

MIMICRY AMONG PLANTS.

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(Plate VIII.)

(Read May 25, 1904.)

Mimicry among animals is of such general occurrence that nobody who takes the slightest notice of the creatures around him can overlook these means of protection. Especially numerous are cases of mimicry among insects, and South Africa in particular possesses many most remarkable forms of this kind.

Whoever meets the "flying leaf" or the "walking twig" or other members of the Mantis tribe in their natural surroundings cannot help admiring the perfect similarity of these insects and of the plants among which they live.

But there is no need for me to mention any further cases of mimicry among insects, for the subject has been dealt with in an excellent way in the presidential address delivered by Mr. Trimen in 1884.

Quite different, however, is the state of our knowledge with regard to the occurrence of mimicry among plants. I may state from the outset, that many of the instances described as mimicry of plants appear to me to be due to teleological speculations and the imagination of the writers. One of the most common cases of this kind is that of the white dead nettle, which is supposed to mimic in its foliage the stinging nettle. In all probability the popular names of the two plants have had something to do with the view that the dead nettle should find some protection in this similarity of foliage. I think that this similarity is a mere coincidence, just as the fruit of the edible chestnut, when green, resembles that of the horse-chestnut; yet I am not sure that the similarity of the two fruits has not induced some writer to proclaim this as another case of mimicry.

There are, on the other hand, a number of instances in which the similarity of parts of plants to other objects is so striking that one can hardly doubt that they have been acquired by natural selection. The best examples of this kind are offered by some orchids, not only among the gorgeous tropical species, but also by some which are fairly common in various parts of Europe. Several species of the genus *Ophrys* do not bear their names without justification, for the flowers of *O. apifera*, *muscifera*, and *aranifera* resemble bees, flies, and spiders to such an extent that they may be easily mistaken for them without closer examination. Of course such similarities are not cases of protective colouring, for the function of these remarkable forms and colours is evidently connected with the fertilisation of the flowers. In all probability they afford the insects which visit the flowers a certain amount of safety from their enemies by hiding them during the time the visitors spend there.

Another example of this kind of mimicry is afforded by some *Stapelias*, a group of succulent plants which has its headquarters in South Africa. The flowers of most species of this group emit a strong odour resembling that of putrid meat, thereby attracting carrion flies which effect cross-fertilisation. It is even said that the eggs and larvæ of such flies have been observed on these flowers, which would show that the deception had been complete. That the scent must be very deceptive to animals I know from experience. I had a rare *Stapelia* in my garden which was going to flower for the first time, but one day I found the bud scratched to pieces by my dog.

All these instances, however, are not mimicry in its proper sense, for the resemblance does not afford any protection to the plant. But there are a few examples recorded where this seems to be really the case. Sp. M. Moore* mentions as one of the means of protection which some desert plants of Australia possess, the similarity of the foliage of some species of *Loranthus* with the leaves of the host upon which they grow. He avoids the word mimicry and introduces instead the term "homoplasy." In particular are mentioned *Loranthus pendulus* Sieb, and *L. Quandang* Ldl., which, owing to this close resemblance, can hardly be discovered on the trees or shrubs upon which they grow. He also mentions that camels are very fond of the *Loranthus* but do not eat the leaves of the host. That, of course, does not prove much, for camels are not indigenous to Australia. The only inference which one could draw from this observation would be the supposition that other

* Sp. M. Moore, "The Botanical Results of a Journey into the Interior of Western Australia," Journ. Linn. Soc., xxxiv., 1899.

herbivorous animals may have the same taste and that in all probability the parasitic plant would thus escape their attacks.

The other example of apparently real mimicry is described by Burchell nearly one hundred years ago. In his travels through the karroo he found a species of *Mesembrianthemum*, which he named *M. turbiniforme*, thinking it to be undescribed. As a matter of fact it had been found by Thunberg, who had named it *M. truncatum*, from the shape of its leaves. Burchell * gives the following account of his find: "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 *Mesembrianthemum*; but in colour 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 colour and even in shape, that it could never have been discovered had it not been observed just at a moment when in motion. 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 colour, 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 colour, these insects may pass unobserved by those birds, which would soon extirpate a species so little able to elude its pursuers, and this little *Mesembrianthemum* may generally escape the notice of cattle and wild animals."

This plant has been referred to by Wallace † as the stone *Mesembrianthemum* of the karroo, and its case is mentioned as the only example of real mimicry that has come to his notice.

As stated at the beginning of my paper, I was at first very sceptical about this and similar statements, particularly as cattle, which Burchell mentions, are not indigenous to the country. Gradually, however, my observations of such cases have become more numerous, hence I cannot look upon them all as mere coincidences.

The most remarkable plant in this respect is *Mesembrianthemum Bolusii*, Hook. f., which inhabits the hills of the karroo about Aberdeen. It generally produces only two leaves, which grow to the size of a duck's egg. Their surface is rough like weathered stone and their colour a brownish grey with a touch of dull green. The leaves are half buried in the soil or between the stones among which the plants grow, hence it requires a keen eye to detect them

* Burchell, "Travels in the Interior of Southern Africa," London, 1822, vol. i. p. 310.

