

things, in which every one does that which is right in his own eyes.

With respect to established species, priority seems to be the universal law for the adoption of specific names (see some excellent remarks, by Mr. Westwood, in the *Zoological Journal*, iv. 3—9.); subject to the exception, that the same name be not repeated twice in a genus. And, if persons could be brought to view specific appellations purely in the light of proper names, this law need have no other exception; for, as we do not object to *William Whitehead's* name because his hair may happen to be *red*, so, if the *meaning* of a specific name be downrightly inapplicable to the object, this need not prevent its *sound* being adopted as the conventional sign of the species. But as, in practice, such a circumstance would produce confusion, we are compelled to admit the farther exception to the above law of priority, that if, as rarely happens, the specific name have a meaning contradictory to the species which it represents, that name should be changed for one that is not contradictory. For the same reason, in naming a new species, it is *desirable* that the name be as expressive as possible; but, if no term that is applicable should occur, the term fixed upon should, at least, be *not contradictory*.

I hope that S. D. W. and other correspondents will regard this subject with the attention which it deserves.

[Mr. Curtis has, in his *Illustrations of British Entomology*, t. 487. note *, disclaimed the exercise of the practice of altering names; under certain conditions, and for certain reasons, there expressed.]

ART. IV. *An Attempt to classify the "Varieties" of Animals, with Observations on the marked Seasonal and other Changes which naturally take place in various British Species, and which do not constitute Varieties.* By Mr. EDWARD BLYTH.

THE appellation "variety" being very commonly misapplied to individuals of a species, which are merely undergoing a regular natural change, either progressing from youth to maturity, or gradually shifting, according to fixed laws, their colours with the seasons, I conceive that it will be useful to some, to point out a few of the less generally known changes which naturally take place in various British animals; some few of which appear to have been hitherto overlooked, and others to have been described incorrectly.

The term "variety" is understood to signify a departure from the acknowledged type of a species, either in structure,

in size, or in colour; but is vague in the degree of being alike used to denote the slightest individual variation, and the most dissimilar breeds which have originated from one common stock. The term is, however, quite inapplicable to an animal in any state of periodical change natural to the species to which it belongs.

Varieties require some classification; and though I feel myself hardly adequate to the task, I shall here propose to arrange them under four principal heads; in the hope that this endeavour will induce some naturalists, more competent than myself, to follow out this intricate and complicated subject, into all its details.

I would distinguish, then, what are called varieties, into *simple variations*, *acquired variations*, *breeds*, and *true varieties*. These appear, in general, sufficiently distinct, although the exact limits of each are sometimes very difficult to be assigned. Indeed, in many cases they only differ in degree, and in others they may be all combined in one individual. Moreover, the varieties of either class have a much greater tendency to produce varieties of another class, than the typical animals of a species have to produce any sort of variety.

I. *Simple Variations*. — The first class, which I propose to style *simple or slight individual variations*, differs only in degree from the last, or *true varieties*; and consists of mere differences of colour or of stature, unaccompanied by any remarkable structural deviation; also of slight individual peculiarities of any kind, which are more or less observable in all animals, whether wild or tame, and which, having a tendency to perpetuate themselves by generation, may, under particular circumstances, become the origin of true *breeds* (which constitute my third class of varieties), but which, in a state of nature, are generally lost in the course of two or three generations. Albinoes belong to this first division, and also the other numerous anomalies mentioned in VII. 589—591. 593—598. These *simple variations* occur both in wild and in domestic animals, but are much more frequent in the latter, and are commonly observed in all *breeds* and *true varieties*.

Among the Mammalia, total or partial absence of colour is always, I believe, continued through life; excepting, of course, the cases of mere seasonal change; and, in this class of animals generally, perfect albinoes are much more numerous than among birds. Perfect albinoes are peculiar to warm-blooded animals, and in them there is a total deficiency of colouring matter in the rete mucosum, and, consequently, in the fur, and even the pigmentum nigrum of the eye is entirely wanting. In birds, these *perfect* albinoes are extremely rare,

