

BIRDS-Concluded.

WE must now consider the transmission of characters, as limited by age, in reference to sexual selection. The truth and importance of the principle of inheritance at corresponding ages need not here be discussed, as enough has already been said on the subject. Before giving the several rather complex rules or classes of cases, under which the differences in plumage between the young and the old, as far as known to me, may be included, it will be well to make a few preliminary remarks.

With animals of all kinds when the adults differ in colour from the young, and the colours of the latter are not, as far as we can see, of any special service, they may generally be attributed, like various embryological structures, to the retention of a former character. But this view can be maintained with confidence, only when the young of several species resemble each other closely, and likewise resemble other adult species belonging to the same group; for the latter are the living proofs that such a state of things was formerly possible. Young lions and pumas are marked with feeble stripes or rows of spots, and as many allied species both young and old are similarly marked, no believer in evolution will doubt that the progenitor of the lion and puma was a striped animal, and that the young have retained vestiges of the stripes, like the kittens of black cats, which are not in the least striped when grown up. Many species of deer, which when mature are not spotted, are whilst young covered with white spots, as are likewise some few species in the adult state. So again the young in the whole family of pigs (*Suidae*), and in certain rather distantly allied animals, such as the tapir, are marked with dark longitudinal stripes; but here we have a character apparently derived from an extinct progenitor, and now preserved by the young alone. In all such cases the old have had their colours changed in the course of time, whilst the young have remained but little altered, and this has been effected through the principle of inheritance at corresponding ages.

This same principle applies to many birds belonging to various groups, in which the young closely resemble each other, and differ much from their respective adult parents. The young of almost all the *Gallinaceae*, and of some distantly allied birds such as ostriches, are covered with longitudinally striped down; but this character points back to a state of things so remote that it hardly concerns us. Young cross-bills (*Loxia*) have at first straight beaks like those of other finches, and in their immature striated plumage they resemble the mature red-pole and female siskin, as well as the young of the goldfinch, greenfinch, and some other allied species. The young of many kinds of buntings (*Emberiza*) resemble one another, and likewise the adult state of the common bunting, *E. miliaria*. In almost the whole large group of thrushes the young have their breasts spotted—a character which is retained throughout life by many species, but is quite lost by others, as by the *Turdus migratorius*. So again with many thrushes, the feathers on the back are mottled before they are moulted for the first time, and this character is retained for life by certain eastern species. The young of many species of shrikes (*Lanius*), of some woodpeckers, and of an Indian pigeon (*Chalcophaps indicus*), are transversely striped on the under surface; and certain allied species or whole genera are similarly marked when adult. In some closely-allied and resplendent Indian cuckoos (*Chrysococcyx*), the mature species differ considerably from one another in colour, but the young cannot be distinguished. The young of an Indian goose (*Sarkidiornis melanonotus*) closely resemble in plumage an allied genus, *Dendrocygna*, when mature.* Similar facts will hereafter be given in regard to certain herons. Young black-grouse (*Tetrao tetrix*) resemble the young as well as the old of certain other

species, for instance the red-grouse or *T. scoticus*. Finally, as Mr. Blyth, who has attended closely to this subject, has well remarked, the natural affinities of many species are best exhibited in their immature plumage; and as the true affinities of all organic beings depend on their descent from a common progenitor, this remark strongly confirms the belief that the immature plumage approximately shews us the former or ancestral condition of the species.

* In regard to thrushes, shrikes, and woodpeckers, see Mr. Blyth, in Charlesworth's *Mag. of Nat. Hist.*, vol. i., 1837, p. 304; also footnote to his translation of Cuvier's *Regne Animal*, p. 159. I give the case of *Loxia* on Mr. Blyth's information. On thrushes, see also Audubon, *Ornith. Biog.*, vol. ii., p. 195. On *Chrysococcyx* and *Chalcophaps*, Blyth, as quoted in Jerdon's *Birds of India*, vol. iii., p. 485. On *Sarkidiornis*, Blyth, in *Ibis*, 1867, p. 175.

Although many young birds, belonging to various families, thus give us a glimpse of the plumage of their remote progenitors, yet there are many other birds, both dull-coloured and bright-coloured, in which the young closely resemble their parents. In such cases the young of the different species cannot resemble each other more closely than do the parents; nor can they strikingly resemble allied forms when adult. They give us but little insight into the plumage of their progenitors, excepting in so far that, when the young and the old are coloured in the same general manner throughout a whole group of species, it is probable that their progenitors were similarly coloured.

