

Morphological Notes.

BY

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With Plates VII-IX.

XI. PROTECTIVE ADAPTATIONS, i.

WE are all so much occupied with exploring and recording what seems to be new that most of us have little time, or perhaps patience, to take stock of the harvest of accurate and acute observation to be found in the writings of authors now almost fallen into oblivion, yet long ago recognized as classical. Such a book is the 'Travels in the Interior of Southern Africa', by William J. Burchell, published in two quarto volumes in 1822-4. Yet the freshness of its outlook and the shrewd appreciation of ideas, which seem to us essentially modern, will amply repay its study. I am told that during the South African war copies were much in request amongst the Intelligence officers, and commanded a high price. Perhaps Professor Poulton, who has charge of Burchell's entomological collections at Oxford and is the vindicator of his zoological work, might induce some enterprising publisher to issue a new edition under his editorship.

MESEMBRYANTHEMUM TRUNCATUM.

The following passage (vol. i, pp. 310-11) recalls the style and feeling of Darwin's 'Naturalist's Voyage':

'On picking up from the stony ground, what was supposed a curiously shaped pebble, it proved to be a plant, and an additional new species to the numerous tribe of *Mesembryanthemum*; but in color and appearance bore the closest resemblance to the stones, between which it was growing. On the same ground was found a species of the *Gryllus* tribe amongst the stones, and so exactly like them in color and even in shape, that it could never have been discovered, had it not been observed just at a moment when in motion; and as if more completely to elude notice, it seldom stirred, and even then, but slowly. The intention of Nature, in these instances, seems to have been the same as when she gave to the Chameleon the

power of accommodating its color, in a certain degree, to that of the object nearest to it, in order to compensate for the deficiency of its locomotive powers. By their form and color, this insect may pass unobserved by those birds, which otherwise would soon extirpate a species so little able to elude its pursuers, and this juicy little *Mesembryanthemum* may generally escape the notice of cattle and wild animals.'

Burchell was clearly on the track on which Darwin reached the goal. But the time had not come for emancipation from the old teleology. This, however, in no respect detracts from the merit or value of his work. For, as Huxley has pointed out¹, the facts of the old teleology are immediately transferable to Darwinism, which simply supplies them with a natural in place of a supernatural explanation.

In another passage (vol. i, p. 226), Burchell gets a clear grip of the equilibrium in Nature at which the struggle for existence ultimately arrives. An immediate deduction from this is the utility of specific or at any rate of adaptive characters.

'When we permit ourselves to contemplate the great designs of the creation, all our boasted knowledge of nature appears only as the ideas and the knowledge of children. Too intent on some little parts of the edifice, we often remain totally ignorant of the proportions, and perfect symmetry of the whole. In the wide system of created objects, nothing is wanting, nothing is superfluous: the smallest weed or insect is as indispensably necessary to the general good, as the largest object we behold. Each has its peculiar part to perform, conducive ultimately to the well-being of all. Nothing more bespeaks a littleness of mind, and a narrowness of ideas, than the admiring of a production of Nature, *merely* for its magnitude, or the despising of one, *merely* for its minuteness: nothing more erroneous than to regard as useless, all that does not visibly tend to the benefit of *man*.'

In a note to the former passage Burchell gives the name *M. turbiniforme* to a new species of *Mesembryanthemum*. I have little doubt that this is the one which he describes in the text. He had, however, apparently been anticipated by Thunberg (see Harvey and Sonder, *Flora Capensis*, vol. ii, p. 393). Till recently no one seems to have collected it since Burchell, nor as far as I know has it been seen in cultivation in Europe, and it is represented in no published figure.

In 1902 Mr. N. S. Pillans of Rosedale, Rosebank, Cape Colony, a most generous and indefatigable correspondent of Kew, sent both living plants and seeds (which readily germinated) to the Royal Botanic Gardens. The accompanying excellent illustration (Plate VII) is reproduced from a photograph by Mr. E. J. Wallis. The pot was eight inches in diameter and the illustration is therefore slightly less than life-size. Amongst the

¹ See *Life and Letters*, i, 457.

plants have been placed water-worn pebbles of about the same size from Thames Valley gravel. The plants not merely simulate them in form, but a mottling of the surface also reproduces their weathering. Personally, without referring to the living plants, I am unable, in many cases, to be quite certain which is which.

