

CHAPTER XVI.

MIMICRY, COLOUR, AND SEXUAL SELECTION.

Special explanation needed for these Characters.—The purpose of the present chapter is to consider the probable origin of three of the most peculiar kinds of character to be met with in the organic creation. I do not mean that they are uncommon, but that they need special explanation.

Mimicry.—I speak of mimicry first, though it is a less common and less simple phenomenon than ordinary coloration, because the facts of local variation, with which we have been occupied in the preceding chapter, appear to throw much light on its probable origin.

Mr. Bates on Mimicry among Butterflies.—Most of the cases of mimicry which have been as yet described are among insects. Its purpose appears to be the protection of a naturally defenceless species, by causing it to be mistaken by its enemies for a species which is naturally defended. Thus, insects which sting are never known to mimic others, though others in some cases mimic them.¹ It is not the purpose of this work to describe facts exhaustively, and respecting the facts of mimicry I shall only quote the following:—

Mr. Bates, the author of *The Naturalist on the Amazons*, has shown that “in a district where, for instance, an *Ithomia* abounds in gaudy swarms, another butterfly, namely a *Leptalis*,

¹ Darwin's *Origin of Species*, p. 377.

will often be found mingled in the same flock, so like the *Ithomia* in every shade and stripe of colour, and even in the shape of its wings, that Mr. Bates, with his eyes sharpened by collecting during eleven years, was, though always on his guard, continually deceived. When the mockers and the mocked are caught and compared, they are found to be totally different in essential structure, and to belong not only to distinct genera, but often to distinct families. If this mimicry had occurred in only one or two instances, it might have been passed over as a strange coincidence. But travel a hundred miles, more or less, from a district where one *Leptalis* imitates one *Ithomia*, and a distinct mocker and mocked, equally close in their resemblance, will be found. Altogether no less than ten genera are enumerated, which include species that imitate other butterflies. The mockers and the mocked always inhabit the same region; *we never find an imitator living remote from the form which it counterfeits.*¹ The mockers are almost invariably rare insects; the mocked in almost every case abound in swarms. In the same district in which a species of *Leptalis* closely imitates *Ithomia*, there are sometimes other Lepidoptera mimicking the same *Ithomia*; so that in the same place, species of three genera of moths and even butterflies may be found all closely resembling a species of a fourth genus. It deserves especial notice that many of the mimicking forms of the *Leptalis*, as well as of the mimicked forms, can be shown, by a graduated series, to be merely varieties of the same species; while others are undoubtedly distinct species.

“But why, it may be asked, are certain forms treated as the mimicked, and the others as the mimickers? Mr. Bates satisfactorily answers this question by showing that the form which is imitated keeps the usual dress of the group to which it belongs, while the counterfeiters have changed their dress, and do not resemble their nearest allies.”²

The *Ithomia* is not preyed on by birds, in consequence of having a disagreeable taste; and to butterflies which have no

¹ The italics are mine.

² Darwin's *Origin of Species*, p. 375.

such protection, it is of course a protection to be mistaken for those which have it.

Objection to the Darwinian explanation of such facts from the difficulty of obtaining a first variation.—At first sight, Mimicry appears to be a strong point in favour of Darwinism; the mimicking forms being, according to this theory, produced by the survival, through successive generations, of those individuals belonging to defenceless species which most nearly resembled the species which have natural means of defence. But here a difficulty arises, with which we often meet in questions respecting the origin of characters by natural selection, though seldom in so simple a form as when we have to do with colour and mimicry;—namely, the difficulty of understanding how a first variation is to occur in the required direction. Natural selection can preserve no variation which is not useful to its owner;—according to Darwin's theory, individual variations are slight, and the change of specific characters is a slow process;—and it appears impossible that a slight variation could be of any sensible utility to its owner, by producing sufficient resemblance to another species, so as to ensure its preservation by natural selection.

Explanation in the facts of Geographical Variation.—The solution of the difficulty is almost certainly to be found in the facts of geographical variation. There is a great amount of evidence to show that organisms belonging to totally different orders, but inhabiting the same regions, tend in many cases to be modified alike. An instance of this kind has been mentioned in speaking of the characters which distinguish the forest trees of North America from allied European species;¹ and it is a fact of the same nature, that animals in Persia—mammals, birds, and reptiles—as a rule, have paler colours than the same species in Europe.² It appears a satisfactory solution

¹ See p. 177.