We may now consider the classes of cases, under which the differences and resemblances between the plumage of the young and the old, in both sexes or in one sex alone, may be grouped. Rules of this kind were first enounced by Cuvier; but with the progress of knowledge they require some modification and amplification. This I have attempted to do, as far as the extreme complexity of the subject permits, from information derived from various sources; but a full essay on this subject by some competent ornithologist is much needed. In order to ascertain to what extent each rule prevails, I have tabulated the facts given in four great works, namely, by Macgillivray on the birds of Britain, Audubon on those of North America, Jerdon on those of India, and Gould on those of Australia. I may here premise, first, that the several cases or rules graduate into each other; and secondly, that when the young are said to resemble their parents, it is not meant that they are identically alike, for their colours are almost always less vivid, and the feathers are softer and often of a different shape.

RULES OR CLASSES OF CASES.

I When the adult male is more beautiful or conspicuous than the adult female, the young of both sexes in their first plumage closely resemble the adult female, as with the common fowl and peacock; or, as occasionally occurs, they resemble her much more closely than they do the adult male.

II When the adult female is more conspicuous than the adult male, as sometimes though rarely occurs, the young of both sexes in their first plumage resemble the adult male.

III When the adult male resembles the adult female, the young of both sexes have a peculiar first plumage of their own, as with the robin.

IV When the adult male resembles the adult female, the young of both sexes in their first plumage resemble the adults, as with the kingfisher, many parrots, crows, hedge-warblers.

V When the adults of both sexes have a distinct winter and summer plumage, whether or not the male differs from the female, the young resemble the adults of both sexes in their winter dress, or much more rarely in their summer dress, or they resemble the females alone.

Or the young may have an intermediate character; or again they may differ greatly from the adults in both their seasonal plumages.

VI In some few cases the young in their first plumage differ from each other according to sex; the young males resembling more or less closely the adult males, and the young females more or less closely the adult females.

CLASS I In this class, the young of both sexes more or less closely resemble the adult female, whilst the adult male differs from the adult female, often in the most conspicuous manner. Innumerable instances in all Orders could be given; it will suffice to call to mind the common pheasant, duck, and house-sparrow. The cases under this class graduate into others. Thus the two sexes when adult may differ so slightly, and the young so slightly from the adults, that it is doubtful whether such cases ought to come under the present, or under the third or fourth classes. So again the young of the two sexes, instead of being quite alike, may differ in a slight degree from each other, as in our sixth class. These transitional cases, however, are few, or at least are not strongly pronounced, in comparison with those which come strictly under the present class.

The force of the present law is well shewn in those groups, in which, as a general rule, the two sexes and the young are all alike; for when in these groups the male does differ from the female, as with certain parrots, kingfishers, pigeons, &c., the young of both sexes resemble the adult female.* We see the same fact exhibited still more clearly in certain anomalous cases; thus the male of *Heliothrix auriculata* (one of the humming-birds) differs conspicuously from the female in having a splendid gorget and fine ear-tufts, but the female is remarkable from having a much longer tail than that of the male; now the young of both sexes resemble (with the exception of the breast being spotted with bronze) the adult female in all other respects, including the length of her tail, so that the tail of the male actually becomes shorter as he reaches maturity, which is a most unusual circumstance.*(2) Again, the plumage of the male goosander (*Mergus merganser*) is more conspicuously coloured than that of the female, with the scapular and secondary wing-feather much longer; but differently from what occurs, as far as I know, in any other bird, the crest of the adult male, though broader than that of the female, is considerably shorter, being only a little above an inch in length; the crest of the female being two and a half inches long. Now the young of both sexes entirely resemble the adult female, so that their crests are actually of greater length, though narrower, than in the adult male.*(3)

* See, for instance, Mr. Gould's account (Handbook of the Birds of Australia, vol. i., p. 133) of *Cyanalcyon* (one of the Kingfishers), in which, however, the young male, though resembling the adult female, is less brilliantly coloured. In some species of *Dacelo* the males have blue tails, and the females brown ones; and Mr. R. B. Sharpe informs me that the tail of the young male of *D. gaudichaudi* is at first brown. Mr. Gould has described (*ibid.*, vol. ii., pp. 14, 20, 37) the sexes and the young of certain black cockatoos and of the king lory, with which the same rule prevails. Also Jerdon (*Birds of India*, vol. i., p. 260) on the *Paloeornis rosa*, in which the young are more like the female than the male. See Audubon (*Ornithological Biography*, vol. ii., p. 475) on the two sexes and the young of *Columba passerina*.