although several instances have been recorded in VII. 593. — 598. There are three sorts, however, of true permanent albinos, which may be thus designated: — 1. *Perfect Albinos*; which are entirely white, and in which the eyes appear crimson, from the total want of colouring matter, rendering the minute bloodvessels visible: 2. *Semi-Albinos*; which are either white or of a pale colour all over, and in which the irides are always paler than usual, and not unfrequently blue [I. 66. 178.]: and, 3. *Partial Albinos*; which are partly of the natural colour, but are more or less mottled *permanently* with white; and in which, if a white patch surrounds the eye, the pigmentum of that organ is commonly wanting. I have thus observed a rabbit, one eye of which was red, and the other dark hazel; but such instances are of very rare occurrence, although (and it is a curious fact) rabbits are often seen wholly white, with the exception of a small patch around each eye; which organ, consequently, is of the usual dark colour. Albinos, when paired together, as is well known, produce chiefly albino offspring, and a *breed* of them may thus be perpetuated; but, even in a domestic state, they not unfrequently produce young of the usual colour; and, if paired with an ordinary individual, they sometimes produce partial albinos, or semi-albinos [I. 178.], and occasionally, if the original colour be brown (as in the case of mice or rabbits*), a black, sandy, or slate-coloured offspring, or an individual with one of these colours more or less varied with white, is produced; but, in the majority of instances, the young wholly resemble one of their parents, and the *preponderance* is decidedly in favour of the natural hue. The coloured offspring of an albino, however, even if matched with another coloured individual, has still a tendency to produce albinos†, and this fact has been noticed in the human species; but, as Mr. Lawrence observes on the subject (in his *Lectures on the Physiology, Zoology, and the Natural History of Man*), “the disposition to change is ‘generally’ exhausted in one individual, and the characters of the original stock return, unless the variety is kept up by the precaution above mentioned, of excluding from the breed all which have not the new characters. Thus, when African albinos intermix with the common race, the offspring generally is black,” &c. These observations apply alike to all *simple* or individual *variations*, and to most other varieties, and afford one of many reasons why marked

* These observations are chiefly deduced from the results of some experiments with mice and rabbits.

† Of seven young rabbits thus produced, two were albinos, one black, and the remainder of the usual colour.

breeds are in a state of nature so rarely perpetuated. There is yet, however, before quitting this subject, another sort of albino to be considered, which, I believe, is peculiar to the feathered race, and which is not, like the others, permanent; these, therefore, I shall denominate *temporary* albinos. Most of the pale, white, and pied varieties of birds, which are produced in a state of nature, are of this kind. A friend informs me that a perfectly white lark in his possession moulted, and became of the ordinary hue. I lately shot a sparrow which was all over of a very pale brown, or cream colour; it was moulting, and some of the new feathers that were coming were of the usual colour, and others were of a pure white: on the next moult, probably, no more white feathers would have appeared. Of a brood of young robins which frequented my garden, two were white, one partially so, and one of the usual mottled brown; these all moulted into the ordinary colour. I could add other instances to the list, especially amongst domestic poultry. But it does not hence follow that among wild birds there are *no* permanently white or pied varieties; or, in other words, no true partial and semi-albinos. A blackbird with a white head has now inhabited a garden in this neighbourhood for three successive years; and if the cupidity of collectors did not mark out every white or pied bird for destruction, I doubt not that I should have been able to have furnished some other similar instances of *permanent* variation.

II. *Acquired Variations.* — The second class of varieties which I would designate thus, comprises the various changes which, in a single individual, or in the course of generations, are *gradually* brought about by the operation of known causes: such as the greater or less supply of *nutriment*; the influence of particular *sorts* of food; or, either of these combined with the various privations consequent upon *confinement*; which changes would as gradually and certainly disappear if these causes were removed.

Redundance or deficiency of nutriment affects chiefly the stature of animals. Those herbivorous quadrupeds which browse the scanty vegetation on mountains are invariably much smaller than their brethren which crop the luxuriant produce of the plains; and although the cattle usually kept in these different situations are of diverse breeds; yet either of the breeds gradually removed to the other's pasture, would, in two or three generations, acquire many of the characters of the other, would increase or degenerate in size, according to the supply of nutritious food; though, in either case, they would most probably soon give birth to *true varieties* adapted to the change. In this instance, *temperature*

appears only to exert a secondary influence. The Iceland breed of sheep, which feeds on the nutritious lichens of that island, is of large size; and, like the other ruminant animals which subsist on similar food, is remarkable for an extraordinary development of horns. Another example of *acquired variation*, dependent solely on the supply of nutriment, may be observed in the deciduous horns of the deer family, which are well known to be large or small according to the quality of their food. That *temperature* also does exert an influence greater or less, according to the species of animal, is very evidently shown in the case of the donkey*, of which there are no breeds, nor true varieties, and but very few simple variations [VII. 590.]: this animal is every where found large or small, according to the *climate* it inhabits.