² This statement is made in Mr. Blanford's *Eastern Persia*.

of the difficulty to suppose that such perfect mimetic resemblance as that of the *Leptalis* to the *Ithomia* was at first a mere similarity of local character, which was, as Darwin would say, "seized on" and perfected by natural selection.

Many local or geographical resemblances are much more decided and remarkable than the peculiarities of North American trees or of Persian animals, mentioned above. Mr. Wallace says of butterflies :—¹

Wallace on local resemblances among Butterflies.—"In South America we have far more striking cases. For in the three sub-families, Danainæ, Acræniæ, and Heliconiinæ, all of which are specially protected [by a taste or smell which prevents them from being eaten by birds], we find identical tints and patterns reproduced, often in the greatest detail, each peculiar type of coloration being characteristic of distinct geographical subdivisions of the continent. Nine very distinct genera are implicated in these parallel changes—*Lycorea*, *Ceratinia*, *Mechanitis*, *Ithomia*,² *Melinæa*, *Tithorea*, *Acræa*, *Heliconius*, and *Eueides*—groups of three or four or even of five of them appearing together in the same livery in one district, while in an adjoining district most or all of them undergo a simultaneous change of coloration or of marking. Thus in the genera *Ithomia*, *Mechanitis*, and *Heliconius*, and sometimes in *Tithorea*, the species of the Southern Andes (Bolivia and Peru) are characterized by an orange and black livery, while those of the Northern Andes (New Grenada) are almost always orange-yellow and black. . . . The resemblance thus produced between widely different insects is sometimes general, but often so close and minute that only a critical examination of structure can detect the difference between them. Yet this can hardly be true mimicry, because all are alike protected by the nauseous

¹ The following extracts are from Mr. Wallace's address as President of the Biological Section of the British Association, reported in *Nature* of the 7th of September, 1876.

² *Ithomia* is the genus which is imitated by *Leptalis*. See p. 249 *et seq.*

secretion which renders them unpalatable to birds. In another series of genera, *Catagramma*, *Callithea*, and *Agrias*, all belonging to the Nymphalidæ, we have the most vivid blue ground with broad bands of orange-crimson or a different tint of blue and purple, exactly reproduced in corresponding but unrelated species occurring in the same locality, yet, as none of these groups are protected [by a nauseous secretion like *Ithomia* and others mentioned above], this can hardly be true mimicry. . . . Yet again, in Tropical America we have species of *Apatura* which, sometimes in both sexes, sometimes in the female only, exactly imitate the peculiar markings of another genus (*Heterochroa*) confined to America. Here, again, neither genus is protected, and the similarity must be due to unknown local causes.

“But it is among islands that we find some of the most striking examples of the influence of locality on colour, generally in the direction of paler but sometimes of darker and more brilliant hues, and often accompanied by an unusual increase in size. Thus, in the Moluccas and New Guinea . . . the most curious are the *Euplæas*, which in the larger islands are usually of rich dark colours, while in the small islands of Banda, Ké, and Matabello are at least three species not nearly related to each other (*Euplæa Hoppferi*, *euripon*, and *assimilata*) which are all broadly banded or suffused with white, their allies in the larger islands being all very much darker. Again, in the genus *Diadema*, belonging to a distinct family, three species from the small Aru and Ké islands (*Diadema deois*, *Hewitsonii*, and *polynema*, are all more conspicuously white-marked than their representatives in the larger islands. . . . The Philippine Islands seem to have the peculiarity of developing metallic colours.”

Wallace on Local Characters among Birds.—There are similar facts among birds, though not so remarkable. “In the Moluccas and New Guinea alone we have bright red parrots belonging to two distinct families, and which therefore most probably have

been produced or preserved by some common cause. Here too, and in Australia, we have black parrots and pigeons; and it is a most curious and suggestive fact that in another insular sub-region—that of Madagascar and the Mascarene Islands—these colours re-appear in the same two groups.”

