NOTE ON THE STRUCTURE OF THE OVULE OF *LARIX LEPTOLEPIS*.—The writer began the study of the structure and life-history of the various Larches in March 1915. Such a study seemed profitable, as, except for occasional observations, the group has been practically neglected. Even such references as do exist are mostly detailed cytology, like Allen's admirable account of the formation of the spindle in the reduction division of the pollen mother-cells of *L. europaea* (Ann. Bot., vol. xvii, 1902). But the broad outlines of the life-history are still far from ascertained. Unfortunately, the work has not made sufficient progress this season to warrant a complete account, and this for many reasons. The absence of information on the group meant that the dates of the appearance of the various stages were unknown, and it was thought advisable to determine these dates as a preliminary to further work. The abnormal sterility of the specimens at the writer's disposal was also a hindrance. It was no uncommon thing in July, when removing the hardened

Longitudinal section of the upper part of the ovule of *Larix leptolepis*. A, nucellus; B, embryo-sac; C, integument; 1, 2, 3, its layers in process of differentiation; D, micropylar constriction; E, fold with stigmatic hairs; F, a pollen-grain entangled; G, thickened plate from which hair-like processes arise.

integument, to cut into 200 ovules before meeting a good one. Finally, difficulties in procuring fixing chemicals, &c., owing to the war, also retarded progress. But there were one or two points which appeared which it is considered well to put at once into this preliminary note.

I. The structure of the ovule was interesting and peculiar. Most worthy of record, however, is the fact that its structure was almost identical with that described by Lawson for the ovule of *Pseudotsuga Douglasii* (Ann. Bot., vol. xxiii, 1909). To describe its appearance and to emphasize the fact of its similarity to that of *Pseudotsuga* nothing can be better than to follow Lawson's description of his ovule on the accompanying figure, which is a longitudinal section of the upper part of the

ovule of *Larix leptolepis*. Lawson says: 'The pollen-receiving device in *Pseudotsuga* is quite peculiar and unlike anything yet described for Gymnosperms. For some little time after pollination the nucellus presents the form of a small protuberance with a perfectly rounded apex (A). The integument (c) extends for a considerable distance beyond the nucellus. At a point immediately above the apex of the nucellus the integument bends inwards in such a fashion as to partly close or narrow the micropylar canal, and then sharply bends out again. This results in the formation of a distinct stricture midway between the apex of the nucellus and the mouth of the micropyle (D). As a result of this peculiar curvature of the integument, the micropylar canal is not a straight passage of uniform width, but consists of two chambers, one immediately above the apex of the nucellus and the other near the mouth of the micropyle. In addition to this narrowing in the middle region of the micropyle, the integument is still further modified. The extremity of the integument which forms the mouth of the micropyle is folded inward (E). On the inner surface of this enfolding extremity numerous fine hair-like processes are present. A close examination of these processes makes it clear that they were not cellular in structure, but were merely outgrowths from the external walls of the epidermal cells. They serve very effectively, however, as a stigmatic surface.' The hairs in *Larix leptolepis* are firmer than those figured by Lawson, and arise from a basal plate (G). He goes on to say that pollen-grains were never found on the nucellus: 'They were invariably found in the upper chamber of the micropyle and frequently entangled in the hair-like processes of the mouth.' A similar condition is found in *leptolepis*, the figure showing a pollen-grain so entangled (F).

The quotation shows how like the two ovules are. The explanation may be, and most probably is, biological, but may also have some phylogenetic significance. The megaspore membrane in *leptolepis* does not cover the upper end of the endosperm, a condition similar to *Pseudotsuga*. There are very small archegonial chambers in both. Lawson states the frequent presence of only one tier of neck-cells in *Pseudotsuga*. In *L. leptolepis* the prevailing condition seems to be one tier of five cells. There are typically five archegonia in *L. leptolepis*, four to six in *Pseudotsuga*. All these points are, of course, of minor importance, but with the peculiar sameness of the ovules there is an obvious temptation to magnify them. The detailed investigation may, however, settle the point.

II. The archegonial jackets usually touch, so that two archegonia are only separated by two cell-layers. Frequently these coalesce to one, and even the archegonia may be separated only by the shrivelled remains of degenerated jacket-cells.

III. Double pollen-grains are very plentiful in *L. leptolepis*, as already described by Coker (Bot. Gaz., vol. xxxviii) for *L. europaea*, by Hutchinson (Bot. Gaz., April, 1915) for *Picea*, and others. Their origin will be investigated next spring, as, even though material was first collected on March 15, practically all the pollen was shed on March 16, in spite of the fact that the spring was a phenomenally late one. *L. europaea* presents similar features.

IV. There is one last point—a vegetative abnormality. As is well known, the male buds of the Larch appear terminally on dwarf shoots from the second year on. While collecting such buds—already well developed in August—a case was noticed of a dwarf shoot carrying such a bud. The shoot was six years old, judging by the

leaf-scar rings on it. Growing out from the dwarf shoot from the axil of the third-year ring of leaves there was a very small secondary dwarf shoot with six or seven small leaves on it. Such an appearance is quite understandable, because, if a dwarf shoot under suitable conditions can become a long shoot upon which dwarf shoots are subsequently formed, there is no reason *a priori* why secondary dwarf shoots should not appear on an ordinary dwarf shoot. But the branching of dwarf shoots in the Abietineae has not often been described.

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