The *Mesembryanthemum* had two problems to face:—(1) how to minimize the loss of water by transpiration: this is achieved by assuming the spheroidal form with its minimum surface. But (2) as soon as it became a succulent blob it was exposed to the danger of being eaten, and it only escaped this by pretending to be an inedible pebble.

There are some dozen species of *Mesembryanthemum* which form the small group *Sphaeroidea*. In these the vegetative organs have undergone the extreme of reduction and consist in fact of nothing more than a pair of succulent leaves which unite at the top, leaving a mere slit for the extrusion of the flowers. The leaves are from time to time renewed and the old ones shrivel and form a sheathing base to the new pair.

Mr. Pillans obtained the plants which he sent to Kew from the Laingsburg District, which is in the same region as Zandvalley, where Burchell found it.

In the Gardeners' Chronicle for April 7, 1900 (p. 211) there is an illustration from a photograph by Mr. Karl Dinter of another species, *M. truncatellum*, which also simulates 'the stones amidst which it grows,' though I think not so perfectly as *M. truncatum*. Mr. Dinter, however, who found it at Windhook, says from actual observation that it 'so closely resembles, when not in bloom, the form and colour of the pebbles among which it grows, that it can only be detected by an experienced eye' (l. c., p. 115). It is figured in the Botanical Magazine for 1874, t. 6077.

MESEMBRYANTHEMUM BOLUSII.

This case is even more remarkable than the last. The mimicry is with angular rock-fragments instead of water-worn pebbles. It was discovered some time previous to 1877 by Mr. H. Bolus, the well-known South African botanist, and named and described in his honour by Sir Joseph Hooker in the Botanical Magazine for 1882. It has been three times in cultivation at Kew. The first specimens appear to have been promptly stolen; the second not to have survived; for the third we were indebted to Mr. C. J. Howlett, Curator of the Botanic Garden, Graaf Reinet, an old Kew employé, who sent it to the Royal Botanic Gardens in 1903. Sir Joseph Hooker describes technically the pair of leaves which practically compose the plant as 'trigonously hemispherical.' They closely resemble angular stones, of which the weathering is imitated by the 'dull grey-green' surface, and the resemblance is enhanced by the minute pustular

spots with which the surface is studded. These produce exactly the same effect as a minute Lichen (*Lecanora*) on weathered stones.

I exhibited a pan of the plant at a Royal Society conversazione in 1903 and pointed out the resemblance (see *Nature*, vol. lxxiii, p. 185). It was then even more striking than in the accompanying illustration (Plate VIII, from a photograph by Mr. E. J. Wallis), which is half life-size. Since then the plants have produced a second crop of leaves which are still not yet fully developed.

I learn from *Nature* (vol. lxxi, p. 232) that Dr. R. Marloth has discussed the adaptive resemblances which form the subject of this article in a paper in the *Trans. S. Afric. Phil. Soc.* (vol. xv, p. 97). Of this I have seen nothing but the brief abstract. He states that *M. Bolusii* grows 'on the rocks round the Karro' and 'closely resembles the surrounding stone, although for a short time its bright yellow flowers render it conspicuous enough.' These are figured from the Kew specimen by Sir Joseph Hooker in the *Botanical Magazine*, t. 6664.