Origin of Protective Mimicry in Local Similarity.—The most remarkable instances of local resemblance mentioned by Mr. Wallace in the above extracts are between genera of butterflies which are specially protected against their enemies by a nauseous secretion, and between other genera which are not so protected. In neither of these cases is the resemblance beneficial to either genus, and therefore it affords nothing for natural selection to work on. But suppose the unknown influence of locality to give the same external appearance to two species of butterflies or of any other organisms, whereof one has special protection of this or of any other kind, while the other is without it; the resemblance will be useful to the unprotected species, by causing its enemies to mistake it for the protected; and will therefore be preserved and increased by natural selection. It seems impossible to doubt that true or protective mimicry has thus originated.

Mimicry is possible only when the two Species dwell side by side.—It is obvious that true mimicry can exist only where the mimicking and the mimicked species inhabit, or have inhabited, the same district, because then only can it be useful.

Resemblances among Plants are mostly not mimetic.—Few, if any, instances of true or protective mimicry appear to be known in the vegetable kingdom. There are, however, a great number of very decided local resemblances, which appear to be in general more directly referable to the action of similar conditions of life than the facts which we have been describing among animals. An able botanist says:—

Alfred Bennett on the effect of Locality on the Habit of Plants.
—“Under peculiar conditions all plants, no matter to what

CHAPTER XIX.

THE ORIGIN OF MAN.

IN the foregoing chapter, we have seen reason to believe that there are many instances in the organic world of structures produced, not by the exercise of their functions, but in anticipation of functions to be exercised in future generations, and by forms not yet evolved. If this can be proved, the Darwinian theory is so far refuted;—such structures cannot have been produced by any unintelligent agency.

Wallace's argument—that natural selection is inadequate to the evolution of the brain of Man, from primitive Man having a brain developed beyond his actual attainments.—Of all structures which Darwinian principles cannot account for, the brain of Man is the most conclusive; perhaps, in the present state of knowledge, we ought to say the only perfectly conclusive instance. This has so impressed Mr. Wallace, who thought out the outlines of the theory of natural selection independently of Darwin, that, while agreeing with Darwin in referring all else in the organic world to the unintelligent and blind action of natural selection, he maintains that the evolution of Man alone gives proof of having been guided by an Intelligent Power. I have shown that I do not agree with this;—on the contrary, I maintain that the entire organic world, not to speak at present of the inorganic, is full of the traces of intelligent purpose and guidance; but those traces become constantly more clearly traceable as we ascend in the scale of being, and consequently

are clearest in Man, who is at once the crown and climax of the organic world, and in some sort a new and distinct creation.

Wallace's argument respecting the brain and mind of Man is an application of the same principle which in the present chapter I have endeavoured to prove applicable to many other cases;—namely, that neither natural selection nor any other unintelligent agency can account for an organism attaining to any perfection which is in anticipation of its actual requirements, and therefore not immediately useful. On this subject I will begin by quoting Mr. Wallace's own statement of the argument. After showing, what scarcely needs proof, that there is a connexion between mass of brain and power of mind, he says :¹—

“The average cranial capacity of the lowest savages is probably not less than five-sixths of that of the average civilized races, while the brain of the anthropoid apes scarcely amounts to one-third of that of Man, in both cases taking the average ; or the proportions may be more clearly represented by the following figures :—

Anthropoid Apes	10
Savages	26
Civilized Men	32

But do these figures at all approximately represent the relative intellect of these three groups ? Is the savage really no further removed from the philosopher, and so much removed from the ape, as these figures would indicate ?”

