

CONTRIBUTIONS TO  
THE THEORY OF  
NATURAL SELECTION.

*A Series of Essays.*

BY  
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"THE MALAY ARCHIPELAGO," ETC., ETC.

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## PREFACE TO THE SECOND EDITION.

THE flattering reception of my *Essays* by the public and the press having led to a second edition being called for within a year of its first publication, I have taken the opportunity to make a few necessary corrections. I have also added a few passages to the 6th and 7th *Essays*, and have given two notes, explanatory of some portions of the last chapter which appear to have been not always understood. These additions are as follows :—

<i>To avoid altering the paging the additional pages now given have been lettered.</i>		
1st Ed.	2nd Ed.	
221	221	Additional facts as to birds acquiring the song of other species.
223	223A } 223B }	Mr. Spruce's remarks on young birds pairing with old.
228	228A } 228B }	Pouchet's observations on a change in the nests of swallows.
229	—	Passage omitted about nest of Golden Crested Warbler, which had been inserted on Rennie's authority, but has not been confirmed by any later observers.
261	261	Daines Barrington, on importance of protection to the female bird.
	372	Note A.
	372B	Note B.

song, but adhered stedfastly to that of the titlark." He then goes on to say that birds taken from the nest at two or three weeks old have already learnt the call-note of their species. To prevent this the birds must be taken from the nest when a day or two old, and he gives an account of a goldfinch which he saw at Knighton in Radnorshire, and which sang exactly like a wren, without any portion of the proper note of its species. This bird had been taken from the nest at two or three days old, and had been hung at a window opposite a small garden, where it had undoubtedly acquired the notes of the wren without having any opportunity of learning even the call of the goldfinch.

He also saw a linnnet, which had been taken from the nest when only two or three days old, and which, not having any other sounds to imitate, had learnt almost to articulate, and could repeat the words "Pretty Boy," and some other short sentences.

Another linnnet was educated by himself under a *vengolina* (a small African finch, which he says sings better than any foreign bird but the American mocking-bird), and it imitated its African master so exactly that it was impossible to distinguish the one from the other.

Still more extraordinary was the case of a common house sparrow, which only chirps in a wild state, but which learnt the song of the linnnet and goldfinch by being brought up near those birds.

The Rev. W. H. Herbert made similar observations, and states that the young whinchat and wheatear,

search for food, and it seems highly probable that the older birds would begin building first, and that those born the preceding summer would follow their example, learning from them how the foundations of the nest are laid and the materials put together.\*

Again, we have no right to assume that young birds generally pair together. It seems probable that in each pair there is most frequently only one bird born the preceding summer, who would be guided, to some extent, by its partner.

My friend, Mr. Richard Spruce, the well-known traveller and botanist, thinks this is the case, and has kindly allowed me to publish the following observations, which he sent me after reading my book.

*How young Birds may learn to build Nests.*

“ Among the Indians of Peru and Ecuador, many of whose customs are relics of the semi-civilisation that prevailed before the Spanish conquest, it is usual for the young men to marry old women, and the young women old men. A young man, they say, accustomed to be tended by his mother, would fare ill if

\* It has been very pertinently remarked by a friend, that, if young birds did observe the nest they were reared in, they would consider it to be a natural production like the leaves and branches and matted twigs that surrounded it, and could not possibly conclude that their parents had constructed the one and not the other. This may be a valid objection, and, if so, we shall have to depend on the mode of instruction described in the succeeding paragraphs, but the question can only be finally decided by a careful set of experiments.

he had only an ignorant young girl to take care of him; and the girl herself would be better off with a man of mature years, capable of supplying the place of a father to her.

“Something like this custom prevails among many animals. A stout old buck can generally fight his way to the doe of his choice, and indeed of as many does as he can manage; but a young buck ‘of his first horns,’ must either content himself with celibacy, or with some dame well-stricken in years.

“Compare the nearly parallel case of the domestic cock and of many other birds. Then consider the consequences amongst birds that pair, if an old cock sorts with a young hen and an old hen with a young cock, as I think is certainly the case with blackbirds and others that are known to fight for the youngest and handsomest females. One of each pair being already an ‘old bird,’ will be competent to instruct its younger partner (not only in the futility of ‘chaff,’ but) in the selection of a site for a nest and how to build it; then, how eggs are hatched and young birds reared.

“Such, in brief, is my idea of how a bird on its first espousals may be taught the Whole Duty of the married state.”