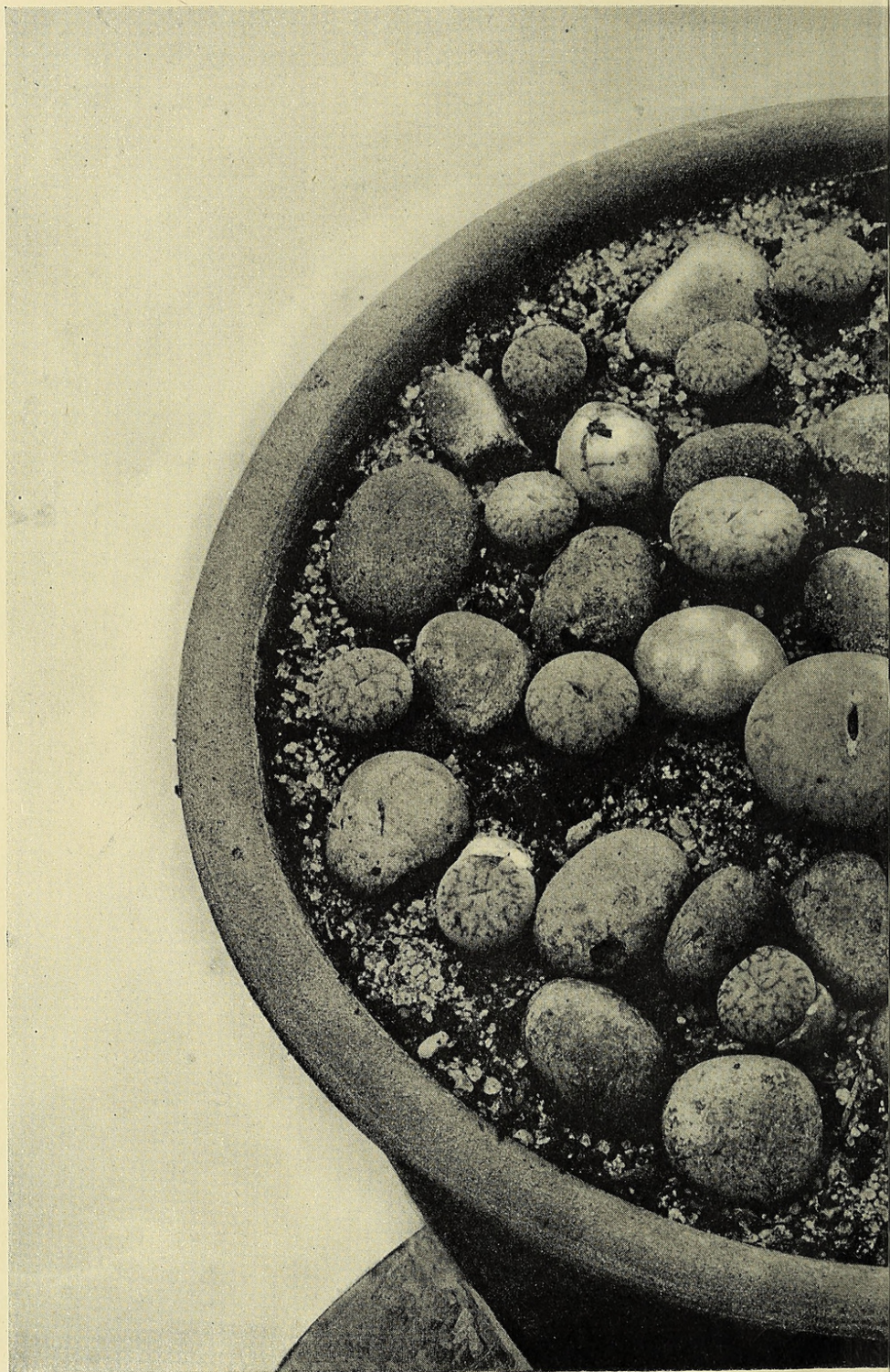
ANACAMPSEROS PAPYRACEA.

The two preceding plants belong to Ficoideae; the present to the closely related order Portulacaceae. Technically, it is a shrub: the leaves are minute and are concealed by their much larger dry and membranous stipules which form the imbricated investment of the persistent stems. One may wonder what the perplexed palaeontologist would make of the impression of such a plant in the fossil state. It is also a native of the Karro, and Kew is indebted for the specimen shown in the life-size illustration (Plate IX, from a photograph by Mr. E. J. Wallis) to Mr. H. J. Chalwin, Superintendent of the Municipal Gardens, Cape Town, who sent it in 1898. In this case Dr. R. Marloth suggests that the protective resemblance is with 'the quartz pebbles among which it grows.' At the risk of suggesting one perhaps somewhat far-fetched, I must confess that the aspect of the plant always calls to my mind the dejecta of some bird, and the more so owing to the whitening of the branches towards the tips.

My friend, Mr. N. E. Brown, whose unique knowledge of South African plants is the result of the study of a lifetime, tells me that he has long had the plant under cultivation, yet has never succeeded in seeing the flowers. I am indebted to him for the following interesting note:—

'The flowers of *Anacampseros papyracea* are at present unknown to science. I have had the plant under notice for many months, but have never seen a flower. One plant, however, produced several ripe capsules, which were developed at the very tips of the branches, and although I saw the plant daily, the first evidence I had that it had flowered was the protrusion of the young fruit through the dome of papery stipules which

permanently cover the apex of the branches. I therefore believe that the flowers were either cleistogamous or expanded under, and were concealed by the dome of stipules; at any rate they must have been very small. The development of the fruit is rather rapid, and as it matures a short stalk is developed, so that when ripe it is exserted just beyond the apical dome. The capsule is globose, less than $\frac{1}{4}$ inch in diameter, thin, dry, whitish-brown in colour, and irregularly breaks up into valves, allowing the very small whitish-brown seeds to escape. These are globose and thickly covered with rather long and very fine hairs. I have not yet succeeded in raising seedlings.'