*(2) I owe this information to Mr. Gould, who shewed me the specimens; see also his Introduction to the Trochilidae, 1861, p. 120.

*(3) Macgillivray, *Hist. Brit. Birds*, vol. v., pp. 207-214.

When the young and the females closely resemble each other and both differ from the males, the most obvious conclusion is that the males alone have been modified. Even in the anomalous cases of the *Heliothrix* and *Mergus*, it is probable that originally both adult sexes were furnished- the one species with a much elongated tail, and the

other with a much elongated crest- these characters having since been partially lost by the adult males from some unexplained cause, and transmitted in their diminished state to their male offspring alone, when arrived at the corresponding age of maturity. The belief that in the present class the male alone has been modified, as far as the differences between the male and the female together with her young are concerned, is strongly supported by some remarkable facts recorded by Mr. Blyth,* with respect to closely-allied species which represent each other in distinct countries. For with several of these representative species the adult males have undergone a certain amount of change and can be distinguished; the females and the young from the distinct countries being indistinguishable, and therefore absolutely unchanged. This is the case with certain Indian chats (*Thamnobia*), with certain honey-suckers (*Nectarinia*), shrikes (*Tephrodornis*), certain kingfishers (*Tanysiptera*), Kalij pheasants (*Gallophasis*), and tree-partridges (*Arboricola*).

* See his admirable paper in the *Journal of the Asiatic Soc. of Bengal*, vol. xix., 1850, p. 223; see also Jerdon, *Birds of India*, vol. i., introduction, p. xxix. In regard to *Tanysiptera*, Prof. Schlegel told Mr. Blyth that he could distinguish several distinct races, solely by comparing the adult males.

In some analogous cases, namely with birds having a different summer and winter plumage, but with the two sexes nearly alike, certain closely-allied species can easily be distinguished in their summer or nuptial plumage, yet are indistinguishable in their winter as well as in their immature plumage. This is the case with some of the closely-allied Indian wagtails or *Motacillae*. Mr. Swinhoe* informs me that three species of *Ardeola*, a genus of herons, which represent one another on separate continents, are "most strikingly different" when ornamented with their summer plumes, but are hardly, if at all, distinguishable during the winter. The young also of these three species in their immature plumage closely resemble the adults in their winter dress. This case is all the more interesting, because with two other species of *Ardeola* both sexes retain, during the winter and summer, nearly the same plumage as that possessed by the three first species during the winter and in their immature state; and this plumage, which is common to several distinct species at different ages and seasons, probably shews us how the progenitors of the genus were coloured. In all these cases, the nuptial plumage which we may assume was originally acquired by the adult males during the breeding-season, and transmitted to the adults of both sexes at the corresponding season, has been modified, whilst the winter and immature plumages have been left unchanged.

* See also Mr. Swinhoe, in *Ibis*, July, 1863, p. 131; and a previous paper, with an extract from a note by Mr. Blyth, in *Ibis*, January, 1861, p. 25.

The question naturally arises, how is it that in these latter cases the winter plumage of both sexes, and in the former cases the plumage of the adult females, as well as the immature plumage of the young, have not been at all affected? The species which represent each other in distinct countries will almost always have been exposed to somewhat different conditions, but we can hardly attribute to this action the modification of the plumage in the males alone, seeing that the females and the young, though similarly exposed, have not been affected. Hardly any fact shews us more clearly how subordinate in importance is the direct action of the conditions of life, in comparison with the accumulation through selection of indefinite variations, than the surprising difference between the sexes of many birds; for both will have consumed the same food, and have been exposed to the same climate. Nevertheless we are not precluded from believing that in the course of time new conditions may produce some

direct effect either on both sexes, or from their constitutional differences chiefly on one sex. We see only that this is subordinate in importance to the accumulated results of selection. Judging, however, from a wide-spread analogy, when a species migrates into a new country (and this must precede the formation of representative species), the changed conditions to which they will almost always have been exposed will cause them to undergo a certain amount of fluctuating variability. In this case sexual selection, which depends on an element liable to change- the taste or admiration of the female- will have had new shades of colour or other differences to act on and accumulate; and as sexual selection is always at work, it would (from what we know of the results on domestic animals of man's unintentional selection), be surprising if animals inhabiting separate districts, which can never cross and thus blend their newly-acquired characters, were not, after a sufficient lapse of time, differently modified. These remarks likewise apply to the nuptial or summer plumage, whether confined to the males, or common to both sexes.

