

## Abnormal Prothalli of *Pinus sylvestris*.

BY

MARY BARTHOLOMEW.

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With Plate XLIX.

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When studying the life history of *Pinus sylvestris* recently in the Laboratory of the Royal Botanic Garden, I found in a hand-made section of an ovule the structure shown in Plate xlix., Fig. A. It resembles in its features that of an ovule described and figured some years ago by Professor Bretland Farmer,<sup>1</sup> but my specimen shows certain differences, and in any case the occurrence of anomalies of the kind have been recorded so seldom that a notice of this one may not be superfluous.

The prominent feature in the specimen is the occurrence of a pair of archegonia, Fig. A,  $a_1$ , not quite at the same level at the chalazal end of the embryosac, and of a single one,  $a_2$ , at the micropylar end. But closer examination shows that the prothallar body in which they occur is not normal. In Fig. A, there is visible at  $s_1$  a distinct lobing of the mass, and passing downwards in the figure, *i.e.*, towards the micropylar end from this indentation, there is an evident line of demarcation between a micropylar and a chalazal portion of the prothallar body. At  $s_1$  the separation of the two is so definite that there is a space between them, but elsewhere in the section, at  $s_2$ , for example, there is no break in continuity between the tissues of the prothallar masses, although there is a difference in the size of the cells at their point of junction as compared with those in the rest of the mass.

We may assume, it seems to me, that there are here two pro-

<sup>1</sup> Farmer, on the occurrence of two Prothallia in the Embryosac of *Pinus*, Ann. of Bot. VI (1892).

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thalli which are partially fused, their archegonial ends being free and turned in opposite directions. In Professor Farmer's specimen, to which I have referred, there were two prothalli apparently more sharply separated than in the one I describe, but the archegonial end of each was directed towards the micropyle, and the prothalli lay therefore somewhat side by side, one, however, overlapping the other. In this feature Professor Farmer's specimen differed from my one, where the prothalli are antiposed.

The explanation of the abnormality which naturally occurs to one is that two of the four potential megaspores of the sporocyte, instead of one as is usual, have germinated and formed each a prothallus; but the solitary specimen I have for examination furnishes no material for a critical opinion.

I may, however, add this. It is evident that an embryo formed from an egg of one of the chalazal archegonia in my specimen would have its cotyledons forced towards the micropyle in germination, whilst the apex of the radicle would in vain push against the hard shell around the chalaza. May it be, then, that it is through an anomalous prothallial development of this kind that those occasional abortive attempts at germination of the seed are to be explained, in which the cotyledons emerge first of all through the micropyle, the radicle does not issue, and the whole seedling, therefore, dies soon through want of an absorbing primary root?

Since the above was written, a series of ovules have been cut by the microtome in the Botanical Laboratory for the purposes of a demonstration series from the excellent material collected at Crookston, on the borders of Midlothian and Berwickshire, from which my specimen was obtained, and one of these ovules shows conspicuously the features of multiplication of prothalli; so much so, that I have included, by permission, an illustration of it (Fig. B in Plate xlix.) side by side with the figure of my own specimen. The section figured shows an arrangement of prothalli more resembling that in Professor Farmer's specimen. At  $s_1$  there is evident separation of the archegonial ends of two prothalli, at  $s_2$  the line of separation is still evident, and at  $s_3$  there is the limit of the prothallus which approaches nearer the micropyle, and in which two archegonia,  $a^1$ , are visible. At  $a_2$  is the only archegonium visible in the other prothallus, but in other sections of the ovule more archegonia are visible. That in this ovule a third

prothallus is represented might be suggested. Above the archegonium at  $a_2$  there is indication of a line of separation which would pass below the body marked  $a_3$ , which may be an archegonium also, and if so it is altogether out of place as a product of the prothallus bearing  $a_2$ . Upon this and other points I do not dwell further at present. An examination of more material will enable me, I hope, to say more on another occasion.

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### EXPLANATION OF THE FIGURES IN PLATE XLIX.

Illustrating Miss Bartholomew's Paper on "Abnormal Prothalli of *Pinus sylvestris*."

FIG. A. Ovule in longitudinal section.  $a_1$   $a_2$ , archegonia.  $s_1$   $s_2$ , line of separation of prothalli.

FIG. B. Ovule in longitudinal section.  $a_1$   $a_4$ , archegonia.  $a_5$ , probably another archegonia.  $s_1$   $s_2$   $s_5$ , lines of separation of prothalli.



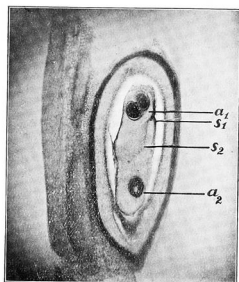


Fig. A.

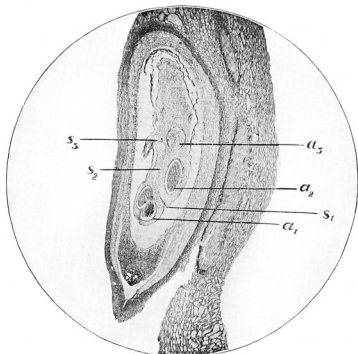


Fig. B.

Bartholomew—Abnormal prothalli in *Pinus sylvestris*.

