in my opinion, a matter of some importance; the study of the sporangium in Pteridophyta has long been based upon the examination of the highly specialized and strictly constructed sporangium of the Leptosporangiateae. The conclusion is, however, becoming obvious that such strictness of construction and regularity of segmentation is exceptional, and that in the Eusporangiateae such strictness is not the rule.

Other Marattiaceae, and especially *Kaulfussia*, have also been examined, and they are all found to conform to one fundamental type, though differing in detail; it appears that, as regards the sorus, *Danaea* is the least specialized, and *Angiopteris* the most specialized, of the living genera, and that they form a very natural series. Such a series in plants of so antique a stock deserves the most careful comparative study, and the results should carry unusual weight.

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DIRECT NUCLEAR DIVISION IN THE EMBRYO-SAC OF LILIUM MARTAGON.—In the course of some work on the nuclear divisions immediately preceding the formation of the ovum in *Lilium Martagon*, I have observed the interesting fact that the two lower antipodal nuclei appear to be regularly formed by a process of direct division.

The primary nucleus of the embryo-sac divides by the indirect method, and the daughter-nuclei divide again after a very short period of rest. These divisions have been frequently figured as typical examples of karyokinesis. The four nuclei thus formed remain in the resting condition for some time, during which the embryo-sac increases greatly in length. At first the resting nuclei are all alike, in spite of the curious difference in the number of chromosomes which go to build up the micropylar and chalazal pair respectively (Guignard, *Nouvelles Études sur la Fécondation*, p. 187). But towards the end of this resting period the nuclei are differentiated in pairs. At the micropylar end the two nuclei have increased little in size since their formation. They are usually rather egg-shaped, and are separated from the chalazal nuclei by a vacuole which occupies the centre of the embryo-sac. The two chalazal nuclei have grown a good deal: the upper one is usually somewhat flattened, and the lower one of rather irregular outline, fitting neatly into the pointed chalazal end of the embryo-sac.

When the four nuclei show signs of approaching division, the appearance of the lowest one is very different from that of the upper three. In these the coiled chromatic ribbon which marks the spirem- (or *knäuel*-) stage is beautifully differentiated, while the lowest (chalazal) nucleus still has the reticulated appearance of the resting stage. Later on each of the micropylar nuclei has formed a small spindle and the upper chalazal nucleus a larger one, while the lower chalazal nucleus has divided in such a way that each segment appears as a hemispherical reticulated shell. These shells are connected by numerous fibrils, apparently formed by the stretching of the network in the equatorial region of the mother-nucleus. The division of the lower chalazal nucleus is complete before the three karyokinetic figures have passed out of the nuclear-plate-stage. The daughter-nuclei of course appear in the resting stage, and are connected by numerous fine threads which represent fairly enough the usual 'connecting threads' of the later karyokinetic stages. Indeed the whole appearance of this lowest pair of nuclei is now that of a rather poorly preserved di-spirem figure. The three spindles which occupy the rest of the embryo-sac are typical examples of karyokinetic figures, and form a curious contrast to the ill-defined appearance presented at the chalazal end.

I cannot do more here than allude to the possible theoretical importance of this distinction between the formation of the two lowest antipodal nuclei and that of the other six nuclei which are found in the embryo-sac before fertilization. So far as it goes, it tends to confirm Weismann's view that the elaborate mechanism of karyokinesis provides for the transmission of hereditary qualities. I hope to discuss the question at length when the details of my work are published.

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