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WALLACE'S ESSAYS ON NATURAL SELECTION*.

IT FALLS TO THE LOT OF BUT FEW MEN to have had so many opportunities for original zoological research as Mr Wallace. In his capacity of a wandering naturalist he has explored many parts of the world almost or entirely unknown to Europeans. He has passed up the great valley of the Amazons, and pursued his labours of love in the depths of "the forest primeval." For many years he has resided in the Islands of the Malay Archipelago; and to his recently published volumes on this little-known group we are indebted for nearly all that has been ascertained respecting their singular zoology and geology. He is, moreover, not only known as an observer, but takes high rank among those more philosophic naturalists who endeavour to solve problems which are frequently regarded as beyond the limits of science, but which men of his aspirations believe will eventually be brought within her domains.

Mr Wallace has long been known as one who has studied deeply the question of the origin of the innumerable species that compose the fauna and flora of our planet, and the speculations that he printed some fifteen years since are in many respects previsions of those since so elaborately worked out and illustrated by the observations of Darwin. The various essays that he has published in the proceedings of the different scientific societies and periodicals bearing on the subject of natural selection are here collected together, and form a most valuable contribution to the literature of the subject. They are ten in number. The first two—on the introduction of new species, and on the tendency of varieties to depart indefinitely from the original species from which they took their origin—establish Mr Wallace's claim as a co-originator of the now celebrated theory of the origin of species by natural selection. Not that Mr Wallace seeks to detract from the value of the researches of Mr Darwin, of whom he says:

> Far abler men than myself may confess that they have not that untiring patience in accumulating, and that wonderful skill in using, large masses of facts of the most varied kind—that wide and accurate physiological knowledge, that acuteness in devising and skill in carrying out experiments, and that admirable style of composition at once clear, persuasive, and judicial—qualities which in their harmonious combination mark out Mr Darwin as the man, perhaps of all men now living, best fitted for the great work he has undertaken and accomplished.

The third essay is on the means by which animals are protected from their natural enemies by their resemblances to different objects, animate and inanimate. This assumption of the form and colour of adjacent objects is known by the rather unfortunate names of mimicry and mimetic analogy—terms which have been misunderstood, and taken to imply the assumption that each individual animal has the power of imitating the object it resembles; whereas all that is asserted by the theory is, that those varieties most inconspicuous to their enemies will be preserved, and thus the variation most conducive to the protection of the animal will be propagated and strengthened by hereditary transmission. The fourth essay is on the Malayan butterflies, as illustrative of the theory of natural selection; the fifth, on instinct in man and animals; the sixth and seventh, on the philosophy and true theory of birds' nests; the eighth, a reply to the statement of the Duke of Argyle on Creation by Law; and the last two, the application of the theory of natural selection to the races of mankind.

Of these essays those on the philosophy of nest building are not the least interesting, and may be quoted as fair samples of the peculiar styles of investigation and reasoning adopted by the writer. In the first of these two essays, Mr Wallace maintains that the construction of their nests by birds is not the result of an unerring instinct, but is essentially imitative, and a slow and partial adaptation to new conditions. In his second article on this subject he shows the connection that exists between the colour of birds and the character of their nests. Mr Wallace arranges nests in two great classes. The first includes all those in which the contents are hidden; and the second those in which the contents, whether eggs, the young or parent birds, are exposed. Each of these classes contains examples of the most elaborately constructed and of the most simple nests. Thus, amongst our own native birds, the kingfisher, woodpecker, and the wren furnish examples of nests the contents of which are concealed; and thrushes, warblers, finches, pigeons, and birds of prey, of those whose contents are exposed.

Of the birds themselves he also forms two groups, the first including those in which both sexes, the second those in which the males only, are adorned with conspicuous colours. With but few exceptions, Mr Wallace maintains that the following rule holds good:

> When both sexes are of strikingly gay and conspicuous colours, the nest is of the first class, or such as to conceal the sitting bird; while wherever there is a striking contrast of colours, the male being gay and conspicuous, the female dull and obscure, the nest is open, and the sitting bird exposed to view.

The groups in which the female is gaily coloured include the kingfishers, trogons, hornbills, barbets, parrots, woodpeckers, hangnests, &c. Those in which the female is less conspicuous than the male include the pheasants, grouse, tanagers, chatterers, &c. Throughout the whole of these latter families, writes Mr Wallace, "the nest is open, and I am not aware of a single instance in which anyone of these birds builds a domed nest or places it in the hole of a tree, or underground, or in any place where it is effectually concealed." Even the very exceptions to the general rule that, when there is any difference of coloration, it is the male that is the more conspicuous, are adduced by Mr Wallace to confirm his theory. Thus he states:

> It is undoubtedly the fact, that in the best known cases in which the female bird is more conspicuously coloured than the male, it is either positively ascertained that the latter performs the duties of incubation, or there are good reasons for believing such to be the case. The most satisfactory example is that of the grey phalarope (Phalaropus fulicarius), the sexes of which are alike in winter, while in summer the female instead of the male takes on a gay and conspicuous nuptial plumage; but the male performs the duties of incubation, sitting upon the eggs, which are laid upon the bare ground.
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> In the dotterell (Eudromias morinellus) the female is larger and more brightly coloured than the male; and here, also, it is almost certain that the latter sits upon the eggs. The Turnices of India, also, have the female larger and often more brightly coloured; and Mr Jerdon states, in his "Birds of India," that the natives report that, during the breeding season, the females desert their eggs and associate in flocks, while the males are employed in hatching the eggs.

In the concluding paragraph of this thoughtful and suggestive essay, Mr Wallace maintains the idea that colour was not given to

> Minister delight to man,
> To beautify the earth,

but to subserve a far more important purpose.

> The great object of all the peculiarities of animal structure is to preserve the life of the individual, and maintain the existence of the species. Colour has hitherto been too often looked upon as something adventitious and superficial, something given to an animal not to be useful to itself, but solely to gratify man or even superior beings—to add to the beauty and ideal harmony of nature. If this were the case, then it is evident that the colours of organised beings would be an exception to most other natural phenomena. They would not be the product of general laws, or determined by ever-changing external conditions; and we must give up all inquiry into their origin and causes, since (by the hypothesis) they are dependent on a Will whose motives must ever be unknown to us. But, strange to say, no sooner do we begin to examine and classify the colours of natural objects, than we find that they are intimately related to a variety of other phenomena, and are like them strictly subordinated to general laws. I have here attempted to elucidate some of these laws in the case of birds, and have shown how the mode of nidification has affected the colouring of the female sex in this group. I have before shown to how great an extent, and in how many ways, the need of protection has determined the colours of insects, and of some groups of reptiles and mammalia, and I would now call particular attention to the fact that the gay tints of flowers, so long supposed to be a convincing proof that colour has been bestowed for other purposes than the good of its possessor, have been shown by Mr Darwin to follow the same great law of utility. Flowers do not often need protection, but very often require the aid of insects to fertilise them, and maintain their reproductive powers in the greatest vigour. Their gay colours attract insects, as do also their sweet odours and honeyed secretions; and that this is the main function of colour in flowers is shown by the striking fact, that those flowers which can be perfectly fertilised by the wind, and do not need the aid of insects, *rarely or never have gaily-coloured flowers.*

* Contributions to the Theory of Natural Selection. By A. R. Wallace, Author of "The Malay Archipelago." London: Macmillan and Co. 1870.