† Wallace, A. R., "Tropical Nature and Other Essays," London, 1878, p. 223.

when not in flower. In autumn, however, when bright yellow flowers about 2 inches in diameter appear between the leaves, the plants are very showy. But that does not last long, and during the dry season the leaves look just like lumps of stone. [See Plate VIII.]

A similar colour and texture of surface have the leaves of *Mesembrianthemum nobile* Haw., which is fairly common in the karroo, e.g., near Laingsburg and Fraserburg Road.

In the Bokkeveld karroo, between Ceres and Calvinia, occurs a species of *Mesembrianthemum* with small leaves, the colour of which harmonises with the pebbles and gravel among which they are half buried to such an extent that I detected them only while stooping down, although the surface of the ground was quite bare. The most curious feature of the case was that the plants differed in colour, some being more yellowish, leather coloured, and others more brown, rust-coloured, and that these variations coincided with the yellowish or brownish colour of the shaly gravel. I could not help thinking of Burchell's reference to the chameleon, although I am unable to understand how this apparent adaptation might have come about. To make the analogy even more complete I captured a member of the Gryllus tribe—I cannot say a grasshopper, for there was no grass within miles, nor did the insect bear the slightest resemblance to grass—which, when at rest, looked so exactly like a brown pebble that I took a few of these fragments of stone with me.

There are several other species of *Mesembrianthemum* which are so curiously marked that in their original locality they easily escape the notice of men and animals. An instance of this kind was mentioned privately by Mr. Hammond Tooke. During a stay in the karroo he had often used a certain footpath which passed for some distance over bare ground merely covered with pebbles. One day, however, he saw some of these pebbles bearing bright yellow flowers, one at the top of each stonelet. The number of these flowering pebbles increased every day until there were hundreds of them on the otherwise bare veld. It was *Mesembrianthemum truncatellum* Haw., which occurred rather plentifully in this locality.

It may be asked whether these plants have any enemies against which this protection would be useful. On that point observation leaves no doubt, for goats eat all these species readily, hence it may be assumed that the wild antelopes do the same. Ostriches are also very fond of them and hares and tortoises eat them as well. As some of these animals feed only or mostly at night time it is obvious that plants which are so well hidden have more chance of escaping destruction than others which can be more easily seen.

Another species of *Mesembrianthemum* seems to achieve the same object in a different way. It forms fleshy cushions on the ground up to 10 inches in diameter. These cushions consist of a large number of tooth-shaped fleshy leaves, which are snow white. All that is nothing unusual in the karroo, where plants with pure white leaves are not uncommon. It surprised me, however, that this plant occurred only where the ground was covered with fragments of white quartz. I found several patches of the plant, but only on these fields of white quartz. Of course there were many such localities without this plant, for white quartzites are of common occurrence in the Laingsburg and Ladismith districts.

A similar observation has been made in connection with another plant by myself as well as by a friend of mine. This is *Anacampseros papyracea* E. Mey., a little succulent of the karroo which is pure white owing to the large papery stipules which cover the tiny leaves. I have seen hundreds of these plantlets in the Laingsburg, Ladismith, and Prince Albert districts, but only on such fields of white quartz—with one exception, and that was a specimen growing in clayey soil. But, and this fact is very significant, this plant stood in a group of *Apicra deltoidea* Bak., which has leaves that are as rigid and sharp-pointed as if they were cut out of a piece of stout metal.

I do not consider the peculiar occurrence of this *Anacampseros* and the last-mentioned species of *Mesembrianthemum* as mimicry, for the white hairs on the leaves of the *Mesembrianthemum* and the papery stipules of the *Anacampseros* serve in the first instance another function. But the whiteness of the plants has probably allowed those individuals which occurred in similar surroundings to escape the depredations of animals, particularly of those which feed at night-time like the hares. It is interesting to note that some natives call this *Anacampseros* "haasjes kost," probably indicating that hares are fond of the plant.

In conclusion, I should like to sum up my views on this question, as far as the South African plants are concerned, as follows:—

1. There are some plants which seem to occur only, or at least mostly, on fields of white quartz, where they are not easily noticed, particularly not at night-time, owing to their own white colour. It is probable that this limited occurrence in these districts is due to the destruction of those individuals which sprang up in other localities where their whiteness easily betrayed them to the night-feeding animals. Examples are *Anacampseros papyracea* and a species of *Mesembrianthemum*.

2. There are some species of *Mesembrianthemum* which are so

well hidden among the fragments of yellow and brown shale that they are most difficult to detect. Yet this is also not true mimicry, for if these plants are cultivated in a moister climate, *e.g.*, at Cape-town, they produce green leaves. This shows that the yellow and brown colourings were the effect of the karroo climate and not acquired protective adaptations, although the plants do obtain efficient protection from them in their natural surroundings.

3. There are, however, some species of *Mesembrianthemum*, viz., *M. bolusii* and *M. nobile*, which retain their remarkable surface structure even in cultivation, although the leaves become somewhat less dull under these modified conditions and lose consequently something of their desert character. This, I think, may be mimicry, or if one prefers the word, homoplasy.

It is possible that *M. truncatum* Thunb. and *M. truncatellum* Haw. are some more examples of this group.



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