Although the females of the above closely-allied or representative species, together with their young, differ hardly at all from one another, so that the males alone can be distinguished, yet the females of most species within the same genus obviously differ from each other. The differences, however, are rarely as great as between the males. We see this clearly in the whole family of the Gallinaceae: the females, for instance, of the common and Japan pheasant, and especially of the gold and Amherst pheasant- of the silver pheasant and the wild fowl- resemble one another very closely in colour, whilst the males differ to an extraordinary degree. So it is with the females of most of the Cotingidae, Fringillidae, and many other families. There can indeed be no doubt that, as a general rule, the females have been less modified than the males. Some few birds, however, offer a singular and inexplicable exception; thus the females of *Paradisea apoda* and *P. papuana* differ from each other more than do their respective males;* the female of the latter species having the under surface pure white, whilst the female *P. apoda* is deep brown beneath. So, again, as I hear from Professor Newton, the males of two species of *Oxynotus* (shrikes), which represent each other in the islands of Mauritius and Bourbon,*(2) differ but little in colour, whilst the females differ much. In the Bourbon species the female appears to have partially retained an immature condition of plumage, for at first sight she "might be taken for the young of the Mauritian species." These differences may be compared with those inexplicable ones, which occur independently of man's selection in certain sub-breeds of the game-fowl, in which the females are very different, whilst the males can hardly be distinguished.*(3)

* Wallace, *The Malay Archipelago*, vol. ii., 1869, p. 394.

*(2) These species are described with coloured figures, by M. F. Pollen, in *Ibis*, 1866, p. 275.

*(3) *Variation of Animals, &c.*, vol. i., p. 251.

As I account so largely by sexual selection for the differences between the males of allied species, how can the differences between the females be accounted for in all ordinary cases? We need not here consider the species which belong to distinct genera; for with these, adaptation to different habits of life, and other agencies, will have come into play. In regard to the differences between the females within the same genus, it appears to me almost certain, after looking through various large groups, that the chief agent has been the greater or less transference to the female of the characters acquired by the males through sexual selection. In the several British finches, the two sexes differ either very slightly or considerably; and if we compare the females of the greenfinch, chaffinch, goldfinch, bullfinch, crossbill, sparrow, &c., we shall see that they differ from one another chiefly in the points in which they partially resemble their respective males; and the colours of the

males may be attributed to sexual selection. With many gallinaceous species the sexes differ to an extreme degree, as with the peacock, pheasant, and fowl, whilst with other species there has been a partial or even complete transference of character from the male to the female. The females of the several species of *Polyplectron* exhibit in a dim condition, and chiefly on the tail, the splendid ocelli of their males. The female partridge differs from the male only in the red mark on her breast being smaller; and the female wild turkey only in her colours being much duller. In the guinea-fowl the two sexes are indistinguishable. There is no improbability in the plain, though peculiarly spotted plumage of this latter bird having been acquired through sexual selection by the males, and then transmitted to both sexes; for it is not essentially different from the much more beautifully spotted plumage, characteristic of the males alone of the tragopan pheasants.

It should be observed that, in some instances, the transference of characters from the male to the female has been effected apparently at a remote period, the male having subsequently undergone great changes, without transferring to the female any of his later-gained characters. For instance, the female and the young of the black-grouse (*Tetrao tetrix*) resemble pretty closely both sexes and the young of the red-grouse (*T. scoticus*); and we may consequently infer that the black-grouse is descended from some ancient species, of which both sexes were coloured in nearly the same manner as the red-grouse. As both sexes of this latter species are more distinctly barred during the breeding-season than at any other time, and as the male differs slightly from the female in his more strongly-pronounced red and brown tints,* we may conclude that his plumage has been influenced by sexual selection, at least to a certain extent. If so, we may further infer that nearly similar plumage of the female black-grouse was similarly produced at some former period. But since this period the male black-grouse has acquired his fine black plumage, with his forked and outwardly-curved tail-feathers; but of these characters there has hardly been any transference to the female, excepting that she shews in her tail a trace of the curved fork.