The influence of particular *sorts* of food may be exemplified by the well-known property of madder (*Rubia tinctorum*), which colours the secretions, and tinges even the bones of the animals which feed on it of a blood-red colour; and, as another familiar instance, may be cited the fact, equally well known, of bullfinches, and one or two other small birds, becoming wholly black when fed entirely on hempseed. I have known, however, this change to take place in a bird (the small aberdevatt finch, so common in the shops), which had been wholly fed on canary seed; yet this by no means invalidates the fact, so often observed, of its being very frequently brought about by the direct influence of the former diet. In several instances which have fallen under my own observation, feeding only on hempseed has invariably superinduced the change.†

The most remarkable of acquired variations are those brought about in animals in a state of confinement or domestication: in which case an animal is supplied regularly with abundance of very nutritious, though often unnatural, food, without the trouble and exertion of having to seek for it, and it becomes, in consequence, bulky and lazy, and in a few generations often very large; while the muscles of the organs of locomotion, from being but little called into action, become rigid and comparatively powerless, or are not developed to their full size. The common domestic breeds of the rabbit, ferret, guinea-pig, turkey, goose, and duck, are thus probably only acquired variations, which, from the causes

* For some curious remarks on this subject, see the excellent article "Ass" in Partington's *Cyclopædia of Natural History*.

† I have not heard, however, that wild bullfinches, hawfinches, and other birds liable to be thus affected, are more commonly found black in localities where hemp is much grown. Amongst others, the skylark and woodlark are very susceptible of the influence of this food.

above-mentioned, have, in the course of generations, become much larger and heavier (excepting, however, in the case of the turkey) than their wild prototypes, and less fitted for locomotion; but which, if turned loose into their natural haunts, would most probably return, in a very few generations, to the form, size, and degree of locomotive ability proper to the species when naturally conditioned.* The crested varieties of domestic geese and ducks, and the hook-billed variety of the latter, are, however, in all probability, *true varieties*; and what are called “lob-eared” rabbits may be either a *true variety*, or a *breed*. The various slight diversities, which I call *simple variations*, are very common in the present class of varieties; and there is also in them a great tendency to produce what I call *true varieties*, as well as those slighter deviations, which, by particular management, may be increased into the sort of variety I denominate *breeds*.

III. *Breeds* are my third class of varieties; and though these may possibly be sometimes formed by accidental isolation in a state of nature, yet they are, for the most part, artificially brought about by the *direct* agency of *man*. It is a general law of nature for all creatures to propagate the like of themselves: and this extends even to the most trivial minutiae, to the slightest individual peculiarities; and thus, among ourselves, we see a family likeness transmitted from generation to generation. When two animals are matched together, each remarkable for a certain given peculiarity, no matter how trivial, there is also a decided tendency in nature for that peculiarity to *increase*; and if the produce of these animals be set apart, and only those in which the same peculiarity is most apparent, be selected to breed from, the next

* [A Tame Duck which flies with the same Power, and at the same Height, as a Crow. (H. S., in I. 378.)—Was not this duck a wild one? I am led to ask this question from having myself witnessed a similar instance. I had often seen a duck, which I had taken to be a tame one, flying about, and always returning to the farm to which it belonged. On enquiry, I found that this duck had been taken, when a duckling, from the nest of a wild duck, and began to fly as soon as it was full grown. The case which H. S. mentions might probably be accounted for in the same manner, as it is by no means likely that so unwieldy a bird as the tame duck should think of trying its wings, after its ancestors had for so many successive generations been satisfied with walking and swimming, and fly “with the same power, and at the same height, as a crow.”—W. H. H. *Postmark, Burton on Trent, Oct. 8. 1834.*

The late Rev. Lansdown Guilding had remarked as follows on the case stated by H. S.:—

Domestic birds, from flying little, have their muscles relaxed, or, perhaps, they never acquire their natural strength, for want of exercise. I have observed the geese in Worcestershire, in harvest time, to take very long flights; but, though they went on boldly, they never ascended very far into the air.—*Lansdown Guilding. St. Vincent, May 1. 1830.*]

generation will possess it in a still *more* remarkable degree; and so on, till at length the variety I designate a *breed*, is formed, which may be very unlike the original type.

