

derived from the shoot-apex. Sadebeck<sup>19</sup> makes the following statement concerning the equisetaceous embryo:—"Nach meinen Untersuchungen bin ich vielmehr zu dem Resultat gekommen, dass die obere Hälfte des noch zweizelligen Embryo ganz unmittelbar die primäre Axe darstellt, aus welcher sich in gleicher Weise, wie später bei der erwachsenen Stammknospe die Blätter erzeugen."

The embryo of *Isoetes echinospora*, as described by Campbell,<sup>20</sup> also resembles in a measure that of *B. virginianum*. It has a large foot originating from *both* the hypobasal quadrants, which by its position and size, at least, somewhat strikingly resembles that of *Botrychium*. In the case of the latter, it is quite impossible to state from which of the primitive divisions of the fertilized egg, the foot takes its origin. A resemblance also exists in the formation of the root and shoot from the upper part of the embryo. In *I. echinospora*, however, the cotyledon is the first shoot-organ to appear, and the stem-meristem does not definitely develop until later, although there is an indication of its existence from the first.

It is not to be supposed, however, that these resemblances are in any way to be considered as indicative of relationship, for the development of the embryo may vary greatly in the same natural group. In the *Marattiaceae*, for example, both *Angiopteris* and *Marattia*, as described by Farmer<sup>21</sup> and Campbell,<sup>22</sup> are distinguished by the precocious development of the cotyledon. In *Dawsonia*,<sup>23</sup> on the other hand, it is the root which first shows considerable development. A somewhat similar state of affairs has been observed by the writer in the *Equisetaceae*. *Equisetum arvense* and *E. hiemale* have a precocious root, whilst *E. limosum* and *E. palustre* develop first the shoot-organs. Among the *Ophioglossaceae* themselves, in *Ophioglossum pedunculatum*, the cotyledon is the first organ to rupture the *calyptra*. In *Botrychium virginianum* and *B. Lunaria*, the root is prior in appearance.

In figure 48, is represented an embryo, which, although larger, is yet younger than that in figure 47. At *a* and *b* are probably the root and shoot initials. Figure 49 is an older stage than figure 47. The root, *r*, is already well advanced and its apical region is fully developed. Behind

19. Die Entwick. d. Keimes d. Schachtelhalme. Pringsheim. Jahrbucher f. Wiss. Botanik. 131. x1., p. 582.

20. Annals of Botany, vol. v., p. 244.

21. Annals of Botany, vol. vi., p. 265.

22. Annals of Botany, vol. viii.

23. Brebner, G. On the Prothallus and Embryo of *Dawsonia simplicifolia*. Annals of Botany, vol. x., p. 100.