I cannot close this brief account of the meetings of Section K, without reference to the very interesting visit that some members were able to make to the Government Experimental Station at Dulacca, where Dr. Jean White and her staff are endeavouring to cope with one of the most difficult practical problems of Australia. One-fifth of Queensland is said to be under the dominance of the terrible pest, Prickly Pear, and its inroads continue at an alarming rate.

Dr. White's long lines of experimental plots for testing the efficacy of different poisons were the admiration of all who saw them, and the laboratory attached now makes possible, investigations into the physiological aspects of their application, so that there is every hope that results of considerable economic importance may accrue.

FOREIGN POLLEN IN THE OVULES OF *GINKGO* AND OF FOSSIL PLANTS.

By Birbal Sahni,

Emmanuel College, Cambridge.

[With Plate II].

WHILE examining some material of young *Ginkgo* ovules from Montpellier, I was struck by the very frequent presence, in the pollen-chamber, of large pollen-grains with two wings, very different from the normal unwinged grains of *Ginkgo*.[1] Of the ovules investigated, about a dozen in all, no less than eight contained these foreign pollen-grains, which are characterised by prominent "wings" with reticulate markings like those on the bladders of pine pollen; in both microspores and tubes starch-grains are abundant (Plate II, Figs. 1, 2, 3,) and in one case two evanescent prothallial cells were seen. These features clearly indicate the Abietineous nature of the pollen.

One of the grains has actually put out a tube twice as long as its own diameter, and, what is more striking, it appears from Fig. 2 as if part of the tube had just penetrated the nucellus. The tip

[1] Recently Professor Jeffrey (Bot. Gaz., Vol. 58, 1914, Pl. 23, Figs, 7, 8) has called attention to what he describes as wings on the pollen of *Ginkgo*; I am, however, unable to confirm this observation.

of the same tube, however, seen in the next section of the series (Fig. 3), is bent sharply away from the nucellus, as if it had met an obstacle. This makes the penetration doubtful. The growth of the tube is away from the floor of the pollen-chamber.

The pollen-chamber of one of the ovules, in addition to a couple of winged grains, also contains two smaller, wingless, round ones (Fig. 4); a third type of pollen, apparently belonging to a third species, and differing from these in its oval shape and smaller size, was seen in different ovules (not photographed). Neither of the two latter kinds of pollen shows any sign of germination; each contains either one or two nuclei and none of them appear to belong properly to *Ginkgo*. It has not been possible to ascertain whether there were any fertile male *Ginkgo* trees in the neighbourhood of the tree from which the ovules were collected.

We have here an interesting case of ovules containing foreign pollen from as many as three distinct species, one of the grains being in an advanced stage of germination. Among living plants such an occurrence has not, so far as I am aware, been hitherto recorded. Of course, the chance of foreign pollen effecting an entrance into the pollen-chamber of *Ginkgo* is not so remote as may at first appear. As in many Conifers, so also in *Ginkgo*, the pollen-collecting mechanism is a drop of liquid, exuded from the micropyle and subsequently sucked in again.[1] In these circumstances any pollen-grains or other foreign bodies which are arrested by the "stigmatic drop" and are not of too great a size may find their way into the pollen-chamber. Especially in the case of a dicœcious tree like *Ginkgo*, away from its home, and in the usual conditions in which it is grown in the West, perhaps there would be even more chance of foreign than of normal pollen reaching the ovules. In fact, one may well be surprised that more instances of this kind have not been observed, for example, in the several genera of Conifers (*Taxus*, *Cephalotaxus*, *Juniperus*, *Cupressus*, *Sequoia*, etc.) possessing a similar pollen mechanism.

As Professor Seward remarked—and herein lies the chief interest of this note—if a similar example were found in a fossil state, it would in all probability lead to a reference of the pollen-grains and ovule to the same species. The only record of foreign pollen in fossil plants known to me is that by Professor Oliver,[2] who in *Stephanospermum akenioides* figures three foreign

[1] Tison, A. "Remarques sur les gouttelettes collectrices des ovules des Conifères." Mém. Soc. Linn. Normandie, t. 24, 1911, p. 51.

[2] Oliver, F. W., Trans. Linn. Soc. Bot. II, 6, 1904, p. 376 and Pl. 42, Fig. 15.

pollen-grains—found by him "in but a solitary instance"—in addition to a large multicellular grain which was probably the true pollen of *Stephanospermum*. A comparison of our Figs. 3 and 4 with Professor Oliver's Fig. 15 is interesting. In both cases the pollen-chamber contains foreign as well as normal grains, but while in the former the germinating pollen is known to be foreign, in *Stephanospermum* the fact that the large grain had germinated went in support of the assumption that it belonged properly to that plant. Had the sections reproduced in Figs. 3 and 4 been from a fossil seed, in the absence of data pointing to the contrary the temptation to assign the germinating grain to the plant in whose ovule it was contained would have been almost irresistible. There is, however, no reason for throwing any doubt upon the diagnosis of the pollen in the fossil seed described by Professor Oliver.

Nevertheless, the present note will serve at least to demonstrate that the mere fact of germination cannot be used in support of conclusions regarding the identity of fossil pollen-grains found enclosed in ovules.

Although perhaps it is not surprising that a pollen-grain should be able to germinate in a foreign ovule, it may be of interest to know at what stage of its growth the (presumably) chemical influences of the ovule arrest the further success of the stranger. Is the ultimate failure occasioned by an active repulsion exercised by the ovule, or is it due simply to a passive inhospitality? Artificial pollination experiments, on a convenient plant like *Taxus*, might be of some use.

I wish to express my thanks to Professor Seward, at whose suggestion this note was written.

THE BOTANY SCHOOL,
CAMBRIDGE.

May, 1915.

EXPLANATION OF PHOTOGRAPHS ON PLATE II,

ILLUSTRATING MR. SAHNI'S PAPER ON FOREIGN POLLEN IN THE OVULES OF *GINKGO*.

Fig. 1. *Ginkgo*. Median longitudinal section of young ovule. Two foreign pollen-grains in pollen-chamber, the left-hand one showing the two large wings, the other lying in a different plane. Female prothallus in early free nuclear stage.

Fig. 2. Same ovule as above, the right-hand grain with its tube penetrating (?) the nucellus. Starch grains. Reticulate markings on the wings.

Fig. 3. Same ovule, next section of the series. Pollen-tube with two nuclei; a third nucleus is seen in Fig. 1, still enclosed in the grain. Tip of tube reflexed.

Fig. 4. Another ovule. Four pollen-grains—two winged, two unwinged.