The examples of this class of varieties must be too obvious to need specification: many of the varieties of cattle, and, in all probability, the greater number of those of domestic pigeons, have been generally brought about in this manner. It is worthy of remark, however, that the original and typical form of an animal is in great measure kept up by the same identical means by which a true *breed* is produced. The original form of a species is *unquestionably* better adapted to its *natural* habits than any modification of that form; and, as the sexual passions excite to rivalry and conflict, and the stronger must always prevail over the weaker, the latter, in a state of nature, is allowed but few opportunities of continuing its race. In a large herd of cattle, the strongest bull drives from him all the younger and weaker individuals of his own sex, and remains sole master of the herd; so that all the young which are produced must have had their origin from one which possessed the maximum of power and physical strength; and which, consequently, in the struggle for existence, was the best able to maintain his ground, and defend himself from every enemy. In like manner, among animals which procure their food by means of their agility, strength, or delicacy of sense, the one best organised must always obtain the greatest quantity; and must, therefore, become physically the strongest, and be thus enabled, by routing its opponents, to transmit its superior qualities to a greater number of offspring. The same law, therefore, which was intended by Providence to keep up the typical qualities of a species, can be easily converted by man into a means of raising different varieties; but it is also clear that, if man did not keep up these breeds by regulating the sexual intercourse, they would all naturally soon revert to the original type. Farther, it is only on this principle that we can satisfactorily account for the degenerating effects said to be produced by the much-censured practice of "breeding in and in."* There would almost seem, in some species, to be a tendency, in every separate family, to some particular kind of deviation; which is only counteracted by the various crossings which, in a state of nature, must take place, and by the above-mentioned law, which causes each race to be chiefly propagated by the most typical and perfect individuals.

V. *True Varieties*.—The last of these divisions to which

* See, however, a good practical article on this subject, entitled "Breeding," in one of the forthcoming numbers of the now publishing edition of Miller's *Dictionary of Gardening and Rural Economy*.

I more peculiarly restrict the term *variety*, consists of what are, in fact, a kind of deformities, or monstrous births, the peculiarities of which, from reasons already mentioned, would very rarely, if ever, be perpetuated in a state of nature; but which, by man's agency, often become the origin of a new race. Such, for example, is the breed of sheep, now common in North America, and known by the name of *ancons**, or *otter* sheep. A ewe produced a male lamb of peculiar form, with a long body, and short and crooked limbs: the offspring of this animal, with ordinary females, was found sometimes to resemble the one parent, and sometimes the other; but did not usually blend the characters of each; and, in the cases of twins, the two lambs were often equally diverse with their parents. This variety was extensively propagated, in consequence of being less able to jump over fences than the ordinary breeds of sheep. The solidungular ["donkey-footed"] variety of swine, tailless cats, back-feathered, five-toed, and rumpless fowls, together with many sorts of dogs, and probably, also, the race of fan-tailed pigeons, are other striking examples of *true varieties*.

The deviations of this kind do not appear to have any tendency to revert to the original form: this, most probably, could only be restored, in a direct manner, by the way in which the variety was first produced.

To this class may be also referred, with more than probability, some of the more remarkable varieties of the human species. With regard to colour, we know that temperature exerts no *permanent* gradual influence whatever: white races remain unchanged at slight elevations within the tropics; and the natives of Boothia Felix are very dark; the swarthy inhabitants of Mauritania are a white race, and their sun-burnt hue is merely an *acquired variation*, which is not transmissible by generation, and which does not extend to those parts which are not exposed to the sun. The colouring principle of black races is inherent in them, and is quite independent of external agency; is even darkest in some parts which are the least exposed, and *vice versâ*. The Ethiopian race is nowhere more black than in the vicinity of the Cape of Good Hope, where the crops are sometimes injured by the winter's frost. Strangely enough, this invariableness of colour constitutes about, perhaps, the most fixed character of these races.

