ON MR WALLACE'S THEORY OF BIRDS' NESTS.

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THE "Theory of Birds' Nests," published in No. 2, Vol I. 1868, of this "Journal," by Mr A. Wallace, is a theory which appears to me to be altogether unsound. It rests upon an ingenious but a very partial and a very arbitrary selection among the facts of nature; it takes no account whatever of many of those facts which are nevertheless conspicuous; and it is supported by arguments which are often inconsistent with each other.

The theory itself is prefaced by some general observations to which also I venture to take exception. I propose in this paper to deal with the various propositions of Mr Wallace in the order in which they occur, whether in the prefatory remarks, or in the more formal exposition of the theory itself.

In the first place, then, Mr Wallace condemns "the very general belief that every bird is enabled to build its nest by means of some innate or mysterious impulse," and he opposes to this belief, as the true doctrine, that birds are enabled to build their nests "by the ordinary faculties of observation, memory, and imitation."

Now, as the young bird which (in England) is born in May or June 1868 will proceed in April or May 1869 to build a nest as perfect and as beautiful as that in which itself was hatched, I do not see how either memory, or imitation, or observation can have anything to do with its architectural powers. It is true, no doubt, as Mr Wallace observes, that some birds (some only) shew considerable intelligence in "modifying the position, form, and material of their nests to suit the changed conditions with which the presence of man surrounds them." But this margin of variation, like all the modifications of mere instinct, is confined within narrow limits; and this degree of intelligence, whatever it may amount to, is itself hereditary and innate, so that it is no greater in an old bird which has seen many summers than in a young bird which has not seen more than one, and never can have seen any nest constructed. The innate character of the physical powers and tendencies which lead to nest-building, is well seen in the chick of the Telegallus, which begins scratching and scraping up the ground the moment it quits the egg, in unconscious but

instructive exercise of the peculiar habit by which the Hatching Mounds are afterwards to be constructed.

Mr Wallace next observes that the habit of ascribing of nest-building to innate impulse "has had the bad effect of withdrawing attention from the very evident relation that exists between the structure, habits, and intelligence of birds, and the kind of nest they construct." But no such effect has arisen or can possibly arise from the doctrine he condemns. Those who believe that the nest-building instinct is innate, believe also, of course, that the structure and habits, and intelligence of birds are all equally innate, and are all strictly correlated together.

Mr Wallace next proceeds to give some explanation of the peculiar nests of some birds as necessarily resulting from the physical structure of those birds themselves. I do not think this explanation is successful. Thus the Caprimulgidæ are said to be physically incapable of weaving together moss, or fibres, or wool into a strong well-constructed nest, because of their small broad bills, and their feet weak in grasping power. But some of the most perfect nests in the world are made by bills apparently quite as ineffective—as, for example, the beautiful nest of long-tailed Tit. The bill of this bird is extremely short, and not very pointed. Nor does a strong grasp of foot seem necessary for the building of a nest on the ground. On the other hand, many birds with a "well-formed and pointed bill" make no nest at all—as, for example, the Terns and Sandpipers. Nor is it true that no good materials are to be found in the haunts of these birds. Dried sea-weed, and the grasses and other plants which grow in abundance on the margins of lakes and seas and rivers, are admirable materials for being woven, nor could any implement be apparently more admirably adapted for weaving them than the bill of a Tern or a Sandpiper. Mr Wallace has missed the real explanation in his determination to accept no explanation which is not rooted in a mere physical cause. There is a reason—a very manifest *reason*—why Terns and Sandpipers should not make elaborate nests; but there is no physical cause rendering it impossible for them to do so. The reason is simply this, that birds which require to breed upon the open ground, must, for the purpose of concealment, make nests as small and inconspicuous as possible. Even the very least collection of materials upon a particular spot attracts the eye at once as it ranges over any uniform or slightly varied surface; and the instructive knowledge and feeling of this fact has been given to

the birds whose habitat is the ground, as a necessity of their existence and of the continuance of their species. Many species make no nest whatever, and, in general, the purpose of concealment is still more perfectly secured by an admirable adaptation of the colour of the eggs to the colour of the ground.

