

VISIT TO THE BRITISH MUSEUM (NATURAL
HISTORY), BOTANICAL DEPARTMENT,

MARCH 14TH, 1885.

DEMONSTRATION ON GYMNOSPERMS, BY W. CARRUTHERS, Esq.,
F.R.S., V.P.G.S., Keeper of the Department.

(Report by W. FAWCETT, B.Sc., F.L.S.)

The Members having assembled in the herbarium of the Botanical Department, Mr. Carruthers, the Keeper, began his Demonstration by pointing out that Gymnosperms, including Fir-trees, Cycads, &c., belong to that division of the vegetable kingdom called *Phanerogamia*, or flowering plants. All these plants produce seeds which contain the rudimentary bud-plant. The other division, *Cryptogamia*, or flowerless plants, are multiplied chiefly by means of spores, minute bodies of homogeneous structure.

Gymnosperms are sharply marked off from other flowering plants by several characteristics, one of which is that the seeds are not enclosed in a receptacle or covering, and hence the name Gymnosperms (naked seeds). In other flowering plants, on the contrary, the young seeds are enclosed in the ovary which is surmounted by the stigma.

There are three great divisions of Gymnosperms, namely (1) Gnetaceæ; (2) Coniferæ; (3) Cycadeæ. The Gnetaceæ, or jointed firs, contain *Ephedra*, *Gnetum*, and *Welwitschia*. The Ephedras are branching shrubs with very small scale-like leaves, the stem bearing a number of stomata. The Ephedra cone has barren scales below, with two at the apex bearing seeds. Fossil Ephedras are found in strata belonging to Miocene times.

The species of *Gnetum* are trees or shrubs, occurring in tropical Asia and S. America. They have jointed, knotty branches, and opposite entire leaves. No species of this genus has hitherto been found fossil.

Welwitschia is an abnormal plant, discovered by Dr. Welwitsch, growing in a limited area in the sandy wastes of Angola. It has a shortened tabular stem, suggestive of a huge Agaric, and it never has more than two leaves, which in time are broken up into long, ribbon-like pieces, and are persistent throughout the life of the plant.

The *Coniferae*, or firs, form a stem by the addition each year of new wood outside the old wood. It is only in the wood formed during the first year that any annular or spiral vessels are found. The wood of a later period has no vessels or ducts of any kind, but is formed of prosenchymatous cells marked with bordered pits. This peculiar structure of the wood renders it easy of identification even in the fossil state; moreover the medullary rays are very narrow, often not more than one cell in breadth. The leaves are long and narrow, and are commonly called "needles," but in some genera, e.g. *Dammara* and *Ginkgo*, they are broad. They occur singly or in groups of two or more rising from the same point; and, even in the seed, the *cotyledons* (or seed-leaves) are not limited to two, but vary in number from two to fifteen. The leaves are very persistent, and when they fall there remains a distinct scar, and sometimes a raised "cushion."

The flowers are unisexual. They are never produced at the apex of the primary stem, as in Cycads, but are terminal on lateral shoots, or occur in the axils of leaves or young shoots. The male flower consists of staminate leaves arranged along an axis. The female flower varies in different genera.

The *Coniferae* may be divided into three groups: yews, cypresses, and pines. The first group contains among others the Yew, the American *Torreya*, and the Chinese *Ginkgo*. The female flowers in the Yew group are never arranged in cones; and they occur on distinct trees from the male flowers.

In the Yew (*Taxus*), the wood-cells have a spiral thickening as well as bordered pits. The leaves are flat, spirally arranged, but so twisted as to lie all in one plane. The leaf-cushion is decurrent, with an elliptical scar. The female flower is at the apex of a lateral shoot. A fleshy ring round the base of the ovule (the "ovule-bearing scale" of Bentham and Hooker) grows up into a red cup surrounding the erect seed. Fruits of *Taxus* are found in the Miocene lignites of Wetterau. Branches referred to *Taxites* have been found in the Miocene of Greenland and the north-west coast of America.

Torreya is much like the Yew, but the fleshy cup is partly adnate to the seed, and grows entirely over it so as to enclose it, and the albumen is ruminant like that of a nutmeg. This genus is not known in a fossil condition.

The leaves of *Ginkgo biloba* are dilated, somewhat two-lobed,

and suggestive of those of a maiden-hair fern, hence the specific name *adiantifolia*, given to the tree by Sir. J. E. Smith. The female flower of *Ginkgo* arises from the axil of a leaf. It is a stalk-like axis with two or three ovules below the apex. In the erect ripe seed, the skin becomes differentiated into two layers, the outer fleshy, and the inner woody. Leaves have been found in the Miocene of Greenland and North America.

Podocarpus is an allied genus with linear-lanceolate leaves, and the seed reversed because of the growth of the peduncle. This genus is a native of tropical countries. Fossil Podocarps have been found in Eocene and Miocene strata.

Stems of immense size have been found in the Lower Coal-Measures named *Palæoxylon*. A fine specimen from Edinburgh was pointed out, which probably should be referred to the Yew group.