There is one fact, however, here to be observed, which is very well worthy of attention; and this is, that coloured

* *Agkôn*, an elbow, from the crooked form of the forelegs. See Lawrence's *Lectures*, p. 447, 448.

varieties appear to have been chiefly produced in hot countries ; which seems almost to induce the conclusion that they were originally efforts of nature, to enable the skin to withstand the scorching produced by exposure to the burning rays of a tropical sun.* How far the structural peculiarities of the negro and other races may not, in some cases, be the effects of *breed*, it would be impossible, perhaps, now to ascertain, and would be worse than presumption, in a novice like myself, to try to determine. Wherever a black individual was produced, especially among rude nations, if the breed was continued at all, the natural aversion it would certainly inspire would soon cause it to become isolated, and, before long, would, most probably, compel the race to seek for refuge in emigration. That no example, however, of the first production of a black variety has been recorded, may be ascribed to various causes ; it may have only taken place once since the creation of the human race, and that once in a horde of tropical barbarians remote from the then centres of comparative civilisation, where no sort of record would have been preserved. But it is highly probable that analogous-born varieties may have given rise to the Mongolian, Malay, and certain others of the more diverse races of mankind ; nay, we may even suppose that, in some cases, the difference, in the first instance, was much *greater*, and was considerably modified by the intermixture which must have taken place in the first generations. The mixed offspring of two different varieties of man thus generally blends the characters of each ; though instances are not wanting of its *entirely* resembling (like the mixed produce of an ancon sheep) either one or the other of its parents ; but in this case (as in the albino) the perfect characters of the other parent frequently show themselves in the next generation. I am entering, however, into a wide field, already well trodden by many philosophers ; and the subject is already probably pretty well understood by the great majority of readers. Those who are not so familiar with it, will find it ably treated in various works ; especially in Dr. Pritchard's work on man, and in the published *Lectures on the Natural History of Man*, by Lawrence : some sound and excellent remarks on *varieties* will also be found in the second volume of Lyell's *Principles of Geology*.

Still, however, it may not be impertinent to remark here, that, as in the brute creation, by a wise provision, the typical characters of a species are, in a state of nature, preserved by

* See Dr. Stark "on the influence of colour on heat and odours," in Jameson's *Edinburgh Journal* for July, 1834 ; also Professor Powell's reply to it, in the number for October, 184.

those individuals chiefly propagating, whose organisation is the most perfect, and which, consequently, by their superior energy and physical powers, are enabled to vanquish and drive away the weak and sickly, so in the human race degeneration is, in great measure, prevented by the innate and natural preference which is always given to the most comely; and this is the principal and main reason why the varieties which are produced in savage tribes, must generally either become extinct in the first generation, or, if propagated, would most likely be left to themselves, and so become the origin of a new race; and in this we see an adequate cause for the obscurity in which the origin of different races is involved. In a civilised state of society there are other inducements, besides personal attractions, and a new variety in this case, unless very *outré* indeed, would be gradually merged, and in a few generations would disappear entirely by intermixture with the common race. The inferior animals appear not to have the slightest predilection for superior personal appearance; the most dissimilar varieties of the same species mix as freely and readily together as the most typical individuals; the most powerful alone becomes the favourite. Instances of this are not rare in the breeds of dogs.

The above is confessedly a hasty and imperfect sketch, a mere approximation towards an apt classification of "varieties;" but if it chance to meet the eye, and be fortunate enough to engage the attention, of any experienced naturalist, who shall think it worth his while to follow up the subject, and produce a better arrangement of these diversities, my object in indicting the present article will be amply recompensed.

Here, however, I may observe, that the classification I have proposed for specific deviations in the animal creation, is equally applicable to those of the vegetable. The "varieties" in both are strictly analogous.

I come now to the second division of my subject, which is to point out

Some Periodical and other Changes of Appearance, which naturally take place in various British Animals, and which do not constitute Varieties.—Among our native Mammalia, I know of three principal modes whereby a change of colour is brought about; namely, an actual shedding of the coat; a partial shedding of the coat; and an actual change of colour in the coat itself.

I. As an example of change of appearance produced by actual shedding of the coat, may be instanced the fallow deer

(*Cervus Dama*), whose white spots disappear with the annual casting of its coat in autumn.