Mr Wallace next looks out for other physical causes as determining bird architecture. "Two other factors," besides the structure of the bird, he specifies—one is the effect of changes in external condition, producing corresponding changes in the form, or the material, or the situation of nests; the other is the influence of hereditary habit, tending to preserve such modifications even after they have ceased to be directly useful. But hereditary habit is merely another form of expression for an instinct. Hereditary habit is an inborn tendency to do certain things in a certain manner—a tendency purely congenital and quite independent of experience or observation of any kind. So far, therefore, I agree with Mr Wallace, although here he does not appear to agree with himself, that this is not only a "factor," but the most powerful factor of all in the nest-building of birds. I agree also with him that external conditions, or what he calls "environment," is another factor—for the very obvious reason, that both the structure and the implanted instincts of birds must be correlated with the external conditions in which they are intended to live. But this is an explanation only in the sense of indicating a purpose which we perceive, and which we see to be actually attained. It is no explanation at all in the sense of even suggesting any instrumentality which we can understand. The reason why such correlations should exist is as clear as day. The physical causes by which they have been brought about are as dark as night.

So far I have been dealing only with Mr Wallace's preliminary observations; but these are intended to prepare the ground for the new theory which follows. It is necessary, therefore, to look carefully to the drift of these observations, and to the direction in which they are intended to lead us.

Nest-building, then, is represented as determined--

1. By the ordinary faculties of observation, memory, and imitation.
2. By the organic structure of the bird itself—the shape of its bill, feet, &c.
3. By hereditary habit.
4. By "environment" or surrounding conditions.

It will be observed that of these four factors, all, except the first,

are consistent and closely connected with "blind instinct." In as far as the nature of a bird's nest is determined by its own structure, and by hereditary habit, and by surrounding conditions, in so far it is determined by conditions over which the bird itself has no control, and which belong to it as part of its very constitution and nature.

We now come to the first sentence which foreshadows the coming theory. Specifying the structure of a bird, and its environment as to the most important elements in determining its kind of nest, Mr Wallace proceeds thus :—

"If, therefore, we find less important and more easily modified characters than these correlated with peculiarities of nidification, we shall be justified in concluding that the former are dependent on the latter, and not *vice versa*."

The obscure wording of this sentence makes it rather a hard one to construe or to follow: but, taken with the context, I believe the argument to be this—When two things, or two sets of things, are correlated together, the one being more fixed or less changeable in its nature than the other, we may conclude that the most changeable is "dependent on" the least changeable (as on its physical cause?). The reasoning, then, as applied to the question in hand, may be stated thus :—

"The structure and habitat of birds we find to be correlated with certain peculiarities in their nesting; but structure and habitat are both comparatively fixed and difficult of change; the peculiarities of nests are therefore dependent on the peculiarities of structure and of habitat in birds. But if, on the same principle, we can find any other circumstance about birds which also is correlated with peculiarities of nesting, but which is more easily capable of change, then we may conclude that this circumstance is one dependent on the nature of the bird's nest and not *vice versa*."

The fallacies which lie hid in this argument are about as numerous as the words which it contains. In the first place, the definition of the peculiarities which are selected as correlated together may be altogether fanciful and arbitrary; in the second place, things which are really correlated together, whether always or only in general, may have no "dependence on" each other as physical cause and effect, but may be and often are the result of some cause or causes which lie above and behind them both; in the third place, the changeability of any peculiar character may be an assumption as arbitrary as the definition and conception of the peculiarity itself.

To test these fallacies we may take a case. Sandpipers,

Grouse, and in general all the larger birds which lay upon the ground, make a very scanty nest, some of them no nest at all. Let us, then, apply the argument of Mr Wallace. As nests are determined by structure and by habitat, they are comparatively fixed. The colour of birds is comparatively unfixed, and liable to change. Therefore, the scanty nests of ground-laying birds are the cause of their peculiar colour—the peculiarity of that colour being, that it is in general assimilated to, or correlated with, the colour of the ground which they inhabit.

But there is no need of testing the fallacy of Mr Wallace's argument by referring to any cases beyond those which he has himself selected. His classification of facts is as arbitrary and unnatural as any which could possibly be chosen for the purpose of shewing how arbitrary and how unnatural a classification can be made. Let us see what it is. "Considering," he says, "the main purpose of birds nests to be the protection of the eggs, and the *security and comfort* of the young birds, we may group them under two primary divisions, *according as they more or less completely fulfil this important function.*" But there are no such primary divisions in nature, from this very obvious cause, that all birds are on a perfect equality as regards the completeness with which these two great objects are attained. The young Guillemot or Fulmar, which is hatched upon a naked ledge of rock, without a scrap of nest, and exposed to all the storms and rains of the Atlantic, is as "comfortable" and as "secure" as the young of the Golden-crested Wren which sways in a dome of well-woven moss under the breezes which reach it in a wood of pines. These modes of nesting are indeed very different, but in respect to providing for the "comfort and security" of the young, the one is as perfect as the other; and amidst the vast variety which prevail in the nests of birds, this one great purpose is secured with equal certainty in them all.