* Macgillivray, *History of British Birds*, vol. i., pp. 172-174.

We may therefore conclude that the females of distinct though allied species have often had their plumage rendered more or less different by the transference in various degrees of characters acquired by the males through sexual selection, both during former and recent times. But it deserves especial attention that brilliant colours have been transferred much more rarely than other tints. For instance, the male of the red-throated blue-breast (*Cyanecula suecica*) has a rich blue breast, including a sub-triangular red mark; now marks of nearly the same shape have been transferred to the female, but the central space is fulvous instead of red, and is surrounded by mottled instead of blue feathers. The Gallinaceae offer many analogous cases; for none of the species, such as partridges, quails, guinea-fowls, &c., in which the colours of the plumage have been largely transferred from the male to the female, are brilliantly coloured. This is well exemplified with the pheasants, in which the male is generally so much more brilliant than the female; but with the Eared and Cheer pheasants (*Crossoptilon auritum* and *Phasianus wallichii*) the sexes closely resemble each other and their colours are dull. We may go so far as to believe that if any part of the plumage in the males of these two pheasants had been brilliantly coloured, it would not have been transferred to the females. These facts strongly support Mr. Wallace's view that with birds which are exposed to much danger during incubation, the transference of bright colours from the male to the female has been checked through natural selection. We must not, however, forget that another explanation, before given, is possible; namely, that the males which varied and became bright, whilst they were young and inexperienced, would have

been exposed to much danger, and would generally have been destroyed; the older and more cautious males, on the other hand, if they varied in a like manner, would not only have been able to survive, but would have been favoured in their rivalry with other males. Now variations occurring late in life tend to be transmitted exclusively to the same sex, so that in this case extremely bright tints would not have been transmitted to the females. On the other hand, ornaments of a less conspicuous kind, such as those possessed by the Eared and Cheer pheasants, would not have been dangerous, and if they appeared during early youth, would generally have been transmitted to both sexes.

In addition to the effects of the partial transference of characters from the males to the females, some of the differences between the females of closely-allied species may be attributed to the direct or definite action of the conditions of life.* With the males, any such action would generally have been masked by the brilliant colours gained through sexual selection; but not so with the females. Each of the endless diversities in plumage which we see in our domesticated birds is, of course, the result of some definite cause; and under natural and more uniform conditions, some one tint, assuming that it was in no way injurious, would almost certainly sooner or later prevail. The free intercrossing of the many individuals belonging to the same species would ultimately tend to make any change of colour, thus induced, uniform in character.

* See, on this subject, chap. xxiii. in the Variation of Animals and Plants under Domestication.

No one doubts that both sexes of many birds have had their colours adapted for the sake of protection; and it is possible that the females alone of some species may have been modified for this end. Although it would be a difficult, perhaps an impossible process, as shewn in the last chapter, to convert one form of transmission into another through selection, there would not be the least difficulty in adapting the colours of the female, independently of those of the male, to surrounding objects, through the accumulation of variations which were from the first limited in their transmission to the female sex. If the variations were not thus limited, the bright tints of the male would be deteriorated or destroyed. Whether the females alone of many species have been thus specially modified, is at present very doubtful. I wish I could follow Mr. Wallace to the full extent; for the admission would remove some difficulties. Any variations which were of no service to the female as a protection would be at once obliterated, instead of being lost simply by not being selected, or from free intercrossing, or from being eliminated when transferred to the male and in any way injurious to him. Thus the plumage of the female would be kept constant in character. It would also be a relief if we could admit that the obscure tints of both sexes of many birds had been acquired and preserved for the sake of protection, - for example, of the hedge-warbler or kitty-wren (*Accentor modularis* and *Troglodytes vulgaris*), with respect to which we have no sufficient evidence of the action of sexual selection. We ought, however, to be cautious in concluding that colours which appear to us dull, are not attractive to the females of certain species; we should bear in mind such cases as that of the common house-sparrow, in which the male differs much from the female, but does not exhibit any bright tints. No one probably will dispute that many gallinaceous birds which live on the open ground, have acquired their present colours, at least in part, for the sake of protection. We know how well they are thus concealed; we know that ptarmigans, whilst changing from their winter to their summer plumage, both of which are protective, suffer greatly from birds of prey. But can we believe that the very slight differences in tints and markings between, for instance, the female black-grouse and red-grouse serve as a protection? Are partridges, as they are now coloured, better

protected than if they resembled quails? Do the slight differences between the females of the common pheasant, the Japan and gold pheasants, serve as a protection, or might not their plumages have been interchanged with impunity? From what Mr. Wallace has observed of the habits of certain gallinaceous birds in the East, he thinks that such slight differences are beneficial. For myself, I will only say that I am not convinced.

