Immediately following this stage in the nuclear division, the chromosomes congregate in the equatorial plane, and simultaneously the granules already referred to in the earlier part of this communication are discoverable in the surrounding cytoplasm. They stain precisely as do the granules which arise in the nucleus by fragmentation of the nucleolus, and are very distinctly seen, many of them influencing the direction of the spindle-fibres as already described. It would at present be premature to attempt to do more than suggest that there may be a closer connexion between the granules of nucleolar origin and those which later occur in the cytoplasm, but it may be mentioned that Hertwig[1] suggested the possibility of a nuclear origin for the animal centrosomes. There are certainly great difficulties in the way of accounting for the sudden and abundant formation of granules on the assumption of a purely cytoplasmic origin, and their obvious relation to the spindle-fibres, as well as their ultimate fate, opens out a whole set of further questions. I will not advert to them at greater length here; I hope to be shortly able to speak more definitely on these, as well as other points raised in this preliminary note.

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THE GENUS TREMATOCARPUS[2].—At Mr. Hemsley's request I have examined the structure of the fruit of *Lobelia macrostachys*. Dr. Zahlbruckner's note on his *Trematocarpus macrostachys* may be divided into two portions, the first of which is decisive for the second, viz. the structure of the fruit, particularly with regard to dissemination, and the generic value of the characters derived from that particular structure. The remarks which I have to make on this structure are based upon observations on the material preserved in the Kew Herbarium, and on a fruit sent by Dr. Zahlbruckner to Mr. Hemsley.

The ovary wall of *Lobelia macrostachys*, Hook. et Arn., exhibits the same general structure as in allied species of *Lobelia*, the generic identity of which has never been doubted. One remarkable character is the presence of a well-developed system of vascular bundles anastomosing in a distinct network very like that found, for instance, in *L. nicotianaefolia*, an Indian species, with the only difference that it is

[1] O. Hertwig, Die Zelle und die Gewebe, Jena, 1892, p. 48 and 164.
[2] See Annals of Botany, vol. vii. No. 26, and vol. vi. No. 21.

of a stronger texture. When the fruit approaches the mature state, the inner part of the pericarp of these species begins to transform into a thin endocarp of a papery or cartilaginous nature, whilst the remainder dries up gradually. But whereas it hardly undergoes any particular transformation during that state in *L. nicotianaefolia* or in *L. hypoleuca*, a Hawaian species, the network of vascular bundles soon becomes very prominent in *L. macrostachys* and assumes the character of mechanical tissue which is formed by the elongated cells surrounding the vascular bundles becoming sclerenchymatous. These sclerenchymatous masses are often confluent forming broader bundles, and they anastomose according to the disposition of the vascular bundles, thus forming a net-like woody skeleton. This skeleton immediately overlies the endocarp and is generally quite distinct, even before the latter has assumed its cartilaginous character. It is enclosed by a thick parenchymatous epicarp with a delicate epidermis. The epicarp dries up and contracts, but as the inner skeleton and the external ribs of the capsule are much stronger, it must break up itself. It becomes distinctly thinner over the interstices of the framework over which it is expanded. Minute cracks and holes appear, and soon a pore is formed showing the smooth margin of the corresponding mesh of the skeleton. As might be expected from this mode of perforation, which is not due to the presence of previously formed lines of weaker tissue like those along which the dehiscence of valves generally takes place, neither in the shape, size, number, nor position of the pores, nor their sequence is anything like regularity. In the material of the Kew Herbarium the number of pores is limited to few. But the fruits still bear the calyx-lobes and the decay of the epicarp is still in the first stage, whilst it is perfect in Zahlbruckner's specimen. Dr. Zahlbruckner denies the presence of any traces of insect-action or of wound-cork surrounding the pores. But both are present in the Kew specimens, and the only restriction I should like to make is as to their being caused by insects. I think it very probable, but I am not able to prove it from dry material. There are minute swellings on the surface, and a dissection shows that the epidermis had been injured and that wound-cork was formed subsequently from the nearest layers of the parenchyma. In other cases the wounds are larger, and their margins gape. They form a smooth rim which consists chiefly of a large-celled periderm. This periderm eventually permeates right through the epicarp, thus cutting out pores of a similar

