

Phytophagic or Biological Races in Insects.

MR. MEYRICK points out in his letter (NATURE, Mar. 12, p. 388) that the idea of biological races is by no means a new one, and, judging from his last paragraph, he seems to think that the principle may be of but little importance as a factor in the production of new species. It may not be out of place to direct attention to the fact that the phenomenon appears to be very widespread among the Insecta.

As regards the Lepidoptera, besides the cases mentioned by Mr. Meyrick, the Codlin moth (*Cydia pomonella*) (H. J. Quayle, 1926) is an interesting probable example observed in the United States; while on the experimental side the production by Pictet (1911) of an inherited modification of feeding habit in *Lasiocampa quercus* is of much interest, although the results are by no means so conclusive as those of Dr. Harrison. The present writer is now working on moths of the genus *Hyponomeuta* from this point of view, and although the experiments are not yet sufficiently far advanced for publication, it seems that to postulate the existence of biological races adapted to special food plants offers the simplest explanation of the facts so far observed.

Among Rhynchota the capsid *Plesiocoris rugicollis* (Petherbridge and Husain, 1917) is another probable case, while in Homoptera the experimental work of P. Marchal (1908) on the coccid *Lecanium* offers a very close parallel to that of Dr. Harrison. In Diptera, to mention only one case, Cameron (1914) working on the anthomyid, *Pegomyia hyoscyami*, definitely proved the existence of at least two biologic strains within the one species.

Similar results have been obtained among Coleoptera, the best known being that of Schroeder (1903) on the *Salix* feeding beetle, *Phratora vitellinae*. This again showed a result very close to that of Dr. Harrison on *Pontania*.

The above are just a few of the more striking cases known, but enough has been said to show that the phenomenon is probably very widely spread among phytophagous insects and, as Mr. Meyrick justly remarks, can scarcely be described as a new principle. Possibly, however, it is of more importance in the evolution of new species than Mr. Meyrick appears to think.

In this connexion it is interesting to note that Dr. M. Hering in his recent book, "Biologie der Schmetterlinge" (1926), says: "Wir können also festhalten: Polyphag in der Raupe sind phyletisch alte Formen; Monophagie ist eine Erwerbung jüngerer Datums." If this generalisation is correct it would seem that phytophagic races may have been the means by which monophagous species were evolved.

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The Geissler Discharge in Argon.

THERE is now a considerable literature dealing with analysis of arcs, and of glow discharges from a hot cathode, in which Langmuir's improved method of using an exploring electrode has been employed. It has been shown by one of us that, as would be expected, the same method can be applied to the glow discharge between cold electrodes (*Proc. Camb. Phil. Soc.*, 23, p. 531; 1927). This work was of a preliminary nature, and the results were, to a certain extent, ambiguous. We have now repeated the experiments under better conditions, in argon, and have confirmed the earlier results.

With a low current density and conditions not far different from those corresponding to a normal

cathode fall of potential, there is a sharp maximum in the concentrations of both positive ions and electrons at the middle of the negative glow. The electric field is reversed between this region and the edge of the cathode dark space, and two groups of fast electrons appear. There are here present electrons with energy corresponding to a large fraction of the full cathode fall of potential. The Faraday dark space extends almost to the anode, and the electric field in it is small at the higher pressures (0.8 mm.) and strongly reversed at the lower pressures (0.2 mm.). We find that the ionic concentration gradients are sufficient to carry the current by diffusion through the reversed electric field, as in low voltage arcs.

Our curves for the collector characteristic in the cathode dark space are difficult to analyse, and it may be questioned if any method of using an exploring electrode may legitimately be applied to this region of the discharge, because of the disturbance indicated by the 'shadows' thrown by the collector.

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Relation between the Reciprocal Impenetrability of Matter and Pauli's Exclusion Principle: A Correction.

SOME paradoxes which have occurred to me and have been pointed out to me also by some of my colleagues (especially Dr. Fues, Copenhagen), show that the fundamental statement of my letter (NATURE, Feb. 5) published under the above title, is incorrect. It is not true that the reciprocal impenetrability of the molecules allows only of the Heisenberg-Dirac determinant solutions, and excludes all others. On the contrary, *all* the symmetrical and antisymmetrical characteristic solutions which existed for absolutely penetrable molecules remain for a (not one-dimensional) gas with molecules having a radius very small compared with the mean distance; only the characteristic values are a little changed, and the characteristic functions undergo a deformation in the immediate neighbourhood of the 'diagonal spaces.' If, therefore, the Pauli principle is valid not only for the electrons of an atom but also for the translatory motion of gas molecules, with radius almost zero, then such a remarkable relation between the molecules cannot be so simply explained by wave mechanics as my mistake led me to believe.

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The Property of Dilatancy.

THE theory of dilatancy, the characteristic of the deformation of granular materials, was given by Osborne Reynolds before the Aberdeen meeting of the British Association on Sept. 10 and 15, 1885, and later in a modified form before the Royal Institution, Feb. 12, 1886. These presentations were published in the *Phil. Mag.*, vol. 20, pp. 469-481, 1885, and in *NATURE*, vol. 33, pp. 429-430, 1886, and later in Reynolds's collected papers.

Since then there has apparently been little discussion of the phenomenon, and the few references I have were found accidentally in papers bearing no hint in their title of a discussion of this subject.

I shall be grateful to any one who will furnish me with references to papers in which the phenomenon is discussed.

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Washington, Mar. 12.