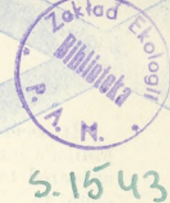


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Recent Developments in the Theory of Mimicry.
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The remarkable resemblances that exist between certain insects belonging to widely different orders, as, for instance, the likeness borne by some of the 'clearwing moths' to wasps and hornets, have long been known to naturalists. They were interpreted by the older observers as cases of 'repetition' and 'analogy' in Nature. Kirby and Spence were the first to attempt a rational explanation. These authors got so far as to suggest that one species might gain an advantage by resembling another; but the first really scientific account of the matter was given by Bates, who pointed out that certain kinds of butterflies in South America escaped attacks from birds by mimicking the appearance of other conspicuous species which were immune from persecution on account of the possession of distasteful qualities. This resemblance to a distasteful model he considered had been gained by a gradual selection of varieties tending in the appropriate direction.

Bates's theory of mimicry, which was at once accepted by Darwin and met with general approval, marked an important step in advance. It left, however, unexplained the fact that these resemblances occurred, not only between distasteful models and their presumably edible mimics, but also between the distasteful models themselves. To account for this he could only suggest that there must be something in the local or geographical conditions which had a direct effect upon forms inhabiting the same region, causing them, even if widely separated in affinity, to assume a common aspect.

But the existence of large groups of insects with various affinities and a common facies was felt as a stumbling-block in the way of the theory of mimicry until in 1879 Fritz Müller found the key to unlock the difficulty. He showed that if (as experiments, chiefly by Lloyd Morgan, have subsequently proved to be the case) birds had no instinctive knowledge of what forms would be suitable for food and what should be avoided, so that each bird had to gain its knowledge by experience, a certain number of the distasteful forms would have to be sacrificed by each generation of birds until these enemies had learned to leave such forms alone. In other words, each distasteful form would have to pay a tax for its immunity. Now if two distasteful species resembled each other so closely that birds or other enemies did not distinguish between them, the disagreeable experience gained by tasting an individual of one species would be applied to the benefit of the other, and so each of the two species would only need to contribute a portion of the tax, instead of each paying the whole. And what is true of a combination of two species would be equally true of a larger assemblage: the greater number of forms that could be got to share the tax, the better for all. Hence the formation of these large Müllerian groups, or, as they might be called, 'inedible associations,' giving room, no doubt, for a certain amount of Batesian mimicry side by side with them or within their own ranks. It is obvious that the resemblances shown between members of these groups, constituted as they are by insects of widely separated orders, cannot be explained by affinity; while the fact (amongst others) that the resemblances are superficial only, never structural, makes strongly against the view which would attribute them to the direct operation of external conditions. The Müllerian theory, which is rather a theory of common warning marks, or 'synaposematism' (Poulton), than of mimicry proper, may thus be said to hold the field as meeting the facts to an extent of which no alternative explanation has been found capable. Müller's suggestion was first brought to the notice of British naturalists by Professor Meldola; and in its further developments at the hands of Meldola himself and of Poulton, it was accepted both by Wallace and by Trimen, the two naturalists who had done most by their own observations to confirm the validity of the original theory of Bates. It is to be observed that both theories alike postulate the operation of natural selection.

It seemed desirable to seek for further confirmation of the truth of Fritz Müller's interpretation, and this the lecturer has made it his business to do. It appeared to him that if the Müllerian theory were valid, certain consequences ought to follow. Did these consequences follow or did they not?

(1) It is obvious that in Batesian or true mimicry the advantage is all on the side of the mimic. Experience gained by tasting the mimic would be used to the injury of the model. While therefore there is every inducement for the mimic to seek safety by approaching nearer and nearer to the aspect of the model, there is no reason for the model to assimilate itself to the mimic, but rather the contrary.

In a Müllerian association, on the other hand, the benefit is mutual. Each fresh accession to the group is a source of strength, not of weakness. Everything is in favour of the formation of such groups as rapidly and on as large a scale as possible; hence there is nothing to impede, and everything to promote, the free interchange of characters all round, each member being able to act, so to speak, as both mimic and model. This could not happen, as has been shown, in the case of Batesian mimicry.

Several instances of such reciprocity or interchange of features have been detected by the lecturer, and others have since come to light. From what has gone before, it is clear that such cases, inexplicable on any other theory, tend to establish the validity of the Müllerian hypothesis.

(2) A further consequence of the mutual influence exercised by the constituents of a Müllerian group is this: it ought sometimes to happen that two species, though both influenced in common by a third, will show a nearer approach to each other than either does to the common model. As a matter of fact this is found actually to occur in Nature, and fresh evidence is thus supplied for the validity of the Müllerian interpretation. This phenomenon, again, could not happen in Batesian mimicry. Two true or Batesian mimics of the same model could not influence each other; they could only be influenced in common by their model.

(3) Finally, the fact that each distasteful form is capable of affording protection to forms on each side of it may be expected to favour the existence of gradational groups; distasteful forms, with perhaps little or no resemblance between them, being held together, as it were, by a chain of distasteful intermediates. This also has been found to be the case, many of the mimetic groups in a given zoological region forming together a kind of nexus, each node of which may be occupied by a dominant group or species showing a very different colour-scheme from the occupants of the other nodes, while the uniting strands of the network are constituted by a more or less completely gradated series of transitional forms.

It will be seen from the foregoing how far we have advanced beyond the original conception of Bates, and it must be allowed to be a striking fact that the progress of recent investigation has uniformly tended to supply fresh confirmation of those developments of the theory of mimicry which have traced their origin from the fertile suggestion of Fritz Müller.