Formerly when I was inclined to lay much stress on protection as accounting for the duller colours of female birds, it occurred to me that possibly both sexes and the young might aboriginally have been equally bright coloured; but that subsequently, the females from the danger incurred during incubation, and the young from being inexperienced, had been rendered dull as a protection. But this view is not supported by any evidence, and is not probable; for we thus in imagination expose during past times the females and the young to danger, from which it has subsequently been necessary to shield their modified descendants. We have, also, to reduce, through a gradual process of selection, the females and the young to almost exactly the same tints and markings, and to transmit them to the corresponding sex and period of life. On the supposition that the females and the young have partaken during each stage of the process of modification of a tendency to be as brightly coloured as the males, it is also a somewhat strange fact that the females have never been rendered dull-coloured without the young participating in the same change; for there are no instances, as far as I can discover, of species with the females dull and the young bright coloured. A partial exception, however, is offered by the young of certain woodpeckers, for they have "the whole upper part of the head tinged with red," which afterwards either decreases into a mere circular red line in the adults of both sexes, or quite disappears in the adult females.*

* Audubon, Ornith. Biography, vol. i., p. 193. Macgillivray, History of British Birds, vol. iii., p. 85. See also the case before given of *Indopicus carlotta*.

Finally, with respect to our present class of cases, the most probable view appears to be that successive variations in brightness or in other ornamental characters, occurring in the males at a rather late period of life have alone been preserved; and that most or all of these variations, owing to the late period of life at which they appeared, have been from the first transmitted only to the adult male offspring. Any variations in brightness occurring in the females or in the young, would have been of no service to them, and would not have been selected; and moreover, if dangerous, would have been eliminated. Thus the females and the young will either have been left unmodified, or (as is much more common) will have been partially modified by receiving through transference from the males some of his successive variations. Both sexes have perhaps been directly acted on by the conditions of life to which they have long been exposed: but the females from not being otherwise much modified, will best exhibit any such effects. These changes and all others will have been kept uniform by the free intercrossing of many individuals. In some cases, especially with ground birds, the females and the young may possibly have been modified, independently of the males, for the sake of protection, so as to have acquired the same dull-coloured plumage.

CLASS II When the adult female is more conspicuous than the adult male, the young of both sexes in their first plumage resemble the adult male. - This class is exactly the reverse of the last, for the females are here brighter coloured or more conspicuous than the males; and the young, as far as they are known, resemble the adult males instead of the adult females. But the difference between the sexes is never nearly so great as with many birds in the first class, and the cases are comparatively rare. Mr. Wallace, who first called attention to the singular relation which exists between the less

bright colours of the males and their performing the duties of incubation, lays great stress on this point,* as a crucial test that obscure colours have been acquired for the sake of protection during the period of nesting. A different view seems to me more probable. As the cases are curious and not numerous, I will briefly give all that I have been able to find.

* Westminster Review, July, 1867, and A. Murray, Journal of Travel, 1868, p. 83.

In one section of the genus *Turnix*, quail-like birds, the female is invariably larger than the male (being nearly twice as large in one of the Australian species), and this is an unusual circumstance with the Gallinaceae. In most of the species the female is more distinctly coloured and brighter than the male,* but in some few species the sexes are alike. In *Turnix taigoor* of India the male "wants the black on the throat and neck, and the whole tone of the plumage is lighter and less pronounced than that of the female." The female appears to be noisier, and is certainly much more pugnacious than the male; so that the females and not the males are often kept by the natives for fighting, like game-cocks. As male birds are exposed by the English bird-catchers for a decoy near a trap, in order to catch other males by exciting their rivalry, so the females of this *Turnix* are employed in India. When thus exposed the females soon begin their "loud purring call, which can be heard a long way off, and any females within ear-shot run rapidly to the spot, and commence fighting with the bird." In this way from twelve to twenty birds, all breeding females, may be caught in the course of a single day. The natives assert that the females after laying their eggs associate in flocks, and leave the males to sit on them. There is no reason to doubt the truth of this assertion, which is supported by some observations made in China by Mr. Swinhoe.*(2) Mr. Blyth believes, that the young of both sexes resemble the adult male.