The very idea of this classification, then, is erroneous from the beginning. But the manner in which it is applied brings out its artificial character still more clearly. "In the first of these two primary divisions," continues Mr Wallace, "we place all those in which the eggs and young are hidden from sight, no matter whether this is effected by an elaborate covered structure, or by depositing the eggs in some hollow tree or burrow under ground. In the second (primary division) we group all in which the eggs and young and sitting bird are exposed to view, no matter whether there is the most beautifully-formed nest or none at all." Here

we have a classification of birds which professes to be founded on their nests, but which, nevertheless, treats as matters of perfect indifference the structure, and the material, and the situation of those nests—which brings into one group the long-tailed Tit, which builds a receptical for its eggs and young of the most exquisite beauty, and the Kingfisher, which vomits a few bones in the bottom of a hole and lays its eggs upon them. In like manner it groups together in the second class birds which build with every variety and degree of skill, and birds which build no nest at all, but lay their eggs upon the bare ground. Mr Wallace is so absorbed in his preconceived idea that he faces this result without any apparent consciousness that it makes a very near approach to a *reductio ad absurdum*. "It will be seen," he says, "that this division of birds, according to nidification, bears little relation to the character of the nest itself. It is a functional, not a structural, classification. The most rude and the most perfect specimen of bird architecture are to be found in both sections."

But Mr Wallace does not see that even his idea of the "function" of birds' nests, as distinguished from their structure, material, and situation, involves total forgetfulness of some of the most important circumstances which determine their fitness for the discharge of that function. The one circumstance on which Mr Wallace fixes his attention, regardless of all others, is the circumstance whether the eggs and young of sitting birds are or are not what he calls "exposed to view." That is to say, he makes, or professes to make, the one circumstance of concealment his principle of classification. But this principle he applies only to the contents of nests, and not to the nests themselves. He forgets that the very form or structure of nests which most completely covers up the eggs, or the sitting bird may, and often does, render the nest itself only more conspicuous. Thus a domed nest is a larger structure, and one more easily observed than the smaller nests, which are nevertheless open and uncovered at the top. But, for the purpose of security and concealment, a nest is perfectly useless which merely covers up the eggs, but attracts attention to itself by its bulk, or its peculiarity of structure. It is the situation of nests, and their closed or open character, on which their safety from concealment depends. Predatory animals, from which danger to nests arises, do not require to see the eggs if they can see the nest. If they can find a nest, they know very well what they will find inside of it. Any schoolboy who has ever nested in

the woods of our own island would detect the fallacy of classifying nests as regards their efficiency in point of concealment according to their open or domed structure. Many of the nests which are the best concealed are the slightest, the shallowest, and the most open. Some of those, on the contrary, which are most easily and most commonly found are those which are necessarily bulky from the very perfection of their architecture. Few nests are more easily found than those of the common Wren, and this in spite of the most wonderful constructive skill in adapting the material of the nest to the vegetation among which it may be placed. But the compactness of the structure, its size, and its beautifully domed shape, very readily betray it to the eye. On the other hand, the comparatively shallow and loose nests of the Blackcap, Garden Warbler, and Whitethroat, are most difficult to find, on account of their very slightness, rendering them singularly inconspicuous among the tangled growths in which they are skilfully concealed.

So far, then, it does not appear that Mr Wallace's idea of the functional perfection of nests, if consistently applied, would at all justify the classification which he seeks to found upon it. On the contrary, the function of concealment is secured very often with the least degree of efficiency by the very kind of nest which he represents as securing it most completely.

