

department where the complicated subjects bearing on the public health of India can be taught is warmly advocated.

It was with the idea of securing such means of study that Sir Henry Acland resigned his office into the hands of the Regius Professor of Medicine, Prof. Burdon-Sanderson, but, unfortunately, the University is not able to carry out the scheme, and it remains for some wealthy person to grasp the great importance of the various questions involved in the public health of India, and assist the University to provide the means required.

LETTERS TO THE EDITOR

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Protective Mimicry.

I HAVE read, with special interest, both Sir George Hampson's remarks on certain cases of pseudo-mimicry and Mr. Ed. Poulton's answer to the same (NATURE, vol. lvii. pp. 364 and 389).

Now, as I am the person that was consulted on the subject by one of Sir G. Hampson's correspondents in India, I think myself entitled, and in a way even bound, as far as possible to remove some of the misgivings that seem to have crept into Mr. Poulton's appreciation as to the true bearing of the facts under discussion.

Though he agrees, on the one hand, with Sir G. Hampson as to the fact that "this and other like cases of mimicry are quite destructive of any interpretation of resemblance based on Bates' theory," he yet maintains, on the other, that "they do not similarly affect the Müllerian theory."

But this is precisely what I contend is contradicted by the facts in question. To make this clear, I shall only use Mr. Poulton's own statements and admissions.

"The Müllerian theory," he says, "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 or pattern and colouring is shared between the species instead of being borne by each independently."

The theory, thus understood, seems to Mr. Poulton to be rather exemplified and confirmed than contradicted by the facts in question, and he therefore continues: "It is probable that *Teraocoli* 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 station, even granting that the 'good round sum' of 6000 feet is an absolute barrier to the *Teraocoli* below and the *Abraxas* above. But future investigation may show that they approach much nearer than this."

First of all this reasoning, which is openly all about admitted facts, looks rather as a running away from those facts to some wished-for possibilities. Besides Mr. Poulton grants, after all, that unless both types occur in the same locality and be exposed to the same enemies, no possible training of young birds can be conceived, and consequently no advantage can be supposed to accrue.

But what are the facts? For here, of course, I do not pretend to discuss what might take place in any possible supposition, nor even to find fault with the logical slip so very common among natural selection evolutionists, which consists in so confounding the simple admission that similarity of colour exists, or even is useful, as to conclude from it that it is therefore the result of usefulness.

Now, so long as we keep to facts, whether we consider the two species of butterflies themselves or their respective enemies, the conclusion is the same, and they both require distinct climatic conditions and distinct "habitats."

Willingly or not, we must resign ourselves to see the "good round sum" of 6000 feet, or rather the difference in climatic conditions and other "surroundings" represented by this difference in elevation in our regions of Southern India remain as an insuperable barrier between the above-named species of butterflies, and to much the same extent also between their enemies.

Far from coming into contact, therefore, they are thus kept by their habits apart from one another, and put under conditions quite different from those required for the possible application of even the Müllerian theory.

Finally, both from the evidence of these and many like facts and, as Mr. Plateau has so well demonstrated, from the trifling importance of colouring in the selection of insects by their enemies, it is, to say the least, difficult to see how the facts of similarity in colour, shape, &c.—which for shortness sake we may even call "mimicry"—can be interpreted or explained by any possible theory based on simple natural selection. And I would, in conclusion, remark that I distrust all such theories not, as Mr. Poulton seems to believe, "on the ground that the evidence is not demonstrative," but because, far from offering an intelligible and possible explanation of facts, they simply stand in contradiction with them and mislead us as to their real meaning.

J. CASTETS, S. J.

St. Joseph's College, Trichinopoly, India, June 8.

I DO not propose to deal with Mr. Castets' objections to natural selection in general. They have often been met before. As to the special case under discussion, he feels that his knowledge of the distribution of the two species is exhaustive enough to give him safe warrant for the assertion that they are invariably separated by a height of 6000 feet. If this conclusion is well founded, it is an important contribution to the facts of the case under discussion. Nevertheless neither this nor the climatic differences need affect the Müllerian theory if the barrier which separates the one form from the other is crossed by the enemies of both. The *Teraocolus*-like appearance of the moth is remarkable, and separates it very sharply from its allies. It occurs on an elevated district surrounded by lower country in which the *Teraocolus* abounds. The approximation is sufficient to render the Müllerian theory a probable explanation in view of the immense number of similar relationships accompanying a closer approximation in other parts of the world, and considering the complete absence of any other explanation; unless, indeed, Mr. Castets intends to imply, by so constantly dwelling upon one aspect of the environment, that the difference in climate is responsible for the agreement in appearance.

Oxford, June 30.

E. B. POULTON.

Epidemics among Mice.

REFERRING to a paragraph in your issue of June 23 (p. 179), relative to the discovery by Dr. Issatschenko of a new microbe pathogenic to rats, I would call attention to some articles by Prof. F. Loeffler on epidemics among mice, &c., in the *Centralblatt für Bacteriologie und Parasitenkunde*, Band xi. pp. 129-141 (February 10, 1892), and Band xii. pp. 1-17 (July 5, 1892), which will be found translated in a Blue Book entitled, "Report of the Departmental Committee appointed by the Board of Agriculture to inquire into a Plague of Field-Voles in Scotland, with Minutes of Evidence and Appendices and a copy of the Minute appointing the Committee" (1893). Translations of the above papers form Appendix vi. of this Report; and Prof. Loeffler's second paper relates his successful efforts to employ the "*Bacillus typhi murium*" to destroy field-voles in Thessaly.

It would be interesting to know whether the microbe discovered by Dr. Issatschenko is the same as that described by Prof. Loeffler, or a different species.

Chiswick, June 25.

W. F. KIRBY.

Remarkable Hailstones.

ON Sunday, June 26, a district to the south of Manchester was visited by a thunderstorm, which was remarkable for its accompaniment of heavy hail. The storm came from the same quarter as the cool surface wind, viz. north-east, and reached its height about 2.15 p.m.

Preceded by a lull in the heavy rain, hail, accompanied by lightning, began to fall, and continued to do so for five minutes.

The most noticeable fact was the peculiar shape of the hailstones. These were conical in shape, about $\frac{1}{2}$ inch long, and $\frac{3}{8}$ broad in widest part. In longitudinal section they showed (a) opaque white bands; (b) clear, colourless bands; (c) semi-opaque bands, dotted with more opaque portions.

All of those examined agreed in possessing transparent portions at the *vertex* and *base*. On making a transverse section through one of the opaque bands, it was seen to consist of (a) narrow clear channels intersecting the surface; (b) opaque