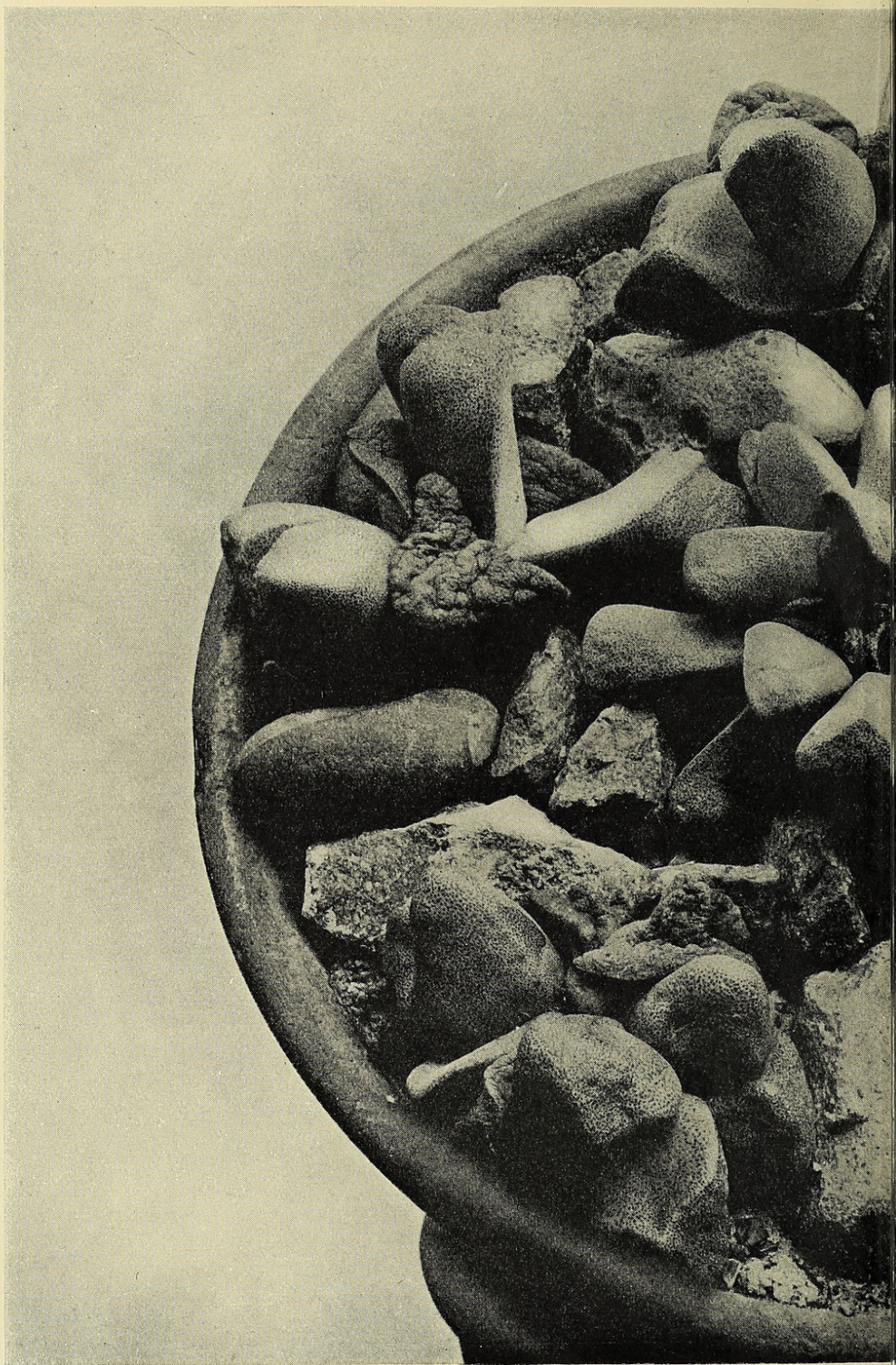




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Thiselton-Dyer, William T. 1906. "Morphological notes." *Annals of botany* 20, 123–127. <https://doi.org/10.1093/oxfordjournals.aob.a089087>.

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