STUDIES IN THE MORPHOLOGY OF SPORE-PRODUCING MEMBERS: PART III. MARATTIACEAE. By F. O. BOWER, Sc.D., F.R.S., Regius Professor of Botany in the University of Glasgow¹.

THE memoir, of which this is an abstract, deals with the sori of all the four living genera of Marattiaceae; the development has been traced in *Angiopteris* and *Marattia* from the earliest stages to maturity, in *Danaea* and *Kaulfussia* from such early condition as the material would permit. Some of the results from *Danaea* have been already submitted to the Society in a preliminary statement². One result of the investigation has been to demonstrate, as regards their development, the substantial unity of type of the sporangia in the four genera. In all of them a single 'superficial parent cell' of prismatic form is to be recognized embedded in the massive sporangium when young, not in a central position, but directed obliquely towards the centre of the sorus. By periclinal division this forms internally the archesporium, externally that part of the wall where dehiscence takes place. The tapetum arises, typically in them all, from the cells surrounding the archesporium. The dehiscence is in all by a slit in a radial plane, which may widen to a circular pore in *Danaea*. In those sori where the sporangia are united laterally there is no annulus; it is present only where the sporangia are separate, as in *Angiopteris*.

An interesting feature is disclosed by estimates of the potential spore-production of the single average sporangium in the four genera; the results in round numbers are, in *Angiopteris* 1,450, in *Danaea* 1,750, in *Marattia* 2,500, in *Kaulfussia* 7,850. It is to be remembered that the usual numbers in Leptosporangiate Ferns are 48-64; in some Leptosporangiate Ferns (*Osmunda*) the number may rise to 500. I have ascertained in *Gleichenia*, however, that the number may be as high as in *Angiopteris*. This large potential output of spores goes parallel with the broad base of the sporangia; in fact, the Eusporangiate condition is that best adapted for maturing large numbers of spores in the individual loculus.

Frequent deviations from the type have, however, been observed, as well as variations of size and mode of segmentation of the sporangia, and it is not possible in certain cases to refer the whole

¹ Abstract of a paper read before the Royal Society, June 17, 1897.

² Roy. Soc. Proc., vol. lix. p. 141.

sporogenous tissue of one sporangium to a single parent cell. A special study of the irregularities has been made in *Danaea*, in which genus they are most marked; incomplete septa are frequent, and the sporangia are of very unequal size. The main features have already been noted in the preliminary statement on that genus, where it has been pointed out that comparison of the details with those of the septate anthers of some Angiosperms shows that there is a remarkable resemblance between the two cases. Similar irregularities have been noted, though less commonly, in *Kaulfussia*, and *Marattia*, and rarely in *Angiopteris*.

Those fossil Marattiaceae which are best known as to the details of the sorus have been compared, and the substantial similarity of the sori in certain cases to those of the modern genera recognized. The facts from fossils and from the modern Marattiaceae have been made the basis for a fresh discussion of the theoretical question, whether the synangium is or is not a result of coalescence of sporangia? It is concluded that the palaeophytological evidence leaves the question open as to the priority of existence of forms with synangia, or with separate sporangia, in the Marattiaceae. Notwithstanding that writers of authority have treated the question as decided, that the synangia are a result of fusion of distinct sporangia, it is held with some persistence that it is still open; the palaeophytological evidence is inconclusive, while the comparative evidence from the living genera will not only accord with, but appears actually to support a view of septation.

For the analogy with septate anthers, where septation must have occurred, and the similarity between the details of these and those in *Danaea*, and especially the partial septations in both, make it appear probable that in this genus progressive septation has taken place. It is thought probable that progressive septation has been a feature, at least where the sori are elongated, as in *Danaea*. But the question is left over for future discussion whether or not a similar septation, rather than coalescence, may be accountable also for the origin in the first instance of a circular sorus with a plurality of sporangia united together as in *Asterotheca*, or in *Pecopteris unita*.

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