

growing shoot was forced to make a half turn to assume its normal, negatively geotropic position.

In 1856, Mettenius<sup>2</sup> published an account of the sexual phase of *Ophioglossum pedunculatum*, which he found in considerable quantities, in the earth of the pots containing the adult spore-plants. Attempts to germinate the spores, under observation, failed also in this case. The youngest prothallia were tuber-like in shape, and one to three millimetres in thickness. Out of the tuber grew subsequently a conical process which elongated considerably (four to fifty millimetres), and sometimes branched. At the tip of the outgrowth, or of its ramifications, was found an apical cell, sometimes at least, of triangular pyramidal shape. The cylindrical portion of the prothallus grew upwards towards the surface of the soil, but, on reaching the light, became green and died away at the apex, or divided into two or three lobes which flattened out on the earth and developed no further. The tuber was composed of starch-laden parenchyma. In the process some textural differentiation was found, there being an axial, elongated, starch-free strand, surrounded by short starch-bearing cells. Both kinds of sexual organs were found in the same plant and not arranged in any definite order, but generally situated on the cylindrical process. The *antheridia* were large in size and their wall was generally two layers of cells in thickness. The antherozoids were large also, and composed of one and a-half to two spiral turns. The *antheridium* opened by a pore produced by the breaking away of two superimposed cells in its wall. The aperture was generally situated in that part of the wall nearest the apex of the prothallium. The spermatozoids swarmed out of the mother cells and about in the cavity of the *antheridium* before making their way out. The *archegonia* originated from two superficial cells, the upper of which gave rise by repeated divisions to a neck of three to five tiers of cells; the lower formed the axial row, which were not, however, made out individually by this writer. On account of the small number of embryos found, it was impossible to follow stage by stage, their development. Nothing was noted in regard to the formation of the first dividing walls. The youngest embryo was oval in shape and already segmented into a number of cells. The older ones were similar in configuration, but of larger size. The anterior end of the elliptical embryo grew through the tissues of the prothallium towards its apex, and bursting forth sooner or later, became the cotyledon, green in colour, and lanceolate in outline. The root developed more slowly and bored its way directly outwards. A rounded protuberance at the

2. Filices Horti Botanici Lipsiensis, pp. 119-120.