Stimulation of the Discharge of Gametangia from a Brown Alga by a Change from Light to Darkness

WHILE studying the polarity of the *Fucales* egg, I observed in 1951 that isolated receptacles of *Pelvetia fastigiata* could usually be stimulated to discharge gametangia by exposure to a brief period of darkness following a longer period of illumination. Thenceforth, gametes of *Pelvetia* have been obtained routinely by this means. It was further observed, especially at lower temperatures, that the shedding stimulus was sometimes transmitted from one region of a receptacle to another. Since no similar observations on algae have been published, and since the *Fucales* egg is an attractive object for embryological investigation, a brief report may be of interest.

Material was collected at Corona del Mar, California. Mature receptacles were cut free at their bases, brought indoors, and allowed to become air-dry until liquid was no longer visible upon them. Then they were placed inside a covered jar which was in turn inside an ice-cooled 'Thermos' jug and transported to the Earhart Plant Research Laboratory in Pasadena, where they were stored in closed jars, still dry, in the dark, and at 6° C. Even after more than two weeks of such storage, receptacles have yielded gametes which united to form zygotes showing more than 95 per cent normal germination.

The light–dark response was found to be weak or absent in receptacles stimulated before two or three days of such storage. Therefore, after at least two days of such storage, receptacles were transferred to sea-water at 16° or at 9° C. and were illuminated by about 500 ft.-candles of white light free from infra-red radiation. Receptacles that had been stored for relatively long times often extruded some gametangia while being illuminated, but such shedding did not affect the subsequent response to darkening.

Receptacles that were transferred to darkness after two hours of illumination did not respond; but those transferred after four or more hours of illumination usually began to shed eggs rapidly within ten minutes and yielded up to 10,000 eggs per receptacle within half an hour. Examination of the process of gamete liberation with a hand lens showed the oogonia being ejected from each ostiole one at a time, often succeeding each other so rapidly as to form long rows like green beads on a string. No upper limit to the effective light period was found; darkening after as long as 450 hr. of illumination evoked shedding in the usual manner. A dark period as short as 3 min. followed by a return to the original illumination brought forth the usual shedding ten minutes later. Thus shedding may be induced by a dark period so short that the discharge of gametangia begins and continues in the light.

In some experiments receptacles were illuminated in the usual way, and then only about one-half (basal or apical) of each receptacle was darkened, the other end remaining undisturbed in the same light. The darkened ends of the receptacles responded by discharging gametangia as usual and in many cases the other, still illuminated, ends also responded. This transmission of the shedding stimulus was observed to occur to a very much greater degree among experiments conducted at 9° C. than at 16° C.

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Abnormal Growths associated with Wool Follicles in Sheep

Burns and Clarkson[1] described 'capsules' in sheep skin which, when traced up towards the skin surface, were apparently degenerate follicles. Similar roughly spherical bodies have now been seen free in the dermis. These usually had lumina like the 'capsules' mentioned above and, although smaller, could presumably have arisen from degenerate follicles by disruption at a point on the longitudinal axis of the follicle. Thus, when in samples taken at different ages from various sheep breeds, these bodies were observed attached to the base of an otherwise normal follicle, usually not far above the bulb (Fig. 1), they were thought to have become secondarily attached. However, in this figure the connective tissue sheath can be seen to be split and 'pushed away' from the follicle, and in preparations stained with cyanol to show blood vessels[2] the capillary network of the follicle has been seen to extend around these bodies. This suggests that the body had, in fact, been formed as an outgrowth from the follicle and had not become secondarily attached. When one was seen in a sheep vibrissal follicle within the blood sinus, the suggestion of secondary attachment seemed untenable.

In Figs. 2 and 3 this body can be seen to be attached by a long stalk to the outer root sheath immediately below the sebaceous gland. In this instance one can see in the body a series of concentric zones having the appearance of stratum corneum. These are arranged around a spheroidal centre of homogeneous appearance which apparently contains some melanized granules. Most of the bodies, however, contain a lumen which in many instances appears to be collapsed. It is possible, therefore, that some of the bodies seen free in the skin represent outgrowths which have become detached from the follicle, and are not proximal parts of degenerate follicles. In

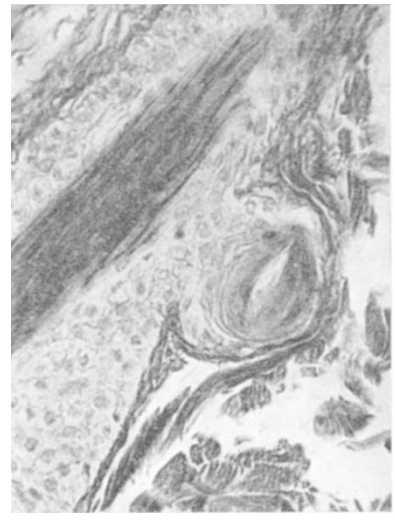

Fig. 1. Abnormal body attached to wool follicle. × *c.* 265