

VISIT TO THE BOTANICAL DEPARTMENT OF THE
BRITISH MUSEUM (NATURAL HISTORY).

SATURDAY, MARCH 7TH, 1891.

DEMONSTRATION ON FOSSIL VASCULAR CRYPTOGRAMS, BY W.
CARRUTHERS, F.R.S., Keeper of the Department.*(Report by the EDITOR, revised by MR. CARRUTHERS.)*

THE Members having assembled in the public gallery of the Department, Mr. Carruthers began by pointing out that if, for palæontological purposes, we divided plants into cellular and vascular, we found that, as cellular tissues were the first to disappear when plants decayed in water, so the cellular plants, the Fungi, Algæ and Mosses, of which he had spoken on previous occasions, were the most liable to leave no traces of their existence.

In the vascular plants, the lecturer continued, which were far better represented in a fossil state, a differentiation of tissues had taken place, and there were present an internal skeleton and an epidermal layer, both capable of resisting decay. The chief existing groups were the EQUISETACEÆ or horsetails, the FILICES or ferns, and the LYCOPODIACEÆ, which three groups were "isosporous," *i.e.* having spores of one form only, and the SELAGINELLACEÆ, which were "heterosporous," *i.e.* having spores of two kinds. In the vascular Cryptogams there was an "alternation of generations:" the spore, which was asexual and borne on the leaves of the plant, on germination produced structures bearing either antheridia or archegonia (the male and female organs) or both; then the archegonium on fertilisation gave rise to a plant like the parent which produced the spores.

Among the vascular plants the EQUISETACEÆ were apparently the lowest group. Their sexual stage was inconspicuous and the spore-bearing stage was the well-known "horse-tail." This had a hollow-jointed stem bearing branches in whorls; its fruit was in terminal cones composed of peltate scales, and its spores were furnished with three coats, the outer one split into a coiled-up thread that was remarkably hygrometric and known as the "elaters." Before Upper Silurian times there was no distinct record of land vegetation; and it was in the Devonian that the earliest known land flora occurred. This included Equisetaceæ in which both vegetative and reproductive systems had a larger and more developed structure than in our own existing genus *Equisetum*. These had been largely worked out by Prof. W. C. Williamson in various memoirs, of which that on *Bowmannites* in the 'Philosophical Transactions' was one of the most important. The

structures which he had described and figured indicated the existence of several sub-families of the Equisetaceæ; some individuals were thirty or forty feet high and several inches in diameter, and had stems which increased in diameter. In the Lower Secondary rocks of India there were certain characteristic forms, and in the Jurassic and Cretaceous strata the genus *Equisetum* itself occurred.

FILICES or Ferns, continued the lecturer, formed a natural group, characterised by the situation of their spores—generally on the under surface of fronds, which were often much divided. The stems of existing species sometimes reached a height of more than 100 feet. Ferns occurred fossil in Devonian rocks. The *Eopteris* of Saprota, however, was nothing more than a mineral crystallisation on the planes of slaty cleavage. The *Cyclopteris hibernica*, originally described by Edward Forbes from the Old Red Sandstone of Kiltorkan, County Kilkenny, was, in its creeping rhizome, its fronds and its involucre, closely allied to *Hymenophyllum*, an existing genus of “filmy ferns.” Two or three of the tribes into which living ferns were divided, were represented in Palæozoic rocks, whilst genera of fossil ferns based on the form and venation of the fronds had no leaf-characters sufficient to separate them from living forms. Existing ferns had in their stems a central medulla surrounded by a cylinder of vascular bundles, the latter mainly composed of scalariform tissue and sending off branch bundles to the leaves; but among Palæozoic ferns there was also another type of stem in which the leaf bundles were formed in the medulla and proceeded directly to the leaves as in Monocotyledons.

Lycopodium, said Mr. Carruthers, was not known as a fossil, except from comparatively recent deposits: the order LYCOPODIACEÆ, however, was represented in Upper Secondary and Tertiary rocks. There was a central axis of vascular tissue in the stem, the leaves were small, and isosporous spores were produced in cones.

All Palæozoic club-mosses the fruits of which were known were heterosporous, and were thus related to *Selaginella* rather than to *Lycopodium*. SELAGINELLACEÆ had, as a rule, leaves of two different forms. They had the larger, female “macrospores” at the base of the cone, and the smaller, male “microspores” in the upper part. The one kind of spore produced the archegonia and the other the antheridia, thus foreshadowing among Cryptogams the embryo-sac and pollen-grain of Phanerogams. In Devonian rocks occurred the genera *Sigillaria* and *Lepidodendron*. The bifurcating stems, small spirally-arranged leaves and fruit-cones of *Lepidodendron* were well known. In *Sigillaria* the leaves were in vertical rows forming the long grass-like “*Cyperites*,” and the spores were placed at the bases of somewhat altered leaves which were borne in the same series as the ordinary leaves.

The *Sigillarie* from Kiltorkan exhibited the macrosporangia, and Goldenberg had figured the same structures in a *Sigillaria* from the Coal Measures.

A well preserved specimen was shown from Kings-Cliff, Burnt-island, where a contemporary volcanic tuff had enclosed fragments of the little decayed peat of Carboniferous age, which had been replaced by carbonate of lime ; this specimen had been found by the late Charles Peach.

Specimens from the Coal Measures of France were examined. That described many years ago by Robert Brown as *Triplosporites* is now known to be the upper portion of a large cone, since a perfect specimen (which also is in the collection) has been found by the late Prof. Schimper. The latter exhibits, in the longitudinal section, the macrospores at the base of the cone and the microspores ("triplospores" of Brown) in the upper part.

The party were then conducted into the Herbarium, where various typical fossil specimens had been laid out on the table. It was shown by these that, though the stems of Equisetaceæ in the Coal Measures were commonly casts, the wood was often preserved, and that the Palæozoic forms had the leaf more fully developed than existing representatives of the order.

Among Ferns, it was demonstrated that the group named *Psaronius* consisted of stems surrounded by aërial roots. The free foliar bundles were formed in the axis of the stem, and the leaves were in vertical rows of two, four, or more. It was shown that *Endogenites erosa* from the Wealden, originally supposed to be a Monocotyledon, was in reality a fern-stem.

From the specimens of Selaginellaceæ, it was demonstrated that the form known as *Halonia* was a fruit-bearing branch, and that the scars characteristic of the so-called *Ulodendron* were the bases of attachments of aërial roots.

A vote of thanks to Mr. Carruthers was proposed by the President, and carried unanimously ; and Mr. Carruthers, in reply, kindly promised at some future date to continue his series of demonstrations on the various groups of fossil plants.

Before the party separated, Mr. Wm. Atkinson exhibited some large masses of chalk ballast from the Thames at Battersea, which showed deep scratches produced by floating ice during the past winter.