“Let us now compare the intellectual wants of the savage and the actual amount of intellect he exhibits, with those of the higher animals. Such races as the Andaman Islanders, the Australians, and the Tasmanians, the Digger Indians of North America, or the natives of Fuegia, pass their lives so as to

¹ The following quotations are from Mr. Wallace's essay on *The Limits of Natural Selection as applied to Man*, published among his “Contributions to the Theory of Natural Selection.” On the same subject, see “Natural Selection insufficient to the development of Man,” by the Rev. George Buckle, *Popular Science Review*, 1871, p. 14. The last-named essay restates and expands Mr. Wallace's argument extremely well, but without adding much that is original.

require the exercise of few faculties not possessed in an equal degree by many animals. In the mode of capture of game or fish they by no means surpass the ingenuity or forethought of the jaguar, which drops saliva into the water and seizes fish as they come to eat it; or of wolves and jackals, which hunt in packs; or of the fox, which buries his surplus food till he requires it. The sentinels placed by antelopes and by monkeys, and the tree-shelter of some of the African anthropoid apes, may well be compared with the amount of care and forethought bestowed by many savages in similar circumstances. His possession of free and perfect hands, not required for locomotion, enables Man to form and use weapons and instruments which are beyond the physical powers of brutes; but, having done this, he certainly does not exhibit more mind in using them than do many of the lower animals.¹ And if this is true of existing savages, how much more true must it have been of the men whose sole weapons were rudely-chipped flints, and some of whom, we may fairly conclude, were lower than any existing race;” yet Mr. Wallace states in the same essay, that “the Engis skull, perhaps the oldest known, and which, according to Sir John Lubbock, ‘there seems no doubt was really contemporary with the mammoth and the cave-bear,’ is yet, according to Prof. Huxley, ‘a fair average skull, which might have belonged to a philosopher, or might have contained the thoughtless brains of a savage.’ Of the cave-men of Les Eyzies, who were undoubtedly contemporary with the reindeer in the south of France [and must consequently have lived during the Glacial period], Prof. Paul Broca says in a paper read before the Congress of Pre-historic Archæology in 1868 :—‘The great capacity of the brain, the development of the frontal region, the fine elliptical form of the anterior part of the profile of the skull, are incontestable characteristics of superiority, such as we are accustomed to meet with in civilized races;’ yet the great breadth of the face, the enormous development of the ascending ramus of the lower jaw, the extent and roughness of the surfaces for the

¹ I quote this without being prepared to assent to it.

attachment of the muscles, especially of the masticators, and the extraordinary development of the ridge of the femur, indicate enormous muscular power, and the habits of a savage and brutal race."

In such cases, Mr. Wallace concludes that "the idea is suggested of *a surplusage of power; of an instrument beyond the wants of its possessor;*"¹ and we have seen that neither self-adaptation nor natural selection can account for this.

If it is said that the superiority of undeveloped or savage man to the brutes consists rather in possibilities of attainment than in anything actually attained, this is true, but it concedes the point raised by Mr. Wallace and myself.

Reply, that Man's first and most characteristic attainment is Language.—Another reply, however, is possible. It may be said that although the superiority of savage man to the brutes in skill and in the use of tools is not comparatively great, yet the real superiority of Man consists in the faculty of language; and that the mental power implied in this unique faculty is represented by the very great excess in the size of the human brain over that of the highest apes. Mr. Wallace does not appear to have seen this, and yet it seems a sufficient answer to his argument, so long as we confine our attention to the contrast between savage man and the highest apes. If then the Darwinian theory is true of Man, the difference between the brain of the highest ape and that of the lowest man is due to the exercise of the brain during the period while the power of language was in process of evolution, aided by the natural selection of the largest brains, in which, of course, this new power would be the most highly developed.

Language, when first evolved, is generally in advance of the intellectual wants of the race.—As a matter of fact, it is true that language is the first product of the mind of man;—language attains a high development while as yet the arts

¹ The italics are mine.

are undeveloped, political organization rudimentary, and science not dreamed of;—and afterwards, when science and the fine arts, especially mathematics and music, have grown into new faculties, and the useful arts have become new powers; and when political organization has made it possible for great empires to be orderly and coherent, and at the same time governed on principles of freedom; language undergoes no corresponding development—indeed, no development whatever; for the languages of the most highly civilized nations excel those of their barbarian ancestors, if at all, only in a greater abundance of words, and in more elaborate discrimination of their meanings; but have not attained to any greater abundance and power of grammatical forms. Language, in pre-historic times, appears to have attained to a development which must have been in advance of the intellectual necessities of the races speaking it, because the same languages still, without further development, suffice for the intellectual needs of their much more cultivated descendants. There are, no doubt, exceptions; Hebrew is poor in both words and grammatical forms. Arabic, however, is of the same stock with Hebrew; the Arabs of the pre-Mohammedan age must have been a very uncultured people, yet it is asserted that the Arabic of the Koran has a force and picturesqueness which are found to be untranslatable into the languages of modern Europe. The Sanscrit-speaking conquerors of India, also, were a rude people, yet Sanscrit is stated to be as perfect a language as that of ancient Athens. And a far inferior race to either of these, namely the Kaffir, has developed a language which, whatever its powers, has a regular system of inflections, and is said to be copious in an extraordinary degree.

