trees, growing to heights of more than 30 meters (100 feet). They were components of the understories of coal swamps of the Carboniferous Period (around 360 to 300 million years ago).

The trunks of *Calamites* had a distinctive segmented, bamboo-like appearance and vertical ribbing. The branches, leaves and cones were all borne in whorls. The leaves were needle-shaped, with up to 25 per whorl.

The stems of modern horsetails are typically hollow or contain numerous elongated air-filled sacs. *Calamites* was similar in that its trunk and stems were hollow, like wooden tubes. When these trunks buckled and broke, they could fill with sediment. This is the reason pith casts of the inside of *Calamites* stems are so common as fossils.

*Calamites* reproduced by means of spores, which were produced in small sacs organized into cones. They are also known to have possessed massive underground rhizomes, which allowed for the production of clones of one tree. This is the only group of trees of their period known to have a clonal habit. This type of asexual reproduction would allow them to spread quickly into new territory, and help to anchor them firmly in the unstable ground along rivers and in newly deposited delta sediments.



***Alethopteris* sp.** is the foliage of a seed fern.

Seed ferns (Pteridospermales) are an extinct group of gymnosperms. Although their foliage resembled that of modern ferns, they reproduced by means of seeds. Their seeds were up to 4 cm (1.5 inches) in length.

This variety of seed fern was a small tree and may have stood about four meters (13 feet) tall.





*Sigillaria* is a genus of extinct, spore-bearing, arborescent (tree-like) plants. It was a lycopodiophyte, and is related to the lycopsids, or club-mosses, but even more closely to quillworts, as was its associate *Lepidodendron*.

*Sigillaria* was a tree-like plant reaching a height up to 30 meters, with a tall, single or occasionally forked trunk that lacked wood. Support came from a layer of closely packed leaf bases just below the surface of the trunk, while the centre was filled with pith. The long, thin grasslike leaves were attached directly to the stem and grew in a spiral along the trunk. The old leaf bases expanded as the trunk grew in width, and left a diamond-shaped pattern, which is evident in fossils. These leaf scars were arranged in vertical rows. The trunk had photosynthetic tissue on the surface, meaning that it was probably green.

The trunk was topped with a plume of long, grass-like, microphyllous leaves, so that the plant looked somewhat like a tall, forked bottle brush. The plant bore its spores (not seeds) in cone-like structures attached to the stem.

*Sigillaria*, like many ancient lycopods, had a relatively short life cycle - growing rapidly and reaching maturity in a few years. Some researchers have suggested that *Sigillaria* was monocarpic, meaning that it died after reproduction, though this is not proven.

*Stigmara* is a general term used for the underground rooting structures of coal forest lycopsid trees such as *Sigillaria* and *Lepidodendron*. These swamp forest trees grew to 50 meters and were anchored by an extensive network of branching underground structures with "rootlets" attached to them. Analysis of the morphology and anatomy of these stigmarian systems suggests they were shoot-like and so they are called rhizomes or rhizophores. The stigmarian rhizomes are typically covered with a spiral pattern of circular scars where "rootlets" were attached. Since the stigmarian systems are shoot-like, these "rootlets" may be modified leaves, adapted to serve the function of roots. However, some paleontologists argue that the "rootlets" were true roots, with a complex branching structure and root hairs, comparable to the roots of the closest living relative of *Lepidodendron*, the quillworts.