The Cypressess have generally a woody cone with peltate scales, the seeds being borne on the base of the scales. The genus *Cupressus*, from which the order has been named, consists of about 12 species, natives of the northern hemisphere; nearly allied is the genus *Thuja*, which, like the Cypress, has small scale-like leaves. Foliage as well as fruits belonging to these genera occur in the Secondary Rocks, and are especially abundant in the Stonesfield Slate.

Callitris may be considered as the representative form of this group in the Southern Hemisphere, though it was not uncommon in Tertiary times in Britain, the fruits being found in Eocene deposits of Sheppey.

Closely related to these are the Wellingtonias (*Sequoia*)—now consisting of two species, confined to the western mountain-region of North America—and the Taxodiums of eastern and central America. In the later Secondary rocks, there is evidence of the existence of plants belonging to both these genera in Britain, and the Sequoias were continued into the Tertiary epoch.

In the true Pines we include the Araucarias, a small genus now existing in South America, Australia, and some of the Pacific Islands, characterised by bearing a single seed on each scale of the large cones, as well as by several series of bordered pits on each wood-cell of their stems. This structure has led to the identification of many stems belonging to different periods, while their characteristic cones have been described from Oolitic and later strata. The

specimens from Edinburgh already pointed out (*Palæoxylon*) have been referred by some authors to this genus. The genus *Pinus*, represented in the existing flora of Britain by a single species, *P. sylvestris*, appears in the oldest Secondary Rocks, and can be traced through more recent deposits in forms corresponding to the divisions recognised among living plants. The Pines proper are found in the Oolites, while in the upper Secondaries they are associated with *Wellingtonias*, the species belonging to the same group as that which is found with the *Wellingtonias* of our own days. In the older Tertiaries, some remarkably thick-scaled pines occur, and those found in later Tertiaries can scarcely be distinguished from existing species. True Cedars have been met with in the Lower Greensand and Wealden, while representatives of the existing genus *Abies* are found in the same rocks.

The third division of the Gymnosperms, the Cycads, have the bearing of tree-ferns or palms, to which groups in earlier times they were referred. Though so different in habit from our fir-trees, they are in essential characters very nearly related. The leaves are large and palm-like, and the male flowers, and usually the female flowers, are produced in cones. The genus *Cycas*, separated from the rest of the order by bearing its seeds on the margins of flat leaves, has a tall simple stem, covered by the persistent bases of the leaves, and exhibiting the alternation of the larger ordinary leaves and smaller fruit-bearing organs. It is found in the tropical regions of the Old World, and stems exhibiting characteristics similar to those seen in living plants occur in the Wealden. In addition to *Cycas*, we meet in Australia with the genus *Macrozamia*, having short stems thickly covered by the bases of the old leaves, and with the scales of the cones of both flowers produced into sharp flattened points; as well as the abnormal genus *Bowenia*, which is exceptional in the Order in having a bi-pinnate leaf. No fossils can certainly be referred to either of these genera. In Africa, the order is represented by a large number of species of the genus *Encephalartos*, which have short stems covered with the long bases of the old leaves, and the scales on the cones of which have a slightly produced and truncated apex. The aberrant form, *Stangeria*, found in Natal, has a napiform trunk, and triangular pinnated leaves with branching veins, found only in this genus. A trunk similar to that of *Encephalartos* has been met with in the Wealden of the Isle of Wight (*Fittonia*). The New World contains a

large number of *Cycadeæ* included in the genus *Zamia*, with two aberrant forms, *Ceratozamia* and *Dion*. The *Zamias* have short dividing stems, or tall and slender simple ones, and the scales of the cones are simply peltate, and arranged in vertical order. A stem from the Lias, which is the oldest fossil which can certainly be referred to the Order (*Yatesia*), should probably be placed near this genus; and the numerous cones from the Oolite and Wealden, though exhibiting a different arrangement of the scales, are probably more nearly related to this genus than to any living form. Besides these, trunks of *Cycads* occur in the Isle of Portland, and in later formations in the south of England, which differ from any living forms in the structure of the stem, and still more in the character of the fruits. The seeds are buried in fleshy cushions, borne in the axils of the leaves. These plants, which have been named *Bennettites*, represent an extinct group bearing the same relation to the living forms that the Yew does to the other Coniferae. A still more anomalous group of plants, known as *Williamsonia*, is met with in the Oolites of Yorkshire, and beds of similar age elsewhere, with stems and leaves like those of this Order; the stamens of which appear to have been borne naked round a shortened fleshy axis, and the seeds on the surface of a radiating disc. These present such strange anomalies that it is not to be wondered at that different views are entertained as to their affinities.

After a cordial vote of thanks to Mr. Carruthers the party separated.

VISIT TO THE GEOLOGICAL MUSEUM OF DR. J.
CHANING PEARCE, AT THE MANOR HOUSE,
BRIXTON.

(Report by H. B. WOODWARD, F.G.S.)

Although the name of Channing Pearce is familiar to geologists who have worked at the Oolitic formations of the West of England, yet few, probably, are aware that the collection of fossils made by the late Mr. Pearce is at the present day accessible to students through the courtesy of his son, Dr. J. Channing Pearce, F.G.S.

This collection, which numbers upwards of 5,000 specimens, and is especially rich in Mesozoic fossils, was formed mainly during the years 1816-47, by Mr. Joseph Channing Pearce. Writing in 1848,