

Specific Characters.

DR. A. R. WALLACE, in his extremely interesting paper on "The Problem of Utility," lately published in *Linn. Soc. Journ.—Zool.*, vol. xxv., arrives at the conclusion (p. 486) that "every species (of the higher animals at all events) will usually possess at least three peculiarities: in the first place, it must exhibit some difference of structure or function adapting it to new conditions; secondly, some distinction of colour, form, or peculiar ornament serving as distinctive recognition-marks; and, thirdly, the physiological peculiarity of some amount of infertility when crossed with allied species. The first two constitute its 'specific characters.'"

Now it appears that the first of these differences is the fundamental one, and we ought not to find species living under exactly the same conditions and in precisely the same manner, separated only by infertility or "recognition-marks." Yet any one examining the current literature of entomology, would suppose that in numerous instances there were no differences whatever between allied species than those either of the class of "recognition-marks," or in the structure of the genital organs. That this would be an extremely erroneous supposition I am convinced both by experience and on theoretical grounds, and I would ask entomologists to produce even a single valid instance in support of it. The fact is, that the specific characters of the first class are overlooked by those who describe insects, until the describers come to imagine they have no existence. Nor is this surprising, since they are largely such as can only be elucidated by observations on the living insects, and no amount of cabinet-study will detect some of them.

It follows from the above considerations that species may occur which are perfectly distinct, but nevertheless offer no palpable differences in dead specimens. I know several instances of this sort, they are what I have termed *physiological species*. As Dr. Wallace states, recognition-marks are practically universal among the higher animals, but there occur groups in which they could not be of much, if any, use; and here it is that the separation of the species becomes so intricate. It is fortunate that many groups in which recognition-marks are reduced to a minimum, the organisms are minute and often transparent, so that their whole structure can be seen under the microscope.

In the case of insects, physiological species appear among the degraded forms, such as the Coccidæ and the bird-lice. Thus the coccid *Aspidiotus aurantii* is a great pest of orange-trees in California, the Eastern Mediterranean region, &c., but in Jamaica occurs a form of it, not distinguishable structurally from the type, which never attacks the orange. Lately Prof. Kellogg, in a paper on bird-lice, stated that a certain so-called species had a great number of hosts, and probably consisted of several species, confined to particular genera or species of birds; but, nevertheless, all attempts to separate them on structural grounds had proved unsatisfactory and inconclusive. Both the coccids and the bird-lice are creatures in which recognition-marks could not be of much service. The males of many Coccidæ, which are never seen by the females, are remarkably uniform in appearance, considering the structural diversities of many of their mates, the latter having contrivances for protection against parasites, against too rapid evaporation or too great heat, for the protection of the eggs, for concealment, and so forth. In *Orthezia*, which has a tolerably active female, the male has a beautiful caudal brush. Among plants the same sort of thing occurs. The higher plants exhibit diverse flowers for recognition by insects; but how subtle are the specific characters of many bacteria, fungi, and even ferns and grasses! Yet the species are distinct, as we see, for example, in the obviously different diseases produced sometimes by bacteria which are hardly or not distinguishable. Thus Dr. Kanthack tells us (*NATURE*, vol. lv. p. 211): "No one nowadays ventures to define the cholera germ; there are two many varieties of it . . . We have come to the conclusion that when a bacillus is morphologically identical in appearance with the diphtheria bacillus, and in its biological characters closely resembles the conventional

type of the diphtheria bacillus, he must be a bold man who ventures to say off-hand that this bacillus is or is not a diphtheria bacillus." Yet the same difficulty does not exist in diagnosing cholera or diphtheria.

I do not suppose that recognition-marks are wanting in many groups of higher animals, even higher invertebrates. The fresh-water bivalves can hardly be supposed to present them, and hence their separation into species becomes exceedingly difficult. But it appears that recognition-marks need not be in colour or markings, but may be, and often are, in odour or voice, which are not observable in dead specimens. Thus the nocturnal lepidoptera, the species of which are often perplexingly similar, undoubtedly many of them emit subtle odours—too subtle usually for us to appreciate. So also, some species of birds are known, which are almost exactly alike in the preserved skins, but are readily distinguished in life by the song or voice.

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