II. Partial shedding of the coat takes place in those animals which acquire in autumn a covering of two different kinds: one long, downy, and warm, which is shed in spring; the other short and glossy, which is retained. This change of appearance is exemplified in the common water shrew (*Sorex fodiens*), the short summer coat of which is much blacker than the longer downy covering which conceals this in winter. In this little animal the additional winter coat is shed about the latter end of March, or beginning of April; and does not take place uniformly, but progressively, beginning on the head, and ceasing at the hinder extremities; and exhibiting in its progress, throughout, a well-defined line of separation. Animals which (as the British *Mustelinæ*) have two sorts of fur, the *shorter* of which is the more warm and downy, do not undergo this change, but retain both sorts throughout the year. In these the young have only one kind, which is close and woolly; as is well exemplified in the common polecat (*Putorius Furo*), the young of which are of a very uniform dark brown, and very unlike the old animals.

III. Actual change of colour in the coat itself is exhibited in the appearance of the fallow deer's white spots in spring, and in the case of the mountain hare (*Lepus variabilis*), which is in summer grey, adapted to the hue of the lichens on which it squats; and in winter white, hardly to be discerned upon the snow. The same change also takes place in the stoat or ermine (*Putorius ermineus*), although this is doubted by Mr. Berry (VII. 591.).* In mild winters, such as we have of late experienced in the South of England, but few of the stoats become white, and some of these not until the latter part of the season. The change takes place quickly, but not uniformly, the animal assuming for a short time a pied appearance; but I have not succeeded in ascertaining whether it is accelerated by sudden cold, as the animals are not always to be seen exactly when we want them. One perfectly changed, however, was seen in this neighbourhood soon after the one or two days of very cold weather in the beginning of last

* This gentleman should have mentioned, in his account of the white stoats seen in summer, whether the tail was white or black. If the former, they were doubtless albinos; if the latter, some constitutional debility may have prevented them from resuming their natural hues. I have seen white stoats late in March, but never after this. Both in these and in the white ferret (a domestic albino variation of the polecat) a decided tinge of yellow is always more or less noticeable.

October. In reference to Mr. Berry's communication, I may observe, that in many dozens of stoats which I have seen in summer, I have never yet seen a white one; whereas in winter, I have seen in the same neighbourhoods a considerable number of white stoats. Where the climate is more excessive, and the transitions of the seasons are more sudden, this change is much more likely to take place generally. In the fur countries, the ermine's change of hue is, I believe, most regular.

There has been, strangely enough, a difference of opinion among naturalists, as to whether these seasonal changes of colour were intended by Providence as an adaptation to change of temperature*, or as a means of preserving the various species from the observation of their foes, by adapting their hues to the colour of the surface; against which latter opinion it has been plausibly enough argued, that "nature provides for the prey as well as for the predator." The fact is, they answer *both* purposes; and they are among those striking instances of *design*, which so clearly and forcibly attest the existence of an omniscient great First Cause. Experiment demonstrates the soundness of the first opinion; and sufficient proof can be adduced to show that the other is also sound. Some arctic species are white, which have no enemy to fear, as the polar bear, the gyrfalcon, the arctic eagle-owl, the snowy owl, and even the stoat; and therefore, in these, the whiteness can only be to preserve the temperature of their bodies [VI. 79.]; but when we perceive that the colour of nocturnal animals, and of those defenceless species whose habits lead them to be much exposed, especially to enemies from above, are *invariably* of the same colour with their respective natural haunts, we can only presume that this is because they should not appear too conspicuous to their enemies. Thus, in the eloquent language of Mr. Mudie†, who, however, advocates the first opinion, "the ptarmigan is lichen rock in summer, hoar frost in autumn, and snow in winter. Grouse are brown heather, black game are peat bank and shingle, and partridges are clods and withered stalks, all the year round." So, also, on the Continent, the common red-legged partridge (*Erythropus vulgaris*) is of the colour of the gravelly and sandy soils on which it is found. So, also, are the different larks, the common quail, the various snipes, and all the other ground squatters, of the hue of their peculiar localities. So, also, are the numerous small Grallatores which haunt the margin

* See Dr. Stark's paper, before cited, in Jameson's *Philosophical Journal* for July, 1834. [See *M. N. H.*, vi. 79.]

