

A GROUP OF FOSSIL PLANTS.¹

THE publication of Mr. Wieland's first volume in 1906 was an event of great importance which had a wide influence on botanical research. The author gave an account of the floral and vegetative morphology of several species of Cycadeoidea, a genus represented in Upper Jurassic and Lower Cretaceous strata in many parts of the world, but nowhere on so large a scale as in the United States, where hundreds of well-preserved trunks have been found. Though agreeing generally in habit and in most anatomical features with recent Cycads, Cycadeoidea is characterised by reproductive shoots of a type far removed from that of the existing members of the Cycadaceæ. The work accomplished by European investigators since Wieland's first volume was published is summarised in the present volume, which also contains many new facts and amplifies the earlier descriptions; it also includes some account of the author's Mexican expedition in 1909-10, which yielded a rich harvest of Liassic Cycadean fossils. Incidentally Mr. Wieland emphasises the importance of personal observation in the field, and gives salutary advice to many of us who have neglected this part of a palæobotanist's duties. He directs attention to the short-sighted policy of some museum authorities in refusing to allow their specimens to be disfigured by the lapidary's wheel.

The American Cycads are divided into groups in part geographical and in part morphological, and each set of forms is critically discussed from a taxonomic point of view. The Maryland stems agree closely with the English specimens described by Buckland from Portland, and British students are reminded that they have not fully investigated their own material. Two of the most interesting species described and beautifully illustrated are *Cycadeoidea colosallis* and *C. Dartoni*, the latter founded on a portion of a trunk bearing 500 to 600 strobili, most of which contain well-preserved seeds and embryos. A chapter on the seeds of Cycadeoidea is especially interesting; in it the author develops more fully his views on the evolutionary history of seeds as represented more particularly by those of the Bennettitales. The structure of the American seeds agrees in essentials with that of European types, the most complete account of which we owe to the late Prof. Lignier. Wieland institutes comparisons between the Mesozoic Cycadean seeds and several Palæozoic genera, such as *Lagenostoma*, *Conostoma*, and others, and in the course of the discussion he gives a summary of recent work on the older seeds. He suggests that the genus *Codonothea*, usually regarded as the male flower of some Pteridosperm, may be a bisporangiate shoot, which originally contained a central seed, though there is no definite evidence of this, surrounded by a whorl of microsporophylls. His contention is that the complex seed-coats of Palæozoic and later types are the result of sterilisation and fusion of encircling leaves or sporophylls round a central spore; in other words, he interprets the elaborate seed-coats as reduced foliage-organs which have become intimately associated with a megaspore. It is, however, noteworthy that the bisporangiate flowers of such a type as *Cycadeoidea colosallis* are apparently more primitive than the much older Palæozoic seeds, which show no trace of any encircling whorl of leafy organs.

In a chapter on Cycad derivatives Wieland ranges over a wide field, but without committing himself definitely to any clearly defined view on the question of a relationship between the Angiosperms and the Cycadean stock. He holds that the columnar, and often unbranched, stems characteristic of the great

¹ "American Fossil Cycads." Vol. ii., "Taxonomy." By G. R. Wieland. Pp. 1-267 + plates i-lviii. (Published by the Carnegie Institution of Washington, 1916.)

majority of the Cycadeoideas are an unusual type derived from a much more slender and freely branched ancestral form. Comparisons are made between the Magnoliaceæ and the Bennettitales, and reference is made to opinions on the evolution of the Conifers, the position of the Gnetales, and other questions. His survey of the fossil Cycads leads to the conclusion that the true Cycads were probably never more abundantly represented than they are to-day: they were preceded by the Cycadeoidea type, a comparatively stereotyped form, and at an earlier stage the *Williamsonia* group occupied the dominant position, a group exhibiting a much greater range in the form of flower and stem. Some account is given of Cycadean foliage from Mesozoic strata, and of the rise and decline of the Cycad element in Mesozoic floras from the Rhætic to the early Cretaceous period, when the Angiosperms assumed the leading rôle.

Mr. Wieland's second volume is a contribution of considerable importance by an author who has well earned the right to speak with authority on a subject of exceptional interest; but after reading the long theoretical discussions, which are suggestive, though the conclusions are often open to question, one regrets that more attention was not paid to the elucidation of several morphological problems that are still unsolved, and on which the splendid American material can undoubtedly throw much light. The author is an enthusiast with a vivid imagination, and does not always fully appreciate the difficulties of the problems before him; his desire to solve the mysteries of the early stages in plant-evolution leads him into deep waters of speculation, and his points are not always easy to grasp owing to a diffuse style and the lack of concise summaries of conclusions. The photographic plates are probably the most striking illustrations of fossil plants ever published, and the student owes a debt of gratitude, not only to the author, but also to the officials of the Carnegie Institution.

A. C. SEWARD.

METEOROLOGY AND THE SOLAR CONSTANT.

THE Journal of the Scottish Meteorological Society (No. xxxiii.), recently issued, contains, as usual, some very interesting articles.

Lieut. Douglas, Royal Flying Corps, gives some details of his experience during his ascents amongst the clouds in northern France. He finds stratus cloud most frequently in anticyclones and round their eastern and northern borders. The top in such cases is very flat and even, and an inversion of temperature is met with at the upper surface. The lowest temperature is generally at the top of the cloud, but is occasionally met with a little lower. If cumuli attain sufficient height they develop into thunderstorms, but at least 6000 ft. from top to bottom is required for this to happen, and on all occasions in 1916 when thunder developed, the height was not less than 10,000 ft. Mr. Douglas states that cirrus and cirro-stratus almost certainly consist of thin snow.

Dr. Knott discusses the value of the solar constant and the associated problems, giving chiefly a summary of the work of Abbott and Fowle and Anders Ångström. He explains very lucidly the method devised by Langley, by which the error caused in determining the constant by the selective absorption and radiation of the air is overcome. The values obtained for the constant range from 1.97 at Washington to 1.92 at Mount Whitney (14,500 ft.), the mean of 573 observations at Mount Wilson (5670 ft.) gives 1.93, and Dr. Knott considers that we may take these results as correct, so that the solar constant is very nearly 2 gram-calories per cm.² per minute. This is