The Evolution of Language cannot be accounted for on Darwinian principles.—This digression on the development of language is really, though perhaps not obviously, relevant to the subject of the development of the brain. On Darwinian principles, as Mr. Wallace urges, the brain of a race can grow only

if it is exercised; the brain of Man has grown enormously in the transition from the ape to Man; and what was there to exercise it in any degree corresponding to its growth? I reply, the formation of language. But this only removes the difficulty by a single step. Can the evolution of language itself be accounted for on Darwinian principles? I think not;—I think this is disproved by the fact above insisted on, that the languages evolved by primitive races are often, I believe we may say generally, far in advance of their intellectual needs.

But even in the case of a language, like Hebrew, of which this is not true, it is by no means evident that it could be evolved by anything like a Darwinian process. It is probable that the first germs of language consisted in the imitation of natural sounds (not in cries or interjections—they are the germ, not of speech, but of song, and ultimately of music). But is it possible for this germ to be developed into even the rudest and poorest of organised articulate languages by any Darwinian process;—that is to say, by any process wherein the only motive powers are the impulse of utility and the pressure of necessity, acting on the minds of successive generations? I think not. Probably all language, and certainly every language whereof the development is in advance of the intellectual wants of the race, needs for its evolution an intelligent mental impulse proceeding from within, and related to habit and natural selection in the same way as is the formative power which produces organic structures in anticipation of function.

Man's mental nature cannot be due to natural selection.—We have thus arrived, though by a different path, at the same conclusion with Mr. Wallace;—namely, that the evolution of Man's mental nature must have been effected by a Power transcending natural selection. And if this is true of the mind, it is equally true of the brain; for mind and brain, like any other function and its corresponding structure, act and re-act on each other's development.

Man's brain is a structure developed in anticipation of function.—But is the brain-structure of Man developed along with and parallel to its functions; or is its development in anticipation of its functions, like the cases dwelt on in the preceding chapter? Here again I agree with Mr. Wallace, though not altogether for his reasons. Not only among savages, but among the majority of individuals among the civilised races, when we compare the development of the brain, which is the organ of thought, with the intellectual development actually attained, “the idea is suggested” (to quote Mr. Wallace’s words again) “of a surplusage of power; of an instrument beyond the wants of its possessor.” In a civilised race, all the brains are approximately equal in magnitude (for the case of exceptionally small brains, such as are found in idiots, does not enter into the present argument); yet how great is the difference in intellectual development between the possessors of these brains! I do not speak of exceptionally endowed individuals;—the relation of genius to brain is an unsolved mystery, and likely to remain so. But consider, on the one side, the intellectual attainments of an utterly uneducated man, acquainted with only the commonest words of his own language, and unable to count except on his fingers; and on the other, those of a well-educated man, a master of two or three languages, a competent mathematician, and acquainted with the principles and the more important results of science;—yet the difference between the intellectual attainment of the two—attainment not only in the sense of knowledge, but of real, though acquired, power—is not represented by any corresponding difference between their brains. When thus we find that the brain of every civilized man, as a rule, has the magnitude and the organization which suffice for the high culture which nevertheless is actually attained by only a small minority, the conclusion appears certain that a Power, acting in some other way than by the blind and unintelligent forces of habit, self-adaptation, and natural selection, has perfected Man’s brain through long ages of ignorance and barbarism, for the needs of knowledge and civilization.