* For the Australian species, see Gould's Handbook, &c., vol. ii., pp. 178, 180, 186, and 188. In the British Museum specimens of the Australian plain-wanderer (*Pedionomus torquatus*) may be seen, shewing similar sexual differences.

*(2) Jerdon, Birds of India, vol. iii., p. 596. Mr. Swinhoe, in Ibis, 1865, p. 542; 1866, pp. 131, 405.

The females of the three species of painted snipes (see *Rhynchoea*, fig. 62) "are not only larger but much more richly coloured than the males."* With all other birds in which the trachea differs in structure in the two sexes it is more developed and complex in the male than in the female; but in the *Rhynchoea australis* it is simple in the male, whilst in the female it makes four distinct convolutions before entering the lungs.*(2) The female therefore of this species has acquired an eminently masculine character. Mr. Blyth ascertained, by examining many specimens, that the trachea is not convoluted in either sex of *R. bengalensis*, which species resembles *R. australis* so closely, that it can hardly be distinguished except by its shorter toes. This fact is another striking instance of the law that secondary sexual characters are often widely different in closely-allied forms, though it is a very rare circumstance when such differences relate to the female sex. The young of both sexes of *R. bengalensis* in their first plumage are said to resemble the mature male.*(3) There is also reason to believe that the male undertakes the duty of incubation, for Mr. Swinhoe*(4) found the females before the close of the summer associated in flocks, as occurs with the females of the *Turnix*.

* Jerdon, Birds of India, vol. iii., p. 677.

*(2) Gould's Handbook of the Birds of Australia, vol. ii., p. 275.

*(3) The Indian Field, Sept., 1858, p. 3.

The females of *Phalaropus fulicarius* and *P. hyperboreus* are larger, and in their summer plumage "more gaily attired than the males." But the difference in colour between the sexes is far from conspicuous. According to Professor Steenstrup, the male alone of *P. fulicarius* undertakes the duty of incubation; this is likewise shewn by the state of his breast-feathers during the breeding-season. The female of the dotterel plover (*Eudromias morinellus*) is larger than the male, and has the red and black tints on the lower surface, the white crescent on the breast, and the stripes over the eyes, more strongly pronounced. The male also takes at least a share in hatching the eggs; but the female likewise attends to the young.* I have not been able to discover whether with these species the young resemble the adult males more closely than the adult females; for the comparison is somewhat difficult to make on account of the double moult.

* For these several statements, see Mr. Gould's *Birds of Great Britain*. Prof. Newton informs me that he has long been convinced, from his own observations and from those of others, that the males of the above-named species take either the whole or a large share of the duties of incubation, and that they "shew much greater devotion towards their young, when in danger, than do the females." So it is, as he informs me, with *Limosa lapponica* and some few other waders, in which the females are larger and have more strongly contrasted colours than the males.

Turning now to the ostrich Order: the male of the common cassowary (*Casuarius galeatus*) would be thought by any one to be the female, from his smaller size and from the appendages and naked skin about his head being much less brightly coloured; and I am informed by Mr. Bartlett that in the Zoological Gardens, it is certainly the male alone who sits on the eggs and takes care of the young.* The female is said by Mr. T. W. Wood*(2) to exhibit during the breeding-season a most pugnacious disposition; and her wattles then become enlarged and more brilliantly coloured. So again the female of one of the emus (*Dromoeus irroratus*) is considerably larger than the male, and she possesses a slight top-knot, but is otherwise indistinguishable in plumage. She appears, however, "to have greater power, when angry or otherwise excited, of erecting, like a turkey-cock, the feathers of her neck and breast. She is usually the more courageous and pugilistic. She makes a deep hollow guttural boom especially at night, sounding like a small gong. The male has a slenderer frame and is more docile, with no voice beyond a suppressed hiss when angry, or a croak." He not only performs the whole duty of incubation, but has to defend the young from their mother; "for as soon as she catches sight of her progeny she becomes violently agitated, and notwithstanding the resistance of the father appears to use her utmost endeavours to destroy them. For months afterwards it is unsafe to put the parents together, violent quarrels being the inevitable result, in which the female generally comes off conqueror."*(3) So that with this emu we have a complete reversal not only of the parental and incubating instincts, but of the usual moral qualities of the two sexes; the females being savage, quarrelsome, and noisy, the males gentle and good. The case is very different with the African ostrich, for the male is somewhat larger than the female and has finer plumes with more strongly contrasted colours; nevertheless he undertakes the whole duty of incubation.*(4)

