ring in the Coast Range, one is often impressed by the abrupt transition from the vegetation of the flat and open uplands of the lower Willamette valley to that of the mountains. A comparison of the Nehalem and Willamette river valleys is a case in point. The Nehalem flows through a mountainous region and in part of its upper course is separated from the Willamette valley by a low range of mountains some ten miles across. While there is a difference of not more than 500 feet in the altitude of the two valleys at some places, there is a marked difference in soil and vegetation. The Nehalem valley has practically the same vegetation as the mountain region which it drains. As one crosses the divide into the Nehalem region the difference in the vegetation is readily apparent. The oak is left behind but the hemlock becomes conspicuous. Instead of the vegetation peculiar to the stream bottoms of the lower country, the water courses are fringed with the wild currant, salmon-berry and Devil's-cane, for the most part. In a detailed description of the flora, various other differences might be mentioned. The whole region offers an interesting field for the study of the distribution of native species.

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EXTRUSION OF THE GAMETES IN FUCUS

By George J. Peirce

Dr. E. B. Copeland's note in Torreya for November, 1901, on the extrusion of the gametes of *Fucus* suggests a comment or two.

In the first place, Thuret * in 1854 and Oltmanns † in 1889 said that the escape of the egg-cells and spermatozoids is "hastened" by exposing fertile branches to the air. There may be other appearances of the same statement, but these two are worth instancing. I doubt either of these authors being willing

* Thuret, G. Recherches sur la fécondation des Fucacées. Ann. d. Sci. Nat., IV. 2 : 197–214. 1854.

† Oltmanns, F. Beiträge zur Kenntniss der Fucaceen. Bibl. Botanica, 3^{14} : 1–94. 1889.

to say or to imply more than that the escape of the reproductive elements is *hastened* by the drying and contraction of the fertile fronds when they are exposed to the air. Unless I do Dr. Copeland an injustice, he does imply that their escape is effected by the shrinkage of the parts. On this point I wish to state my own experience.

Last summer and the summer before, at the Hopkins Seaside Laboratory, Pacific Grove, California, I repeatedly put the fruiting tips of *Fucus evanescens* Ag., into glass dishes of sea-water and left them, often for two weeks, without changing the water or baring the plants. The gametes escaped nevertheless, spores and young plants of various ages presently appearing on the bottom of the dishes. In this way I was able to get a series of young plants consisting of from one to many cells.

In these cases, neither water-pressure nor the compression of the parts within by the drying and contraction of the outer parts, can have had anything to do with the escape of the spores. Another factor was concerned, namely, the solution of the gelatinized walls and other gelatinous material surrounding the gametes. When this goes into solution, the antherozoids can swim out of the conceptacles. This does not, however, account for the escape of the non-motile egg-cells. It will be noticed that the fruiting tips of this species of *Fucus* are covered with gelatinous drops, a drop at the mouth of each conceptacle, whether the plants are submerged or exposed. The drops ooze out, that is are squeezed out, from the cavity of the conceptacles. The expressed slime may become so abundant as to form a coating over the surface of the fruiting tip. The pressure which forces this out is developed by the parts surrounding the conceptacle and first becomes effective when the antherozoids and egg-cells, or the antheridia and oögonia, become detached and are imbedded in a gradually dissolving gelatinous matrix. As this gelatinous material dissolves, it resists the compressing effect of the walls of the conceptacle less and less, and presently becomes squeezed out through the mouth of the conceptacle.

So far as this species of *Fucus* is concerned, therefore, the extrusion of the gametes (or, more properly, of the sexual

organs) from the conceptacles, is accomplished by mechanical pressure which is developed within the plant, whether the plant dries and contracts or not. I fancy the same thing is true of the other species of *Fucus* on this coast, and also of the species on the Atlantic Coast, including the unnamed one about which Dr. Copeland writes. It is obvious, however, that the drying, contraction, and compression, of which Dr. Copeland speaks, will supplement the pressure which normally develops within the plant itself.

Where *Fucus* grows in thick masses covering the rocks between tide-marks, only those plants living far up on the sides and on the tops of rocks will have any considerable part directly exposed to the air and sun. When the tide goes out, a very small part of a mass of *Fucus* is wholly exposed, as the fronds overlie and protect one another, only the topmost layer being wholly uncovered. Of course the overlapping is more or less incomplete, so that some of the tips of the plants below may be exposed. These exposed tips and whole plants represent, however, only a small proportion of all the fruiting parts. These exposed parts are the only ones which would dry and contract in such a way as to expel the reproductive organs and elements, and yet other plants and other tips are undoubtedly also fertile, in the fullest sense of the word.

Again, the amount of drying, contraction and consequent forcing out of the reproductive parts when low tide comes at night would be very slight. Are such tides unfavorable to reproduction? Then, too, there is little or no drying of *Fucus* or anything else in fog or rain. At these times, too, the gametes, if ripe, should be forced out of the conceptacles.

I think I have shown the desirability of the plants' possessing some adequate means of removing the gametes from the conceptacles no matter what the weather, the time of day and the state of the tide may be. Unfortunately I cannot prove that the Atlantic * species of *Fucus* are in this respect as independent of

* [There are at least three very distinct species of *Fucus* about New York City: a hermaphrodite species (*F. spiralis* L.?) found only near the high-water mark; a dioecious species (*F. vesiculosus* L.) of rather wide range in the littoral zone; and a hermaphrodite species (*F. evanescens* Ag.) growing near the low-tide line and in

atmospheric conditions as are our Pacific species. At all events the matter deserves further examination.

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MUTUAL IRREGULARITIES IN OPPOSITE LEAVES

BY FRANCIS E. LLOYD

It is not uncommon to find that the leaves of the lilac (*Syringa vulgaris* L.), which are generally supposed to present little variation in shape, become notched on one side. A tooth or a lobe of considerable size may thus be formed, so that the simple cordate leaf is then lobed asymmetrically. The lobe is sometimes of quite regular form and ends in a fine tooth at the tip. It is moreover supplied with veins which give it a normal appearance. At other times it is more rounded; or there may be nothing more to suggest it than a rounded irregularity on the margin, accompanied by a slight warping of the leaf blade near by.

Now it has further been observed that when such an irregularity occurs, the leaf opposite—the leaves being in decussating pairs—has with few exceptions a similar lobing, but on the *other* side of the midrib; and therefore, since the ventral surfaces of the leaves are opposed in the bud, on the same side of the axis of the stem. A considerable number of similar instances have been observed by me in some other plants with opposite simple leaves, namely in *Lonicera* and *Forsythia*. What appears at first blush to be a variation of the same kind may occur also in compound leaves, and such a case I have found in the European ash, in which the terminal leaflets of a pair of opposite leaves showed mutual variations but in this case on the *same* side of the midrib. In one of the leaflets a lateral lobe only was formed, while on the other a complete lateral leaflet appeared in the corresponding position. The condition recalls that which arises in the juvenile opposite leaves of some plants (*Phaseolus*) and in the alternate leaves on the new shoots of others (*Rubus occidentalis*, *R. nigro-*

some cases rarely, if ever, uncovered. Farther north on the Atlantic coast, *Fucus edentatus* De la Pyl. and *F. serratus* L. are found near the low-water mark and do not as a rule become very dry at the ebbing of the tide.—ED.]