the scale of temperature, any metabolism can really be proceeding. In these cases the molecular machinery of life is all present and intact, but the *manifestation of vitality*, as measured by chemical movement and by a change in the condition of energy, is absent. But such a state differs widely from death, seeing that when the conditions favourable to the continuous progress of those reactions which are associated with vitality are restored, the organism proceeds to work in the normal manner once more. Similarly the albumin heated in the desiccated form retains, instead of changing, that particular molecular condition which enables it, on restoring the essential conditions of moisture, to coagulate in a normal fashion when heated to a suitable degree of temperature.

Since the above observations were made, I have been able to experiment with some vegetable albumin, also obtained from Merck.

The substance is in the form of a dry powder, and clearly contains far less water than does the ordinary dried egg-albumin. And in correspondence with this fact it is found to be easily dried in air at a temperature of about 40° C., after which it may be heated in a flask under the same conditions as the egg-albumin, with precisely similar results, allowance being made for the much higher temperature (about 77° C.) at which coagulation occurs. The easy desiccation of the vegetable albumin is perhaps of special interest in considering the power of resistance displayed by seeds when subjected to the action of high temperature.

ON NUYTSIA FLORIBUNDA, R. Br.—Originally described by La Billardiére (1804) as a *Loranthus*, this plant was subsequently separated from that genus by reason of its peculiar fruit—a dry drupe with the pericarp in three longitudinal wings—by Robert Brown in 1831, who renamed the plant *Nuytsia*, after the Dutch navigator of the Swan River, Peter Nuyts.

Nuytsia is especially interesting as a member of the Loranthaceae which is said to have an independent existence, the plant often developing into a tree 10–12 metres in height. Its distribution is extremely limited, being confined to the Swan River region of Western Australia, in which locality the plant is known to the inhabitants as the 'Fire-Tree' on account of its masses of bright orange-coloured flowers.

The seedling exhibits a very unusual feature in having three

cotyledons, a fact apparently first observed by Bidwell¹. Beyond this peculiarity very little appears to have been known of the plant until quite recently.

In May, 1899, seeds of *Nuytsia* were obtained from Western Australia and were successfully germinated at the Royal Botanic Garden, Edinburgh. The young plants have grown vigorously up to the present, and there appears every reason to hope that they will reach maturity under cultivation.

Fig. 10 represents one of these seedlings about six months old. The most conspicuous feature is the three large fleshy cotyledons, which are persistent for a considerable time, and are much longer and wider than the numerous foliage leaves so far produced. The latter are oval in section, almost round, and taper gradually to a point. While the majority of the seedlings at Edinburgh show three cotyledons, a few possess four; but the fact that in the latter case two of the cotyledons are smaller and appear somewhat malformed, seems to indicate that three is the normal number. The root at present shows no special peculiarities either in external character or in its anatomy.

Fig. 10. *Nuytsia floribunda*, seedling.

Van Tieghem² has recently described at some length the anatomy of *Nuytsia*, but there are some abnormalities observable in the seedlings grown here and in material of the matured plant received in spirit from Australia, which appear to have been absent in his specimens, and to these I will direct attention.

An unusual formation of a superficial cambium in isolated patches is a conspicuous feature in the preserved material obtained from Australia. On most of the leaves, as well as here and there on the

¹ Bidwell, Ann. Nat. Hist. viii, 439.

² Van Tieghem, Bull. d. l. Soc. Bot. d. France, 1893 and 1898.

stem, and even on the bracts of the persistent involucre, small brown patches occur. They are irregularly distributed, and appear to indicate signs of some disease. Sections taken through a portion of the leaf including one of the brown spots, show the latter to consist of several layers of peripheral cells with no contents, the walls being suberized. Below these, and cutting them off from the rest of the leaf, occurs a well-marked cambium—the whole having somewhat the appearance of a lenticel. These structures may occur on either surface of the leaf or at the margin. It is difficult to surmise the cause of this actively dividing cambium, as there is no trace of fungus; but it might possibly be due to the bite of some insect injuring the epidermis, the subsequent suberization and the cambium below, protecting the inner tissue. It was later observed that many of the seedlings in cultivation here, showed precisely similar formations, with the exception that they were, in many cases, of much larger extent. The first sign of the development of these structures in the leaf of the seedling is a moist glistening appearance on the external surface, as if the epidermis had become porous to moisture. Subsequently, in many cases, mucilage in large drops is secreted and lies on the surface of the leaf in irregular masses over the apparently injured epidermis. In the third or fourth layer below the epidermis a cambium is now formed, which gradually curves up in all directions until it meets the uninjured epidermis around the abnormal portion, completely cutting off the latter from the rest of the tissue. The walls of the outer cells then become suberized and appear a light brown colour. In some cases the cambium is formed in sub-epidermal layers nearly all round the leaf, giving at first sight an impression that it is by this means that the leaf increases in circumference. The formations are perhaps connected with the environmental conditions under which the seedlings are grown, such as an atmosphere too moist, since the method of cultivation of the plant is naturally of a somewhat experimental nature at present.

The non-parasitic nature of *Nuytsia* is still an undecided point. Differing from its parasitic allies in its anatomy and terrestrial habit, it shares with them the same degradation in the structure and development of the gynoecium. It is obvious that the plant might be terrestrial and attain to its large size and yet be semiparasitic on the roots of other plants. In response to Von Mueller, W. Webb, of King George's Sound, reported that the roots of the mature tree

do not penetrate deeply, and that he never found the roots attached to those of other plants. Should the young plants in cultivation here, and elsewhere, continue to thrive, it may be possible to make experiments and to satisfactorily elucidate the question.

J. H. BURRAGE, Edinburgh.

ON THE STRUCTURE OF THE STEM IN TWO SPECIES OF LYCOPODIUM.—Among the few species of *Lycopodium* possessing dimorphic leaves, *L. volubile*, Forst., and *L. scariosum*, Forst., approach very closely to the habit of most species of *Selaginella*. That this is only a general resemblance is seen when one examines the arrangement of the leaves in *L. volubile* in detail. In the stouter branches of this species the leaves are not dimorphic; they are all small and similar, and cannot be referred to a definite phyllotaxy. There may be as many as twenty-two leaves from one to the next in the same vertical line, and they are arranged in an irregular manner, some at considerable intervals, a few of them in pairs, and others crowded into a short spiral, which may be succeeded by a few leaves forming a spiral running in the opposite direction. In the crowding of the leaves there is a tendency towards the formation of pseudo-whorls.

In the smaller branches (roughly those of the three highest orders) the *Selaginella*-type of habit is found; this may be called the distichous region. There are here two series of large leaves extended in one plane, but, judging by the insertion of these leaves, they probably represent four orthostichies, which approximate to two in the upper region. Besides these, there are also about three ventral and three dorsal orthostichies of small leaves with their points directed forwards. This species is thus much more complex than *Selaginella*, which has only two rows of large leaves, and two dorsal rows of small ones. Towards the tips of the branches of *L. volubile*, the smaller leaves become reduced in number. Thus in the lower distichous region there are often three small leaves (two dorsal and one ventral) to each pair of large leaves, while, near the tip of a branch, there may be only two dorsal and one ventral leaf to a length of stem bearing two pairs of large leaves. The phyllotaxy of the cone is $\frac{2}{7}$. The other dimorphic species of *Lycopodium*¹ have various numbers of

¹ Baker, Handbook of Fern-Allies.

Burrage, J. H. 1900. "On Nuytsia floribunda, R. Br." *Annals of botany* 14, 312–315. <https://doi.org/10.1093/oxfordjournals.aob.a088780>.

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