the whole matter? Not in the Nürnberg *Propädeutik,* truly, nor yet in *reines Denken* as a purely 'subjective' function; but Hegel had some other things to say! "It becomes very clear that one and the same method obtains" in each of the three spheres of being, knowing and doing, "the method of absolute syllogistic. Genera, species and specimens are the only realities in being; genera are realized only in the whole of their species, and species only in the whole of their specimens; the relation of genus, species, and specimen is necessarily that of the three terms in the syllogism. * * * Similarly, ideas, concepts and percepts are the only realities in knowing; ideas are realized only in concepts, and concepts only in percepts; the relation of idea, concept and percept is that of the three terms of the syllogism. * * * Lastly, ideals, purposes and deeds are the only realities in doing; ideals are realized only in purposes, and purposes only in deeds; the relation of ideal, purpose and deed is that of the three terms of the syllogism. * * * Through this principle of absolute syllogistic as the law of unit-universals, or apriori of being, or necessary identity of methods in the sphere of reality and ideality alike, philosophy attains its end in syllogistic as the principle of absolute methodology, and in personality as the topmost reach of its application in human knowledge" (ii., 285 f.). By how much does this differ from, say, the *Rechtsphilosophie?* And by how much the *Rechtsphilosophie* differs from this, because based on an analysis far more profound than that offered in 'Syllogistic'!

For the rest, suffice it to say that students of technical philosophy will find some suggestive criticisms in these pages; for, notwithstanding its author's avowed purpose, the work ranks much stronger in destructive than in constructive material, a circumstance in itself indicative of much. Second, a number of acute interpretations, particularly of Aristotle, Kant and Fichte, are presented, which will raise controversy, and possess the merit of sending the reader to the original sources. Third, Darwin is hailed, not simply as a great scientific man, but as the herald of a new philosophy which, in all likelihood, he would have failed to comprehend. Lastly, much is offered which could be worked up into an epistemology or logic with advantage, were it first subjected to fundamental analyses. For example, we read:

> Every logical conclusion from true premises, that is, every concreted syllogism of knowledge, every true judgment, or real cognition, is one of the ultimate cells which syllogistic, as the cell-theory of the organism of universal human knowledge, recognizes as the indivisible living components of all science and all philosophy. The object, we repeat, determines the subject in knowing. That is, what the object is in itself, even on the idealist's assumption that the subject has created it, must determine all possible knowledge of it; the relations immanent in it must determine all relations immanent in the cognition of it, since any variation in these at once vitiates the cognition so far (II., 247 f.).

Elements are presented here which idealism has not been too prone to emphasize; but they stand in sore need of the regress of criticism.

Dr. Abbot's intense seriousness and total lack of humor, added to his exasperating repetition of formulæ such as the mystic 'My self as one of the we,' and the 'I in the we,' render the work difficult reading; but as a mental gymnastic, the effort to discover the author's special originality and to justify his treatment of the classics of the past, may be recommended. An admirable index makes reference easy.

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American Fossil Cycads. G. R. Wieland. The Carnegie Institution of Washington, 1906. Pp. viii + 296. Pl. I.–L.

The appearance of this handsome quarto volume marks a very important forward step in our knowledge of the Cycadales, while it also throws a great deal of light upon the general problem of the phylogeny of the gymnosperms and their supposed relation to filicinean ancestors. It is the result of studies carried out by Dr. Wieland since 1898, when the first field work was undertaken. In the present treatment the author devotes his attention to establishing the obvious boundaries and botanical aspects of the cycads, reserving their

classification and nomenclature for future consideration; nor does he fail to indicate what must be of the greatest interest to those who are concerned in the solution of broad biological problems, that a study of the seed is certain to reveal much of the highest importance, and we are led to believe that on a future occasion the author may take up this part of the subject more in detail.

The first cycadean trunks from America to receive scientific mention were obtained from the Potomac formation of Maryland and were noticed by Philip Tyson in 1860; but for more than a quarter of a century they remained practically unnoticed until, in 1889, some of the original Tyson specimens which had come into possession of the Maryland Academy of Natural Science were described and illustrated in accordance with their macroscopic characters by Fontaine.

A further collection of Maryland cycads was made in 1893 by Mr. Arthur Bibbins, and this valuable material is now in the museum of the Woman's College, Baltimore. Most of it was gathered from various country people between Baltimore and Washington, representing in all some sixty specimens which had 'been unsuspectedly sequestered from time to time during the preceding hundred years.' Much loss to science resulted during that period, owing to the fact that, being regarded with idle curiosity or with more or less superstitious interest, the specimens had been carelessly treated, while many of those which were too large to handle with ease were broken up and many valuable parts were lost. Characteristic methods of branching were thereby wholly destroyed. As later determined by Professor Ward, this collection was found to embrace seven species of *Cycadeoidea*.

