

## LETTERS TO THE EDITOR

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## Protective Mimicry and Common Warning Colours.

I HAVE just read with interest Sir George Hampson's criticism of certain supposed examples of protective mimicry. Such outspoken attacks are satisfactory in bringing out the truth one way or the other; and they contrast very favourably with vague expressions of opposition unaccompanied by reasons, and not stated in a manner or on an occasion which would permit reply.

I find from his letter that insufficiently supported conclusions are not confined to those who accept the theories in question. Sir George Hampson described a new geometer (*Abraxas etridoides*) from a single specimen in a private collection, and pointed out its resemblance to a *Teracolus* (*T. etrida*) from the same part of the world. Colonel Swinhoe directed the attention of the President of the Entomological Society to the resemblance, considering that it supported his (the Colonel's) contention that *Teracolus* is a protected genus. From these facts Sir George Hampson draws the remarkable conclusion that Colonel Swinhoe had in all probability never seen the species of *Abraxas* referred to. I give the inference in his own words—"this was quite enough for such an ardent student of mimicry as Colonel Swinhoe to base the statement on, without knowing any more of the species, and probably without ever having seen it, the type being in a private collection." The last reason would be more convincing if it was not followed by the statement—"I have, however, lately received more specimens." If Sir George Hampson, why not Colonel Swinhoe? As a matter of fact, Colonel Swinhoe received several specimens of *Abraxas etridoides* many months before he wrote to the President about them. There is a specimen in the Hope Collection here, presented by him in the early summer of last year.

All this does not affect the theory of mimicry. But the letter goes on to argue that the resemblance cannot be mimetic because the *Abraxas* rests in damp woods, while the *Teracolus* is flying on the plains 6000 feet below; and, furthermore, that the former is protected by distastefulness, while the latter is not. Similar objections are then raised against the supposed mimetic resemblance of Chalcosid moths to Danaine and Papilionine butterflies.

Now I quite agree that these criticisms, and especially that of the special protection of the moths, are destructive of any interpretation of the resemblance based on Bates' theory of protective mimicry. But they do not similarly affect that theory of mimicry (or more accurately common warning [synposematic] colours) which we owe to Fritz Müller. Being aware of the distasteful qualities of *Abraxas*, I had at once placed the example under the latter category and not under the former.

The Müllerian theory supposes that a common type of appearance among distasteful insects in the same locality acts as a common advertisement to enemies, so that the loss of life which must ensue during the time in which each generation of enemies is being educated to avoid the owners of a particular type of pattern and colouring, is shared between these species instead of being borne by each of them independently.

Prof. Lloyd Morgan's recent experiments on young birds of many species prove that there is no inherited knowledge of suitability or unsuitability for food, but that everything of an appropriate size and at the right distance is pecked at and tested. On the other hand the young birds are extremely quick in learning, and have very retentive memories. Furthermore one unpleasant experience makes them suspicious of other things, and they remember well the appearance of the insect which gave them a disagreeable surprise. Many more such experiments are needed, but taken alone they go far to show that the education of young birds is actually of the kind which is presupposed by Fritz Müller's theory.

And what is true of birds is probably true of other animals as well. My experience with lizards points in the same direction.

Sir George Hampson has previously pointed out that birds sometimes devour *Teracoli*; but I have induced a lizard, by

hunger, to eat an *Abraxas*. It is probable that *Teracoli* are, on the whole, avoided by birds; and if this is also true of the *Abraxas*, the resemblance may well be advantageous in spite of the difference in habits and the difference of station, even granting that the "good round sum" of 6000 feet is an absolute barrier to the *Teracoli* below and the *Abraxas* above. But future investigation may show that they approach much nearer than this.

The facts brought forward in Sir George Hampson's letter, while, I submit, by no means fatal to the Müllerian theory of mimicry, seem to be entirely destructive of the other suggestions by which the attempt has been made to explain these resemblances—suggestions which depend upon similarity in climatic or other physical or chemical conditions connected with locality.

The last paragraph of the letter demands a word of protest. If insufficient field observations have been made, it is because the observers have thought of other things, and chiefly the amassing of specimens; but it is, in part, due to the extreme difficulty of the observations themselves. And under any circumstances the museum work was necessary for the theory. Mr. Godman, in his presidential address to the Entomological Society, told us that the theory was suggested to Bates as a result of the comparison of specimens at home, although of course his memory of observations in the field was also necessary. The work in the study enabled him to bring under observation at a single time the captures which were separated by great intervals of time and space; and no doubt it was the opportunity thus afforded of taking a broad view of the resemblances as a whole, which enabled him to originate the theory.

It seems strange that a writer whose energetic and successful work has involved so much "matching of specimens in a drawer," should speak of mimicry as "degraded" by such study. It is a necessary and important study for the naming of species as well as the recognition of examples of mimicry, and as such it deserves respectful attention, although it may at times have led to the creation of "museum-made" species on an even larger scale than the manufacture of "museum-made mimicry."

The matching of ribbons of uniform colour can hardly be compared with any degree of fairness to the matching of the complex patterns on the wings of Lepidoptera; but in the matching of highly developed specimens of decorative art by the anthropologist, and in the attempt to determine whether the resemblance is due to a common origin, or to accident, or to the mind of man working independently along the same lines, we have problems which present much in common with those confronting the student of mimicry.

In conclusion it may be well to remind those who oppose the theories of mimicry on the ground that the evidence is not demonstrative, that we believe in evolution although we do not see one species growing into another. We believe the theories of mimicry and of common warning colours, not because we have before us demonstrative proof in a complete knowledge of the details of the struggle for existence—it will be very long before we attain to this—but for the same reason that we believe in evolution—because the theory offers an intelligible explanation of a vast number of facts which are unexplained by any other theory as yet brought forward, and especially because it enables us to predict the existence of facts which we can afterwards verify.

EDWARD B. POULTON.

Oxford, February 18.

## Oat Smut as an Artist's Pigment.

WITH reference to Mr. David Paterson's interesting letter in NATURE for February 17 (p. 364), it may be noted that a copy of an etching from a painting by Berghem, in the Kew Museum, No. 2 (Case 115, No. 200), is drawn with smut of wheat (*Ustilago tritici*), and that, according to Dietel (*Die Naturlichen Pflanzenfamilien*, Th. I. 1 Abth. p. 6), ladies in Japan are accustomed to use the dark olive-brown spores of *Ustilago esculenta* as a pigment for painting the eyebrows.

H. MARSHALL WARD.

Botanical Laboratory, Cambridge, February 18.

## Giraffe from the Niger Territories.

MY brother, the late Lieut. R. H. McCorquodale, of the 3rd Dragoon Guards, while doing special service duty in West Africa, was fortunate enough to kill a very fine giraffe (female). This is a most interesting record, as it is the only specimen