LETTERS TO THE EDITORS

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IN THE PRESENT CIRCUMSTANCES, PROOFS OF "LETTERS" WILL NOT BE SUBMITTED TO CORRESPONDENTS OUTSIDE GREAT BRITAIN.

An Interesting Sidelight on the Causes of Coloration in Butterflies

IMMS[1] states that "pigment very commonly co-exists with structures that are, in themselves, colour producing" and that "combination colours are much more prevalent among insects than colours solely due to structural features . . . Iridescent colours are very often devoid of the presence of all pigment excepting black or dark brown . . . as a rule a background of this nature is necessary to the production of the brilliant and intense structural blues. . . ."

Butterflies of the Oriental genus Euplœa well exemplify this phenomenon, often more strongly in the male sex, and a specimen of *E. tulliolus aristotelis* Moore from British North Borneo in the Oxford University Museum throws interesting light upon it.

The butterfly, a very fine fresh male, had been seized and released by a bird, and the nip of the beak has left a conspicuous ∧-shaped 'beak-mark' on the right fore wing extending from the hinder angle forward, near to the outer margin, to beyond vein 4; it is, of course, clearly shown on the under surface also. Such 'beak-marks' have long been a subject of special study at Oxford[2], where a large collection of specimens has been gathered together, but the interest of the one in question is that it illustrates Mason's remarks on these blue reflections[3]. He examined species of butterflies with blue-green bars, etc., and found that "the remainder of the surface is dull brown except in certain positions, when it is purple to blue-green, so that as the wing is inclined this colour flashes out. The scales in these brown to blue areas are not particularly convex [as they are in the blue-green areas] but are markedly inclined to the surface of the wing, so that the tip is higher than the base and the scale makes an angle of thirty degrees with the plane of the wing. The reflection from these scales is specular, and they therefore appear bright only when the angle of incidence of the illuminating beam and the angle of reflection along the line of vision are equal.

"The two factors render the reflection colour visible when one looks along the grain of the wing, but against the grain there is no reflection and the effect is that of the brown pigmentation. . . ."

I have not been able to find a reference to Euplœa in this connexion, but the specimen under consideration shows the same phenomena; the whole wing is brown (or purple) except for small submarginal white spots. But the linear imprint of the bird's beak has acquired a colour different from that of the rest of the wing, being more blue than purple and not disappearing when the wing is tilted.

The microscope shows, first, that the pressure of the beak has ruptured the saccular scales so that the pigmented, brown, contents have escaped and dried in minutely granular masses. These, especially noticeable at the apex of the beak-mark, reflect strongly deep blue rather than purple.

Secondly, scales have been (*a*) displaced, (*b*) flattened along the line of the beak's contact, and being in different positions from the normal, tilted, scales, their striated surfaces reflect differently, so that the mark for this reason shows purple when the rest of the wing does not.

I am indebted to my friend Mr. E. B. Ford for help in the elucidation of this interesting result.

G. D. HALE CARPENTER.

Department of Entomology,
University Museum,
Oxford. Feb. 20.

[1] Imms, A. D., "Recent Advances in Entomology" (2nd ed.), p. 194 (London, 1937).

[2] Carpenter, G. D. Hale, "Further Evidence that Birds Do Attack and Eat Butterflies", *Proc. Zool. Soc. Lond.*, A, 223–247, Plates 1 and 2 (1937).

[3] Mason, C. W., *J. Phys. Chem.*, 30, 392-3 (1926).

Effect of Temperature on the Mutation Rate of an Unstable Gene in *Portulaca grandiflora*

THERE are few data on the relation between temperature and natural mutation rate, though obviously this is important in formulating any concept of the nature of genes. Delbrück *et al.*[1] have examined the consequences of regarding mutations as simple chemical changes in molecules, and have pointed out that if the 'life' of an allele be of the order of months or years, then the mutation rate may be expected to have a Q_{10} of the order of 5. Experiments by a number of workers (reviewed by Stubbe[2]) do in fact show a high Q_{10} of that order, for genes having 'normal' mutation rates (1 in 10,000 or more life-cycles) and particularly for the collective class of lethal mutations in the *X*-chromosome of *Drosophila melanogaster*.

A frequently mutating gene on the other hand, the miniature-3-gamma in *Drosophila virilis*, has been shown by Demerec[3] to be apparently but little affected by temperature differences, and Rhoades reported at the Seventh International Congress of Genetics[4] an apparent decrease in mutations of the gene *dt* (in conjunction with another factor) in *Zea Mays* with higher temperature. On the view proposed by Delbrück, even unstable genes like these should have a Q_{10} of not much less than 4, a value which it seems impossible to reconcile with Demerec's data, after making the fullest allowance for experimental inaccuracies.

We have carried out an experiment with a mutable gene which produces coloured spots on the petals and stems of *Portulaca grandiflora* (Ikeno[5]). Four clones were grown, and one representative of each was kept in a thermostatic chamber for six weeks.