At various times trunks of cycads have been obtained from other widely separated localities, such as the Trias of Prince Edward Island, the Dakota formation of southern Kansas, from one or two localities in Colorado and from California, but the richest deposit of these remains is to be found in the Mesozoic rim of the Black Hills of South Dakota and Wyoming.

Scientific attention was not directed to this locality until 1893, although on several previous occasions miners proceeding to Deadwood had observed them at Black Hawk and Minnekahta; but at that time six silicified trunks were received at the United States National Museum, and five years later they were described by Ward, who found them to include four species of *Cycadeoidea*. This collection, together with another lot of twenty trunks obtained by Professor T. H. MacBride later in the same summer, served to arouse great interest and to awaken the special enthusiasm of Professor O. C. Marsh, of Yale University, whose efforts to secure a representative collection resulted in placing more than seven hundred trunks, many of them of large size and fine preservation, in the Yale Museum. This truly magnificent series furnishes the greater part of the material upon which the present monograph is based.

In the Freezeout Hills of Carbon County, Wyoming, there is another cycad locality which ranks as third in importance on this continent. The discovery of this locality is due to Professor Marsh, who obtained a very large collection of specimens representing exclusively the genus *Cycadella*.

An examination of the American distribution of the cycads shows them to be represented in the following geological horizons:

		Species
1. Trias of Prince Edward Island	*Cycadeoidea*,	1
2. Trias of York, Pa.	*Cycadeomyelon*,	1
3. Upper Trias of North Carolina	*Cycadeoidea*,	1
4. Jurassic of Colorado	*Cycadeoidea*,	1
5. Upper Jurassic, Wealden or Cretaceous of the Black Hills of South Dakota and Wyoming	*Cycadeoidea*,	27
6. Upper Jurassic of Central Wyoming and Black Hills, and from Freezeout Hills, Wyoming	*Cycadella*,	21
7. Potomac Formation of Maryland	*Cycadeoidea*,	7
8. Lower Chico of Colusa County, Cal.		1

9. Dakota Formation of Kansas ..... *Cycadeoidea*, 1
10. Pre-Laramie (?) of Golden, Colo. ..... *Cycadeoidea*, 1

From this it may be observed that up to the present it is possible to recognize

	Species.
Cycadeomyelon	1
Cycadella	21
Cycadeoidea	40

with one specimen as yet unidentified.

The author discusses at some length the varying conditions of fossilization and the resulting effect upon structure; and he further directs attention to the alterations of external form due to pressure, either during or after fossilization. The cutting of such bulky material, and more particularly the excision of special parts, required the elaboration of special methods and the manufacture of specially constructed cutting tools; but the exercise of ingenuity, skill and great patience enabled the author to cut all his own sections with great success.

As in existing cycads, the fossil forms show a highly developed armor composed primarily of the persistent leaf bases; but in addition there is a ramentum which is borne over and densely packed between the leaf, peduncle and bract surfaces, as well as thickly enveloping the entire crown. The presence of such a ramentum is well known, not only in the cycads, but also in the ferns. The special features of this structure in the present case are, first, the perfection of its preservation, probably resulting from the free percolation of silica-laden solutions through the hairy ramental mass; and second, the fact that among fossil species the ramentum shows a profuse development which is in striking contrast with its very reduced condition in existing species, and which in *Cycadella* results in fully half the bulk of the trunk being made up of this material. This variation, while at first appearing to constitute the basis of a broad differentiation of the great groups, is in reality little more than of generic importance. The various stages of development found show conclusively that the Cycadeoideæ and Cycadaceæ have been alike subject to a progressive reduction of the profuse ramentum characterizing their common Paleozoic filicinean ancestry.

The most striking external feature of all the cycads is to be found in the armor composed of spirally arranged old leaf bases. In existing cycads the regular order in which the leaves appear is not disturbed except by the appearance of terminal cones. In Cycadeoideæ, on the other hand, disturbance of this arrangement is very common and is due to the emergence of numerous large and laterally borne fructifications, and to the particular level at which periderm formation takes place. In consequence of these disturbances, the leaf arrangement can not be used for either generic or specific distinctions. A much more definite and constant feature is to be found in the particular grouping of the vascular bundles in the leaf scars.