On this difficult point I have sought for information from some of our best field ornithologists, but without success, as it is in most cases impossible to distinguish old from young birds after the first year. I am informed, however, that the males of blackbirds,

swift (*Tachornis phænicobea*) inhabited exclusively the palm trees in a few districts in the island. A colony then established themselves in two cocoa-nut palms in Spanish Town, and remained there till 1857, when one tree was blown down, and the other stripped of its foliage. Instead of now seeking out other palm trees, the swifts drove out the swallows who built in the Piazza of the House of Assembly, and took possession of it, building their nests on the tops of the end walls and at the angles formed by the beams and joists, a place which they continue to occupy in considerable numbers. It is remarked that here they form their nest with much less elaboration than when built in the palms, probably from being less exposed.

A still more curious example of change and improvement in nest building was published by Mr. F. A. Pouchet, in the tenth number of the *Comptes Rendus* for 1870, just as the first edition of this work appeared. Forty years ago M. Pouchet had himself collected nests of the House-Martin or Window-Swallow (*Hirundo urbica*) from old buildings at Rouen, and deposited them in the museum of that city. On recently obtaining some more nests he was surprised, on comparing them with the old ones, to find that they exhibited a decided change of form and structure. This led him to investigate the matter more closely. The changed nests had been obtained from houses in a newly erected quarter of the city, and he found that all the nests in the newly-built streets were of the new form. But on visiting the churches and older

buildings, and some rocks where these birds build, he found many nests of the old type along with some of the new pattern. He then examined all the figures and descriptions of the older naturalists, and found that they invariably represented the older form only.

The difference between the two forms he states to be as follows. In the old form the nest is a portion of a globe—when situated in the upper angle of a window one-fourth of a hemisphere—and the opening is very small and circular, being of a size just sufficient to allow the body of the bird to pass. In the new form the nest is much wider in proportion to its height, being a segment of a depressed spheroid, and the aperture is very wide and shallow, and close to the horizontal surface to which the nest is attached above.

M. Pouchet thinks that the new form is an undoubted improvement on the old. The nest has a wider bottom and must allow the young ones to have more freedom of motion than in the old narrower, and deeper nests, and its wide aperture allows the young birds to peep out and breathe the fresh air. This is so wide as to serve as a sort of balcony for them, and two young ones can often be seen on it without interfering with the passage in and out of the old birds. At the same time, by being so close to the roof, it is a better protection against rain, against cold, and against enemies, than the small round hole of the old nests. Here, then, we have an improvement in nest building, as well marked as any improvement that takes place in human dwellings in so short a time.

But perfection of structure and adaptation to purpose, are not universal characteristics of birds' nests, since there are decided imperfections in the nesting of many birds which are quite compatible with our present theory, but are hardly so with that of instinct, which is supposed to be infallible. The Passenger pigeon of America often crowds the branches with its nests till they break, and the ground is strewn with shattered nests, eggs, and young birds. Rooks' nests are often so imperfect that during high winds the eggs fall out; but the Window-Swallow is the most unfortunate in this respect, for White, of Selborne, informs us that he has seen them build, year after year, in places where their nests are liable to be washed away by a heavy rain and their young ones destroyed.

#### *Conclusion.*

A fair consideration of all these facts will, I think, fully support the statement with which I commenced, and show, that the mental faculties exhibited by birds in the construction of their nests, are the same in kind as those manifested by mankind in the formation of their dwellings. These are, essentially, imitation, and a slow and partial adaptation to new conditions. To compare the work of birds with the highest manifestations of human art and science, is totally beside the question. I do not maintain that birds are gifted with reasoning faculties at all approaching in variety and extent to those of man. I simply hold that the



Darwin informs me he has facts to support), I impute the difference, in the great majority of cases, to the greater or less need of protection in the female sex in these groups of animals.

This need was seen to exist a century ago by the Hon. Daines Barrington, who, in the article already quoted (see p. 220), after alluding to the fact that singing birds are all small, and suggesting (but I think erroneously) that this may have arisen from the difficulty larger birds would have in concealing themselves if they called the attention of their enemies by loud notes, goes on thus:—"I should rather conceive it is for the same reason no hen bird sings, because this talent would be still more dangerous during incubation, which *may possibly also account for the inferiority in point of plumage.*" This is a curious anticipation of the main idea on which this essay is founded. It has been unnoticed for near a century, and my attention was only recently called to it by Mr. Darwin himself.

#### *Conclusion.*

To some persons it will perhaps appear, that the causes to which I impute so much of the external aspect of nature are too simple, too insignificant, and too unimportant for such a mighty work. But I would ask them to consider, that the great object of all the peculiarities of animal structure is to preserve the life of the individual, and to maintain the existence of the species. Colour has hitherto been

## NOTES.

## NOTE A. (Page 360.)

Some of my critics seem quite to have misunderstood my meaning in this part of the argument. They have accused me of unnecessarily and unphilosophically appealing to "first causes" in order to get over a difficulty—of believing that "our brains are made by God and our lungs by natural selection;" and that, in point of fact, "man is God's domestic animal." An eminent French critic, M. Olaparède, makes me continually call in the aid of—"une Force supérieure," the capital F, meaning I imagine that this "higher Force" is the Deity. I can only explain this misconception by the incapacity of the modern cultivated mind to realise the existence of any higher intelligence between itself and Deity. Angels and archangels, spirits and demons, have been so long banished from our belief as to have become actually unthinkable as actual existences, and nothing in modern philosophy takes their place. Yet the grand law of "continuity," the last outcome of modern science, which seems absolute throughout the realms of matter, force, and mind, so far as we can explore them, cannot surely fail to be true beyond the narrow sphere of our vision, and leave an infinite chasm between man and the Great Mind of the universe. Such a supposition seems to me in the highest degree improbable.

