gravels of Dartford Heath, and the gravels and loams of the lower or Crayford stage, the papers mentioned under 1912 and 1914 should be consulted.

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NOTE.—In these papers and reports references are given to numerous older accounts of the deposits near Crayford and Erith.

ANCIENT TYPES OF VEGETATION.

A DEMONSTRATION AT KEW GARDENS, APRIL 8TH, 1916.

BY W. B. TURRILL, B.Sc.

OWING to the large number of members who attended the demonstration it was found inadvisable to go through the houses, and the original programme was therefore modified, attention being chiefly directed to the more ancient types of Gymnosperms and Angiosperms growing in the open.

The party assembled at the main (Kew Green) gate and walked towards the Palm House and thence to the Pinetum, finishing at the Temperate House. As the gardens are only to a limited extent laid out in a systematic manner, it was not possible to deal with the different tribes and genera consecutively, and in pointing out the following types it was frequently necessary to refer to some plants seen earlier or to some to be seen later. The plants most interesting from a palæontological standpoint were commented upon as follows :—

Taxodium distichum—Examples near the Ferneries showed the deciduous character, rather unusual in the coniferæ, the only other common example being the larch. The Kew specimens (including those near the lake and water-lily pond) do not show the interesting breathing roots or pneumatophores, but these are well seen in trees at Syon House. The plant inhabits the swampy districts of the southern United States, and its usual

habitat recalls the conditions under which many of the Coal Measure plants probably grew.

Ginkgo biloba.—A male tree near the Tropical Fern House, and smaller examples in the Pinetum. The sole living representative of a very ancient group, now only known in the cultivated or semi-wild state. *Ginkgoephyllum kiltorkense* is a probable ancestor recorded from the Kiltorcan, Upper Devonian, beds of Ireland, and described by Johnson (*Proc. R. Dublin Soc.*, 1914). *Psygmoephyllum Williamsoni* is described by Nathorst from the Upper Devonian beds of Spitzbergen (*K. Sven. Vet. Akad. Handl.*, 1894). Species of *Psygmoephyllum* are described from the Carboniferous, and in the Mesozoic rocks numerous examples of *Ginkgo* and *Baiera* are found. In the Cainozoic *Ginkgo* had a very wide distribution, and *G. adiantoides* (possibly the same as *G. biloba*) has been found in rocks from Mull, Italy, Siberia, N. America, etc.

Cedrus Libani, *C. Deodara*, *C. atlantica*, numerous examples seen; the characters were pointed out and the geographical distribution commented upon.

Attention was called to the two types of branching so frequently met with in the Coniferæ (e.g., in *Cedrus*, *Larix*, *Pinus*, *Sciadopitys*) and also in *Ginkgo*. The long branches of indefinite growth mainly increase the size of the tree, and the short branches of definite growth bear most of the leaves.

Pinus.—This is the largest living Gymnosperm genus, and many species were examined. *P. muricata* has the cones remaining for years unopened on the old wood, as was well seen in the specimen behind the Palm House. This character has been used as an analogy to support the "cone-theory" of the Ulodendroid-scar found in certain extinct Lepidophyta. Pines with varying numbers of leaves in each fascicle (2, 3, 4, or 5) were pointed out. Many fossil types of the genus have been described from the Jurassic rocks upwards. *Prepinus* (Jeffrey, *Ann. Bot.*, xxii, p. 207) is a suggested ancestor.

An interesting discovery of a winged pollen-grain, very like one of *Pinus*, is announced by Seward in the report on the fossil plants of the "Terra Nova" expedition, 1910, from the Upper Beacon Sandstone, probably (Lower?) Mesozoic, and it is suggested that the generally accepted view of the purely northern evolution of the Abietinæ may be wrong.

Araucaria.—*A. imbricata* (the common "monkey-puzzle") is a commonly cultivated tree. *A. Bidwillii* and *A. excelsa* were seen in the Temperate House. The tribe Araucarineæ is perhaps the most ancient of the coniferous tribes, and may have evolved from palæozoic Cordaitan ancestors. *Walchia*, the first known English conifer, is found in the Upper Carboniferous, and was probably an ancestor of the Araucarineæ.

Other coniferous genera seen in the Pinetum were *Tsuga*,

Taxus, *Cephalotaxus*, *Torreya*, *Sciadopitys*, *Sequoia*, *Podocarpus*, *Cupressus*, *Thuja*, *Abies*, and *Picea*.

Ephedra, an example of the Gnetales, grows in a dry situation in the Pinetum. The three genera of the group—*Ephedra*, *Gnetum*, *Welwitschia*—have no known fossil history, but are interesting from our standpoint in being intermediate in certain histological and floral characters between the Angiosperms and Gymnosperms. They have also peculiar geographical distributions.

The most interesting Angiosperms especially commented upon were the species of *Magnolia* and various Cupuliferæ (*Quercus*, *Corylus*, *Betula*) and Salicaceæ (*Salix* and *Populus*). The two main theories of the origin of the Angiosperms suggest: the one, that this great group was derived from Cycadophytæ forms, possibly from members of the Bennettitales, and that the most primitive existing members are such types as *Magnolia* and *Liriodendron*, the other, that the most primitive type of Angiosperm is to be sought for among the unisexual Apetalæ (e.g., Amentiferæ and Piperaceæ). These views have been discussed in detail by Arber and Parkin (*Journ. Linn. Soc.*, Botany, vol. xxxviii, 1907, p. 29).