in the shortest time. This seems to indicate that acquired habits can be inherited. Recently experiments have been undertaken in Prof. E. W. MacBride's laboratory to see if the parthenogenetic stick insect of Ceylon could inherit the habit of eating plant *B* (which it can eat but does not usually do) instead of *A* which is its usual food-plant. An account of this was published in *NATURE* of April 21 (p. 598). The result seems to show that such a preference can be transmitted to the offspring.

The difference between the maze-threading experiment and that of compelling the acquisition of a new food-plant is that in the former case no foreign matter is introduced into the body of the organism, while in the latter case a different kind of food is introduced. In the former the habit is not accompanied by an obvious physical change in the organism, while in the latter it is nothing but the acceptance on the part of the organism of a physical fact.

Whatever may be the conclusions drawn from these experiments, to determine whether a habit is inherited or not, information on the following points is first necessary: (1) Does habit produce a physical change, (2) if so, how can it be measured, (3) in what way is this change registered in the reproductive cells?

It seems to me that the experiments so far undertaken have the same hit-and-miss character as those of the animal breeders before Mendel's time. For example, it could not be predicted that a particular egg taken out of the lot produced by those insects that easily accepted the second food-plant would result in an insect which showed a definite predilection for this alternative host-plant.

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Mimicry in Insects

PROF. T. D. A. COCKERELL points out¹ that parallelism and convergence are so frequent that they indicate deeply-seated tendencies "which find expression without any reference to immediate utility", and that "if mimicry is promoted by natural selection these resemblances are the raw material on which it works".

May I remark that the last words quoted are misleading in their suggestion that convergence may play a large part in the causation of *all* the cases of resemblance of one animal to another which are, unfortunately, classed together in the common usage of the term 'mimicry'.

It is indeed possible that convergence (or arrested divergence) has played a part in the production of synaposematic resemblance such as Prof. Cockerell mentions in the case of wasps, although even in such cases there is no relation between the degree of resemblance and the degree of consanguinity. The similarity between species of the well-known Burnet moths in England might, with justice, be claimed as a good example. But this explanation, so simple and plausible, is of much too limited applicability to deal with the phenomena of 'mimicry'. It cannot explain such examples of true, Batesian mimicry as the pseudoposematic resemblance of a caterpillar to a snake which deceived Bates himself. Nor can it possibly apply to the analogous and equally deceptive procrystic resemblance of a caterpillar to a stick, or a moth to a bird-dropping.

I find it difficult to understand how parallel development can have played any part in the production of a similar appearance in insects of different degrees of relationship by entirely different means: a phenomenon in mimicry too often left out of account in discussions. Upholders of the Darwinian explanation of mimicry are still awaiting an alternative which will embrace the above mentioned and many other phenomena which fall into line.

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¹ *NATURE*, 133, 329, March 3, 1934.

Pseudopodial Movements of Foraminifera

WORK of recent years has done much to elucidate the protoplasmic changes accompanying amoeboid movement. The endoplasmic streaming which is the most striking feature in the pseudopodium of an amoeba is not, however, present in most other rhizopods in which locomotion by creeping is less well developed, and it seems that the time is ripe for a careful re-examination of the different types of pseudopodia.

In the Foraminifera, the pseudopodia are long, fine protoplasmic threads containing granules, the size of which varies with the species and which are in rapid longitudinal movement. Commonly, both centrifugally and centripetally moving granules are present simultaneously in the same thread, often passing one another even though the thread may be less than a micron in diameter. Sometimes also a pseudopodium may be increasing in length at a time when the predominant movement of the granules is centripetal, indicating a movement of the clear ground-protoplasm independent of that of the granules. The granules are usually (perhaps always) near the surface of the pseudopodium, and it is commonly supposed that the clear axial part of the protoplasm is of a more solid nature, thus conferring stability on the fluid thread, which otherwise would be expected to break up into drops owing to the fact that its length is often some hundred or more times its diameter.

Though it is at present impossible to give a clear account of the exact location of these various moving streams, or of the nature of the motive force producing them, or of the conditions of stability of the fluid pseudopodia, the following preliminary observations have some bearing on these questions.

(1) In all the species examined by me the pseudopodia are enclosed by a relatively tough moving 'skin' which can be demonstrated by various methods. Crawling ciliates may pluck the pseudopodium, pulling and stretching it considerably without adhering to it. Small flagellates may even come to rest against a pseudopodium, be carried along passively for a considerable distance and then swim away without any sign of sticking. In transporting food, on the other hand, the pseudopodia show themselves to be very sticky. This may be due, as Verworm¹ believed, to active secretion of a sticky substance, but seems to be more probably due simply to penetration of the 'skin' by the captured object, causing it to come into contact with the viscous internal fluid.

(2) The mean velocity of the granules in different pseudopodia of an individual at any instant is fairly