Testimony of Moralists to the same effect.—The most competent of those who have studied human character as moralists, endeavouring to understand it not by science but by sympathy, will, I believe, be found to unite in bearing witness to the same truth, of the existence of a great reserve of unused and only half-discovered faculty in most men. And if some are blinded to this by the contempt for men which is often produced by much familiarity with them, this very feeling of contempt is the result of a dim perception of the same truth. No one despises dogs or horses;—what awakens, though it does not justify, contempt, is the perception in man of an unrealized ideal—a falling short of what he was intended to be. To the same cause is to be ascribed the widely-spread, though utterly untrue, belief of a state of higher virtue and happiness than the present having been once enjoyed by Man. The myth-creating imagination has represented the falling short of an ideal state as a fall from an actual one.

It is probably true that the adaptation of living beings to the circumstances of their lives is never perfect, but only a close approximation; but the approximation is so close that for most purposes its deviation from perfection may be disregarded. How different is the mental nature of Man! It is perhaps no exaggeration to say that every sane human being is born with faculties which are never perfectly developed; and that those whose early promise is the highest, fall the farthest short of fulfilling it. It is a saying, I believe, of Goethe's, that if all children were to develop their natures on every side alike, all would grow up into men of genius. But even if there is no other reason, this is made impossible by the fact that youth is too short for the development of the character on all sides alike; and when youth is past, the power is lost of beginning development in a new direction. Auguste Comte wished that he could have two or three hundred years for study; but if, like Tithonus, he had forgotten to ask for continued youth, he would probably have found the greater part of such a life utterly barren, from the difficulty of turning the mind to new subjects.

Mr. Wallace on Man's hairless back.—Besides his unique mental nature, there are several peculiarities of Man's bodily structure which Mr. Wallace¹ mentions as being impossible for natural selection to produce. "In Man the hairy covering of the body has almost totally disappeared; and, what is very remarkable, it has disappeared more completely from the back than from any other part of the body. Bearded and beardless races alike have the back smooth, and even when a considerable quantity of hair appears on the limbs and breast, the back, and especially the spinal region, is absolutely free, *thus completely reversing the characteristics of all other mammalia.*" This character cannot have been produced by ordinary natural selection, because it would have been injurious to any animal whatever in the wild state; and there are few if any races, however savage, which do not wear clothing of some kind as a substitute for the hairy covering that they have lost. Darwin suggests that the hairy covering may have been lost by a species, now extinct, of our ape-like ancestors, through sexual selection:—that is to say, through the preference given to hairless mates, whereby those with least hair were most frequently able to leave offspring. No evidence of this is offered, and I cannot think it in the slightest degree probable. It has been suggested that the absence of hair might be beneficial to an animal living in a warm climate, by making it less liable to the attacks of parasites; but this will not account for the nakedness being most complete on the back.

But though the absence of hair on Man's back must have been almost purely injurious while he was emerging out of the merely animal state, yet its subsequent effect, as Mr. Wallace remarks, must have been very great, and probably on the whole highly beneficial, by making shelter and clothing necessary, and thereby stimulating industry and invention.

Man's faculty of Music.—Mr. Wallace further says:—"The same remark will apply to another peculiarly human character ;

¹ The following quotations are from the essay already quoted. The italics are mine.

—the wonderful power, range, flexibility, and sweetness of the musical sounds produced by the human larynx, especially in the female sex. The habits of savages give no indication of how this faculty could have been developed by natural selection, because it is never required or used by them. The singing of savages is a more or less monotonous howling, and the females seldom sing at all. Savages certainly never choose their wives for fine voices ; sexual selection could not therefore have developed this wonderful power, which only comes into play among civilised people. *It seems as if the organ had been prepared in anticipation of the future progress of Man*, since it contains latent capacities which are useless to him in his earlier condition. The delicate correlations of structure that give it such marvellous powers could not therefore have been acquired by means of natural selection.”

The same may be said of the perceptive and inventive powers which make the art and science of music possible.

Conclusion ;—What is most characteristic in Man is not due to natural selection.—We conclude, that what is most characteristic in Man’s bodily and mental nature cannot be the result of natural selection. And we must here recall the fact mentioned in a previous chapter,¹ that the usual relations of the sexes are in one most remarkable way reversed in Man ;—the sex in which the passions are the weakest being in Man alone, of all known species, that in which the highest beauty is developed.

¹ See p. 276.