Now, in referring to the origin of man, and its possible determining causes, I have used the words "some other power"—"some intelligent power"—"a superior intelligence"—"a controlling intelligence," and only in reference to the origin of universal forces and laws have I spoken of the will or power of "one Supreme Intelligence." These are the only expressions I have used in alluding to the power

which I believe has acted in the case of man, and they were purposely chosen to show, that I reject the hypothesis of "first causes" for any and every *special* effect in the universe, except in the same sense that the action of man or of any other intelligent being is a first cause. In using such terms I wished to show plainly, that I contemplated the possibility that the development of the essentially human portions of man's structure and intellect may have been determined by the directing influence of some higher intelligent beings, acting through natural and universal laws. A belief of this nature may or may not have a foundation, but it is an intelligible theory, and is not, *in its nature*, incapable of proof; and it rests on facts and arguments of an exactly similar kind to those, which would enable a sufficiently powerful intellect to deduce, from the existence on the earth of cultivated plants and domestic animals, the presence of some intelligent being of a higher nature than themselves.

NOTE B. (Page 365.)

A friend has suggested that I have not here explained myself sufficiently, and objects, that *life* does not exist in matter any more than *consciousness*, and if the one can be produced by the laws of matter, why may not the other? I reply, that there is a radical difference between the two. Organic or vegetative life consists essentially in chemical transformations and molecular motions, occurring under certain conditions and in a certain order. The matter, and the forces which act upon it, are for the most part known; and if there are any forces engaged in the manifestation of vegetative life yet undiscovered (which is a moot question), we can conceive them as analogous to such forces as heat, electricity, or chemical affinity, with which we are already acquainted. We can thus clearly *conceive* of the transition from dead matter to living matter. A complex mass which suffers decomposition or decay is dead, but if this mass has the power of attracting to itself, from the surrounding medium, matter like that of which it is composed, we have the first rudiment of vegetative life. If the

mass can do this for a considerable time, and if its absorption of new matter more than replaces that lost by decomposition, and if it is of such a nature as to resist the mechanical or chemical forces to which it is usually exposed, and to retain a tolerably constant form, we term it a living organism. We can *conceive* an organism to be so constituted, and we can further conceive that any fragments, which may be accidentally broken from it, or which may fall away when its bulk has become too great for the cohesion of all its parts, may begin to increase anew and run the same course as the parent mass. This is growth and reproduction in their simplest forms; and from such a simple beginning it is possible to conceive a series of slight modifications of composition, and of internal and external forces, which should ultimately lead to the development of more complex organisms. The LIFE of such an organism may, perhaps, be nothing added to it, but merely the name we give to the result of a balance of internal and external forces in maintaining the permanence of the form and structure of the individual. The simplest conceivable form of such life would be the dewdrop, which owes its existence to the balance between the condensation of aqueous vapour in the atmosphere and the evaporation of its substance. If either is in excess, it soon ceases to maintain an individual existence. I do not maintain that vegetative life *is* wholly due to such a complex balance of forces, but only that it is *conceivable* as such.

With CONSCIOUSNESS the case is very different. Its phenomena are not comparable with those of any kind of *matter* subjected to any of the known or conceivable *forces* of nature; and we cannot *conceive* a gradual transition from absolute unconsciousness to consciousness, from an un-sentient organism to a sentient being. The merest rudiment of sensation or self-consciousness is infinitely removed from absolutely non-sentient or unconscious matter. We can conceive of no physical addition to, or modification of, an unconscious mass which should create consciousness; no step in the series of changes organised matter may undergo,

which should bring in sensation where there was no sensation or power of sensation at the preceding step. It is because the things are utterly incomparable and incommensurable that we can only conceive of *sensation* coming to matter from without, while *life* may be conceived as merely a specific combination and co-ordination of the matter and the forces that compose the universe, and with which we are separately acquainted. We may admit with Professor Huxley that *protoplasm* is the "matter of life" and the cause of organisation, but we cannot admit or conceive that *protoplasm* is the primary source of sensation and consciousness, or that it can ever of itself become *conscious* in the same way as we may perhaps conceive that it may become *alive*.