† See Mudie's *Feathered Tribes of the British Islands*, i. 50.

of the ocean, adapted to the colour of the sand. So, also, are those sylvan birds, which quit the dense umbrage of healthy growing trees, to seek their food and expose themselves on bare trunks and leafless decaying branches, of the hue of their particular haunts. "So exquisitely are they fitted for their office," says Mr. Mudie*, "that the several woodpeckers vary in tint with the general colours of the trees which they select. If it is an alternation of green moss, yellow lichen, and ruby tinted cups, with here and there a spot of black, then the green woodpecker comes in charge; but if it is the black and white lichens of the alpine forest or the harsh-juiced tree, then we may look for the spotted races upon the bark." The wryneck is the colour of the lichenized branch; and the night swallow and the owls resemble their peculiar places of concealment. So, also, the gayer colours of nocturnal moths are always on the hinder wings†, and the anterior, which, when they rest, conceal these, are adapted to the hues of the various places where by day they are found: even the bright upper wings of the tiger moths (*A'rctia Càja*, and *A. villica*) are with difficulty recognised upon a lichenized bank or paling.‡ It is curious, indeed, the resemblance which subsists between the colours of nocturnal birds and night Lepidóptera; the buff tip moth (*Pygæ'ra bucéphala*) thus reminds us of the barn owl (*Stríx vulgàris*); and the goat moth (*Cóssus Lignipérda*), and a host of others, are similar in their tints to most of the *Strígida*: in both cases they are doubtless intended for the same purpose, that of concealment. It would indeed be easy to extend this list of examples considerably further; but I shall only now mention the common hare, which, when in form, would hardly ever be seen were it not for its brilliant eye; if its eye were closed, which it probably was before its quick sense of hearing had warned it of our approach, it would almost always, perhaps, wholly escape our observation. This ever continued watchfulness must have given rise to the supposition, that the hare always sleeps with its eyes open.

Seeing, therefore, so many most striking adaptations of colour to haunt, in cases where the concealment thus afforded can be the *only* purpose, I think it is not too much to infer, that the changes of colour in many arctic animals were intended

* See Mudie's *Feathered Tribes of the British Islands*, i. 190.

† Among day-flying Lepidóptera, the more gaudy colours are usually on the *fore* wings.

‡ Animals of bright and gaudy colours are generally very retiring in their habits: even the common robin mostly turns away his breast as you approach.

by Providence for the double purpose of preserving their bodily heat, and of enabling them to elude the observation of their enemies. Certain it is, that their *conspicuousness* would otherwise expose them to inevitable destruction. If I had here space, I could satisfactorily prove that the high-flying Falcónidæ can, in most cases, only perceive their prey when it is *moving*; just, as on the sea-shore, ~~we~~ can only distinguish sanderlings when they move. Small Mammàlia which frequent open situations are rarely much abroad, except in the twilight; and ground-feeding birds are ever on the watch, and even the smaller kinds (as I have repeatedly observed) can perceive a hovering falcon *long* before it comes within the sphere of human vision; and they instantly flee to shelter, or they crouch, and lying motionless, so exactly resemble a portion of the surface, that even a hawk's eye cannot distinguish them. Why should the falcon race be endowed with such wonderful powers of enduring hunger and fatigue, if, as is said, at the elevations at which they soar, they can clearly distinguish every living object scattered over the wide expanse beneath them? It is only on such animals as are *off their guard* that they descend; or otherwise, food being so abundant, they would soon multiply to the extirpation of their prey; which, of course, would be very speedily followed by that of the preyer.

How beautifully do we thus perceive, as in a thousand other instances, the balance of nature preserved: and even here we see another reason why sickly or degenerate animals (those, I mean, which are less able to maintain the necessary vigilance) must soon disappear; and why the slightest deviation from the natural hue must generally prove fatal to the animal. How different, thus, are even *simple variations* from the seasonal changes of colour which naturally take place! Properly followed up, this subject might lead to some highly interesting and important results. It certainly points to the conclusion, that every, even the slightest, tint and marking has some decided use, and is intimately connected with the habits and welfare of the animal; and it also furnishes a satisfactory reason, why closely allied animals (or, in other words, animals of very similar form and habits) should so very commonly nearly resemble each other in their colours and in the general character of their markings.

(*To be continued.*)