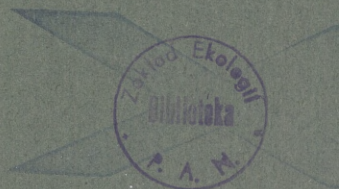
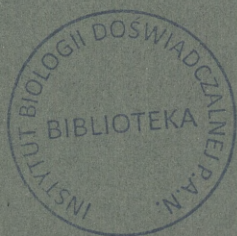


ANIMAL COLORATION AND NATURAL SELECTION



S. 1668.

ANIMAL COLORATION AND NATURAL SELECTION

Adaptive Coloration in Animals

By Dr. Hugh B. Cott. Pp. xxxii + 508 + 49
plates. (London: Methuen and Co., Ltd., 1940.)
40s. net.

THIS excellent work, eagerly awaited for many years, will be most welcome to naturalists, even, we may hope, to the few who have hitherto rejected the Darwinian interpretation which the author has here supported by a mass of additional evidence based on his own observations and those of very many others. Dr. Julian Huxley, in his introduction, refers to one of these critics, the American zoologist, A. F. Shull, who writes in contemptuous terms of the whole subject. To this Huxley replies: "Dr. Cott, in this important book, has turned the tables with a vengeance on objectors of this type. He has shown that it is they who are the armchair critics, or, one might say, the laboratory-bench critics. Had they taken the trouble to acquaint themselves with even a fraction of the relevant facts to be found in nature, they could never have ventured to enunciate such sweeping criticisms".

"Adaptive Coloration", following the author's preface, is divided into three parts: (1) concealment; (2) advertisement; (3) disguise, including mimicry (in cuckoos as well as insects and the relations between the two forms of resemblance); finally, a brief conclusion in which the cumulative effect of the facts and arguments is shown to "present a body of evidence which makes it appear that adaptive coloration is one of the chief attributes of the higher animals, and has been, indeed, one of the main achievements of organic evolution" (p. 427).

The immense amount of labour devoted to the production of this great work may be inferred from the 685 titles of original memoirs quoted in the bibliography (pp. 439-66). A brief inspection of the list will at once show how much we owe

to the author for bringing together and discussing these scattered records of observations on adaptive coloration in animals and for their certain result, the stimulation of further researches along the same lines as well as others which are sure to be developed as the work proceeds. Special mention must be made of the illustrations. The coloured frontispiece, by the author, exhibits the warning coloration of eight Amphibia, while forty-eight monotone plates, chiefly reproduced from his admirable photographs of living species at rest in their natural surroundings, and eighty-four text illustrations, supply the help which is so absolutely necessary in this subject. Prof. Hale Carpenter, in a recent review, has referred to "the scattering of the plates at random through the pages" and the inconvenience of the references to some of them. I, too, felt something of a shock, in reading the extremely interesting pages on crabs and the stinging sea anemones, their welcome and invaluable guests, to be suddenly faced by the lovely plate 30 (opposite p. 236), displaying an East African hawk-moth at rest on a tree trunk at Beira. There can be no doubt that a second edition will soon be required, and we may hope that the arrangement of plates and the references to them will then be improved.

In the limited space available it is impossible to treat adequately the first and much the longest of the three sections into which the book is divided, namely, concealment. I must, however, direct special attention to the admirable and abundant plates and text figures and the excellent account of the whole subject and each of the ten heads into which it is divided, as clearly shown in the table of contents.

On the subject of Part 2, advertisement—aposematic or warning colours—I believe that every open-minded reader of pages 191–233, devoted, with the accompanying plates and figures, to the methods by which different animals are rendered conspicuous in Nature, will agree with the author's statement that the classes of evidence "all point to the conclusion that *aposematic appearances are adaptive*: that they tend to satisfy a vital need in the struggle for life, *the need for recognition by predatory enemies as something*

unwholesome, something unwelcome, and something to be avoided" (p. 233).

The succeeding section, on adventitious warning coloration (pp. 234-44), describes many examples of "relatively defenceless and palatable animals . . . known habitually to associate themselves with others which are specially protected and conspicuous, and thus to share the protection from enemies which the latter enjoy" (p. 234). Instances of such partnership between crustaceans and sea-anemones or other unpalatable forms were recorded long ago—an interesting British example by P. H. Gosse in June 1859 and several observed by Walter Garstang at Plymouth, a few years later. Extremely interesting and remarkable as these and other early records certainly are, I do not remember meeting with any criticism or doubt of an interpretation based on adaptation which was, I believe, offered by every observer. But the facts and their interpretation are so significant, and indeed arresting, that the admirable section in which the subject is brought up to date gave me special satisfaction and I hope it will be widely read, especially by those who are inclined to be critical of natural selection. A few of the many examples quoted by the author may be mentioned :

"The coral-haunting crab *Melia tessellata*, from Mauritius, invariably grasps two anemones, one in each claw—employing them both for defence and for feeding. Borradaile states that if the crab is assailed it thrusts the polyps towards the enemy and thus wards him off with their stinging tentacles, but if the polyps capture food, the crab takes the morsel from their grasp with one of its legs and transfers it to its own mouth" (p. 235). Other examples quoted are the damsel-fishes (Pomacentridæ) of the Indo-Australian Islands, which find protection among the stinging tentacles of certain large anemones and apart from these are unable to withstand the attacks of more active fishes (pp. 237-38).

Immediately following the account of associations observed in the life of the sea is a description of the nesting partnerships between birds and aggressive Hymenopterous insects, such as wasps, which Dr. J. G. Myers has carefully studied in

South America and the West Indies (pp. 238-39). Dr. Cott concludes that the evidence as a whole "indicates that we have in these forest-dwellers a highly perfect and singular instinct correlated with the need for protection from enemies" and that it has its parallel "in the waters of coral reefs, where stinging anemones, rather than stinging aculeates, play the role of protector to the defenceless creatures who solicit their company" (pp. 239-40).

Dr. Cott has lightened and brightened his book by numerous admirably chosen quotations introduced into the text or appearing as headings to sections. Thus, referring in the preface (p. xiii) to the function of camouflage in aerial warfare, he points out that "we have lagged far behind nature, and have much leeway to make up before we can approach the efficiency attained by different forms of wild life in the field. We should do well, therefore, to follow advice from the Book of Job: 'But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee . . . and the fishes of the sea shall declare unto thee'". Another attractive and appropriate quotation, from Milton, supplies the heading (p. 290) to Section 9: "Evidence of selective feeding by vertebrate enemies in a state of nature", containing abundant proof that the diet of many insectivorous animals is determined by palatability rather than availability, as some critics have urged. In the quotation the Archangel Raphael speaks to Adam of the "various living creatures" of the earth and air, and asks him:

"Know'st thou not
Their language and their ways? They also know,
And reason not contemptibly."

It has been a very great pleasure to read Dr. Cott's fine work, to remember that it has been produced in this, the country of Charles Darwin, and that many excellent observations made in happier times by our present enemies are here described. May such happiness soon return!

E. B. POULTON.