appearance to those in the skeleton. It is evident that such perforations must accelerate the general decay of the epicarp, after which, however, all traces of them must disappear, as nothing is left but the netlike skeleton and the endocarp. Long before the decay of the epicarp has become general, the endocarp has split from the base towards the marginal ring of the capsule which bears the calyx-lobes. This splitting takes place in the same way as in *L. hypoleuca* and other species, but the tenderness of the outer tissues of their capsules causes them to tear as the valves expand, whereas the skeleton of *L. macrostachys* is sufficiently strong to resist that pressure. Thus the seeds are freed and find their way out, through the pores of the skeleton in *L. macrostachys*, through the ruptures in *L. hypoleuca.* The next question is if the normal dehiscence by two valves on the top takes place in *L. macrostachys.* So far as the material at hand and Hildebrand's observations go, it is not the case, though the anatomical structure is not of a kind to prevent it or to make it improbable. On the contrary, the very fruit which Dr. Zahlbruckner kindly sent, split after boiling, with a very slight pressure, along a line running from the persistent base of the style to the periphery of the top along which the normal dehiscence was to be expected.

The obliteration of the normal terminal dehiscence in combination with the peculiar development of the mesocarp and the mode of dissemination depending thereupon seems to deviate from what we find, for instance, in *L. nicotianaefolia* and *L. hypoleuca.* But I must now introduce another species which forms a connecting link in a striking way, *L. Gaudichaudii*, also a native of the Hawaian Islands, the close affinity of which to *L. macrostachys* cannot be doubted. Here we have a thin cartilaginous endocarp splitting loculicidally to the base, and a network of vascular bundles which though finer and less strong than in *L. macrostachys* acts in a similar way. It is strong enough to resist the pressure of the expanding valves, for a long time at least. The parenchyma decays more or less in the end, but without leaving such distinctly circumscribed pores, and its decay is more like that caused by ordinary maceration. The top, which is produced into a beak, opens either in the normal way, or it remains altogether entire or at least so long that meanwhile the dissemination by way of the decayed pericarp has already begun. With regard to *L. Gaudichaudii* we might say it is in a state of transition towards becoming indehiscent, a state which seems to have already been attained by

L. macrostachys. Thus the latter forms the extreme step in a direction which is indicated in the former. But, just as *L. macrostachys* is linked thus very closely to the allied species of *Lobelia* in spite of the obliteration of the dehiscence, so also the mode of dissemination which replaces that by way of terminal valves is the mere outcome of a structure which is perfectly congeneric to that found in the allied species. There is no element in it which would point to a generically distinct line of descent. It is rather a case of ultimate adaptation of a part of an organ to a particular biological function. There are many cases where species with dehiscent and indehiscent, with succulent and dry fruits, are placed in the same genus without anyone objecting to it, because the close natural affinity is evident notwithstanding the deviation in a single character which we know is exceedingly subject to adaptation to particular biological conditions. I admit that on the other hand genera are sometimes distinguished solely on such characters. But the expediency of this procedure is often very doubtful, and in other cases it might be defended because the two genera are characterized at the same time by the fact of their inhabiting quite distinct and often remote areas, or because the distinction is absolute, so far as our knowledge goes. Neither is here the case, and I am therefore of the same opinion as Mr. Hemsley, that the genus *Trematocarpus* can by no means be maintained by reason of its peculiar mode of dissemination.

Finally, I may mention that Hildebrand described the dehiscence or indehiscence respectively, and dissemination of *L. Gaudichaudii* and *L. macrostachys* in his Flora of the Hawaiian Islands, pp. 236–7, briefly though not quite correctly in all the morphological details, in a way which amounts to the same as my interpretation of it.

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A MARINE FUNGUS.—In a recent paper[1] on 'Parasites of Algae' Mr. George Murray alludes to the doubtful nature of the records of higher Fungi actually inhabiting salt water. The following well-marked and probably widely-distributed instance may therefore prove of interest.

If the swollen fertile 'pods' of *Ascophyllum nodosum* be examined in early spring, they will be seen to be dotted over with numerous

[1] Natural Science, Vol. II, February 12, 1893.