Special interest centers in the character of the inflorescence. A study of the ovulate cone of *Cycadeoidea wielandi* shows a structure which arises from between the old leaf bases or else from their axils in part, at any point between the base of the trunk and the youngest series of leaves. In structure they present the type exhibited by *Bennettites gibsonianus* and *B. morierei*. But it is found that in all the strobili, situated about the lateral bract-bearing surface of the peduncle, and just beneath the terminal ovulate cone, there is an annular shoulder which bears distinct traces of some earlier, dehiscent or abortive or wilted disk. This disk is seated on the receptacle above the bracts, and vascular bundles pass out to it from the woody cylinder of the peduncle. This disk is interpreted as a staminate receptacle, and its presence in all the specimens from the Black Hills is held to signify that all these species were bisporangiate. In some cases the inconspicuous character of the disk leads to the inference that the inflorescence was homosporous. The evidence presented by the great majority of cones studied supports the conclusion that all the known Cycadeoideæ are descended from bisporangiate forms, and that of all the considerable number of fruits

of *Cycadeoidea* and *Bennettites gibsonianus*, or allied species, far the larger portion were actually bisporangiate and discophorous. That this conclusion has not resulted from previous studies, and that it has only rarely been suggested in a modified form, is ascribed to the imperfection of the longitudinal sections of cones.

The orthotropous seeds are about the size of a small grain of rye, and each is produced on a separate pedicel. Only one coat encloses the nucellus. In this respect *Cycadeoidea wielandi* is comparable with *Bennettites morierei* from which, however, it differs in detail to such an extent that the two can not be homologized with certainty. The seed coat of the former is nevertheless exactly comparable with *Lagenostoma*, which, of all the existing and extinct forms thus far discussed, affords the most striking structural parallels with American *Cycadeoidea* seeds.

A further parallelism between the American *Cycadeoidea dacotense* and *C. wielandi*, and the European *Bennettites gibsonianus* and *B. morierei*, is to be found in the presence of well-marked dicotyledonous embryos which more or less nearly fill the entire space and indicate a nearly, if not complete, exalbuminous condition. These embryos are strikingly like those of *Gingko*. Evidence has also been obtained with respect to the existence of an earlier or preembryonic stage which has never been found preserved in any other specimen or hitherto observed in any other fossil gymnosperm or other plant. The evidence points to the replacement of the oospore by a homogeneous tissue and the absence of a suspensor. The embryo was therefore formed directly through growth of the oospore which thus represents the proembryo or protocorm. The suggestion arising from these facts is an analogy with *Ginkgo* in which there is a much more simple form of embryogeny than in other gymnosperms.

One of the most striking facts revealed by the studies so far completed, is that the hiatus between the two great Cycadean lines is of a two-fold character. In existing cycads great complication of the cortical bundle system has developed, while the reproductive organs are relatively little changed and primitive. Conversely, in the Cycadeoideæ there is a retention of the primitive cortical system together with the most surprising reproductive changes leading up to the bisexual flower which mimics that of the angiosperms. It is therefore natural to ask if two groups so related shall be included in one greater class, the Cycadales, or the Cycadeoideæ be excluded from the true Cycadales, as Bennettitales or Cycadeoidales? After a careful review of the positions taken by Scott, Zeiller, Potonié and Count Solms, and of the evidence afforded by the paleontological record, it is held that the Cycadeoideæ find their appropriate place amongst the true Cycadales.

An interesting summary of the fern-cycad relations, together with suggestions bearing upon analogies of the ferns and angiosperms, closes a very able treatment of a difficult but intensely fascinating problem. The general tendency of the evidence is to greatly strengthen the current views respecting the marattiaceous origin of the cycads; or, in the pregnant words of the author "The preceding résumé of the principal characters of the two great cycad groups as combined and showing their descent from marattiaceous ferns of the Paleozoic, is not merely conclusive, but one of the great cornerstones upon which the conception of evolution can rest secure."

D. P. PENHALLOW

MONTREAL,
May, 1907

SCIENTIFIC JOURNALS AND ARTICLES

THE April number (volume 8, number 2) of the *Transactions of the American Mathematical Society* contains the following papers:

E. KASNER: 'Dynamical trajectories: the motion of a particle in an arbitrary field of force.'

W. R. LONGLEY: 'A class of periodic orbits of an infinitesimal body subject to the attraction of n finite bodies.'

E. B. VAN VLECK: 'A proof of some theorems on pointwise discontinuous functions.'

L. E. DICKSON: 'Invariants of binary forms under modular transformations.'

E. J. WILCZYNSKI: 'Projective differential geometry of curved surfaces (First memoir).'

J. I. HUTCHINSON: 'A method for constructing