We now come to the special theory for which Mr Wallace has been preparing the way. "Turning from the nests to the creatures who make them, let us consider," says Mr Wallace, "birds themselves from a somewhat unusual point of view, and form them into separate groups, according as both sexes, or the males only, are adorned with conspicuous colours." There is, no doubt, a very remarkable difference among birds in this respect. There is a large number of species among which the rule prevails, that bright colours are confined to the male, the females having plumage of dull or neutral tints. There is, on the other hand, another large number of species among which this rule does not prevail, and in which both sexes are equally brilliant in their colouring. Now, two questions arise in respect to these facts. One question is this, "Can any reason be assigned why dull colouring should be given to the female birds of any species?" The second question is this, "Can any physical cause be discovered by which this object, if it be an object, has been carried into effect?"

To the first of these questions, at least as regards many species,

there is an obvious and satisfactory reply. There is a reason, and a conclusive reason, why the female bird in some species should be dull coloured. Take the case of the common Pheasant, which is a type of a large class similarly conditioned. If the hen Pheasant, which lays its eggs upon the ground, were as brilliantly coloured as the male, she would be so conspicuous an object to every predatory animal that the species would be speedily exterminated. This, therefore, is a sufficient reason why she should be dull coloured, and totally dissimilar from the male. But as regards the second question, by what physical cause it is brought about, that this good reason should be met and complied with, no answer can be given. Mr Wallace himself makes an observation which effectually disposes of the one "law," in the sense of a physical connexion of cause and effect, which would most naturally suggest itself. The observation I refer to is this:—That the fact of both sexes being equally brilliant in many species shews that there is no absolute and physical connexion between the male sex in birds and a brilliant plumage. All, therefore, that can be said is, that it is one of those special adaptations for special purposes which are so abundant in nature, but which leave us absolutely in the dark as to the physical agencies by which they are secured.

And if this be the object, or the reason, or the "final cause," of the dull colouring in the female in Pheasants, it is extremely probable that the dull colouring which prevails in the females of other species is connected with the same great purpose; and it is equally probable that when brilliant colouring is given to female birds, the circumstances and conditions of their nesting are such as to dispense with this particular protection, which is so necessary under other circumstances and other conditions.

Accordingly, Mr Wallace announces the law, or the generalized expression of the facts in this matter, to be as follows:—"That when both sexes are of strikingly gay or conspicuous colours, the nest is of the second class, or such as to conceal the sitting bird; while, whenever 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."

Such is Mr Wallace's statement of the facts—and now we have his explanation of the physical cause. "The mode in which this has been effected is very intelligible, if we admit the action of natural and sexual selection. It would appear from the numerous cases in which both sexes are adorned with equally brilliant

colours, that the normal action of sexual selection is to develop colour and beauty in both sexes by the preservation and multiplication of all varieties of colour in either sex *which are pleasing to the other*. The female bird, however, while sitting on her eggs in an uncovered nest, is especially open to the attacks of enemies, and any modification of colour which rendered her more conspicuous would lead to her destruction and that of her offspring. All variations of colour in this direction in the female would, therefore, sooner or later be exterminated, while such modifications as rendered her inconspicuous by assimilating her to surrounding objects, as the earth or the foliage, would, on the whole, be preserved the longest, and thus lead *to the attainment* of those brown or green and inconspicuous tints which form the colouring (of the upper surface at least) of the vast majority of female birds which sit upon open nests."

Let us now analyze the assumptions which are involved in this theory of the physical causes, whereby opposite systems of colouring have been produced in birds.

It assumes that there is some innate tendency in the plumage of all hen birds, or at least of the hens of certain species of birds, to become as brilliantly coloured as the cock. It assumes, in the second place, that this colouring, when produced, is always more pleasing to the other sex than dull colouring. It assumes, for example, that a cock Pheasant would be much better pleased if he could have a wife coloured like himself than a wife coloured like the ground—an assumption which, by analogy, as applied to our own species, would require that men ought to prefer for wives the most masculine-looking women. It assumes, in the third place, that this innate tendency to the development of bright colours has no other limit than the extermination of the unfortunate hens on which it is exerted. It assumes, in the fourth place, that somehow, as these individual bright hens come to be all killed off, this dangerous tendency gets so snubbed and discouraged in some other individuals that it ceases to act upon them. It assumes, in the fifth place, that alongside of this tendency to produce bright hues there is all the time another tendency opposite but equally innate to produce dull colouring, imitative of the colours of the ground or of the habitat of the bird. It assumes, in the sixth place, that this opposite tendency of colouring becomes encouraged and confirmed in certain individuals by some kind of knowledge or intimation conveyed to it, that the birds upon which it works have a better chance

of life than others, and that other hens have been killed as a penalty for their brightness.

I need not comment on the gratuitous and highly imaginative character of these assumptions. But there is one peculiarity attaching to them which is well worthy of attention. The whole theory is intended to substitute what Mr Wallace would call a self-acting system of causes for the purpose of a contriving Mind. And yet it is very curious to observe, that the only plausibility which the theory possesses is in the appeal which it involves to the idea of experience, and the effects of experience upon Mind—that mind being supposed to exist in some such abstraction as "nature," or "correlations," or in some other form of words which serves to cover up and conceal the essentially mental attributes which are nevertheless invoked. For example, there is clearly no causal or physical connexion between the destruction of one bird and the cessation of a tendency to bright colouring in another bird which is not yet born or begotten. If that tendency be a blind force it must act blindly constantly, and irrespective of all consequences. If it ceases to operate because of the bad effects which it produces, it must be conceived of as a sort of living thing. The stopping of its works, and the need of that cessation, can no otherwise be brought together. The only idea which can lead any mind to place these two facts in such a connexion is an idea founded on its own consciousness of experience and observation, and of the course which itself would take to avoid and prevent evil consequences. It then ascribes (unconsciously) a similar self-consciousness to nature or to the correlated forces of nature, and under this assumption the connexion between the facts is represented as intelligible. And no doubt if the tendency to bright colouring is conceived of as a power or force gifted with the attributes of Mind, and able first to see and then to foresee the result of its own works, then the cause of the cessation of that working does become intelligible enough. But if it be a blind material force always present and always operating, then it is utterly unintelligible how it should cease to operate because of the mischief it does.

It will be observed, too, that as this theory always represents the actual colouring which we now see in any species as the result of a long process of "selection," it must assume that the species has started from a condition of colouring different from that which we now see. Thus, the cock Pheasant has "attained" to the brilliant plumage he now wears by the admiration and selection of succes-

sive hens. Therefore, the cock Pheasant is assumed to have begun originally from a dull colour. But the hen, on the contrary, has " attained" to her dull colouring by the continual destruction of preceding hens. Therefore, the hen Pheasant is assumed to have begun originally from a brilliant colouring. Of course this is a theory of such admirable elasticity that it is capable of being adapted to any facts whatever. If they don't suit the theory, when read straight forwards, it is only requisite to turn them round and read them backwards, and one way or another they can always be made to fit.

I wish, however, to observe that in my opinion it is not possible to assign a reason any more than a physical cause for many of the peculiarities of nest-building. Take the case of the Blackbird and the common Thrush—birds closely allied, and building very much in the same situation. Why should the Thrush always line her nest with mud, and the Blackbird always with fibrous roots? No answer can be given. In like manner may other species, closely related in structure, in habitat, in food, have fixed and persistent differences in their architecture. I am more and more convinced that variety, mere variety, must be admitted to be an object and an aim in Nature; and that neither any reason of utility nor any physical cause can always be assigned for the variations of instinct.

I would, however, suggest to Mr Wallace that one great object and use of domed nests, and also of many nests being made in holes, is one which has no connexion whatever with concealment, or consequently with his theory. That use is the very obvious and simple one of the better conservation of animal heat in cases where, from the extreme smallness of the bird and of its young, special provision has to be made for this purpose. It is at least remarkable that in our own country the most perfectly domed nests are made by the smallest birds, and these, too, by birds whose colouring requires no special precautions on account of its conspicuousness. So far as sombre and neutral tints are concerned, no birds could more safely sit upon open nests than the golden-crested Wren or the common Wren, or the long-tailed Tit, or the Willow Wrens. But the very diminutive size of all these birds, and their delicate organisation, do require that special provision should be made for the retention of warmth, and for protection from wet as well as from cold. This is the reason why the birds should make domed or covered nests. I have no doubt whatever that the same reason applies in numerous other cases, wherever the conditions

of climate establish the same conditions of existence as regards birds whose bodies are so small as to need great economy of their little store of animal heat. As to the physical cause of this need being met, there is no other explanation possible than this—that the Creator has implanted in every creature those instinctive desires and powers which are necessary for the preservation of its existence. And this, too, is the explanation, and the only explanation, of the adaptive or assimilated colouring, which, not being dependent on any instinct or desire of the bird itself, can only be the result of Mind directing the forces of Nature in a preconceived and preordained direction.