* The natives of Ceram (Wallace, *Malay Archipelago*, vol. ii., p. 150) assert that the male and female sit alternately on the eggs; but this assertion, as Mr. Bartlett thinks, may be accounted for by the female visiting the nest to lay her eggs.

*(2) *The Student*, April, 1870, p. 124.

* (3) See the excellent account of the habits of this bird under confinement, by Mr. A. W. Bennett, in *Land and Water*, May, 1868, p. 233.

* (4) Mr. Sclater, on the incubation of the Struthionides, *Proc. Zool. Soc.*, June 9, 1863. So it is with the *Rhea darwinii*: Captain Musters says (*At Home with the Patagonians*, 1871, p. 128), that the male is larger, stronger and swifter than the female, and of slightly darker colours; yet he takes sole charge of the eggs and of the young, just as does the male of the common species of *Rhea*.

I will specify the few other cases known to me, in which the female is more conspicuously coloured than the male, although nothing is known about the manner of incubation. With the carrion-hawk of the Falkland Islands (*Milvago leucurus*) I was much surprised to find by dissection that the individuals, which had all their tints strongly pronounced, with the cere and legs orange-coloured, were the adult females; whilst those with duller plumage and grey legs were the males or the young. In an Australian tree-creeper (*Climacteris erythroptera*) the female differs from the male in "being adorned with beautiful, radiated, rufous markings on the throat, the male having this part quite plain." Lastly, in an Australian night-jar "the female always exceeds the male in size and in the brilliance of her tints; the males, on the other hand, have two white spots on the primaries more conspicuous than in the female."*

* For the *Milvago*, see *Zoology of the Voyage of the Beagle: Birds*, 1841, p. 16. For the *Climacteris* and night-jar (*Eurostopodus*), see *Gould's Handbook of the Birds of Australia*, vol. i., pp. 602 and 97. The new Zealand shieldrake (*Tadorna variegata*) offers a quite anomalous case; the head of the female is pure white, and her back is redder than that of the male; the head of the male is of a rich dark bronzed colour, and his back is clothed with finely pencilled slate-coloured feathers, so that altogether he may be considered as the more beautiful of the two. He is larger and more pugnacious than the female, and does not sit on the eggs. So that in all these respects this species comes under our first class of cases; but Mr. Sclater (*Proceedings of the Zoological Society*, 1866, p. 150) was much surprised to observe that the young of both sexes, when about three months old, resembled in their dark heads and necks the adult males, instead of the adult females; so that it would appear in this case that the females have been modified, whilst the males and the young have retained a former state of plumage

We thus see that the cases in which female birds are more conspicuously coloured than the males, with the young in their immature plumage resembling the adult males instead of the adult females, as in the previous class, are not numerous, though they are distributed in various Orders. The amount of difference, also, between the sexes is incomparably less than that which frequently occurs in the last class; so that the cause of the difference, whatever it may have been, has here acted on the females either less energetically or less persistently than on the males in the last class. Mr. Wallace believes that the males have had their colours rendered less conspicuous for the sake of protection during the period of incubation; but the difference between the sexes in hardly any of the foregoing cases appears sufficiently great for this view to be safely accepted. In some of the cases, the brighter tints of the female are almost confined to the lower surface, and the males, if thus coloured, would not have been exposed to danger whilst sitting on the eggs. It should also be borne in mind that the males are not only in a slight degree less conspicuously coloured than the females, but are smaller and weaker. They have, moreover, not only acquired the maternal instinct of incubation, but are less pugnacious and vociferous than the females, and in one instance have simpler vocal organs. Thus an almost complete transposition of the

instincts, habits, colours, size, and of some points of structure, has been effected between the two sexes.

Now if we might assume that the males in the present class have lost some of that ardour which is usual to their sex, so that they no longer search eagerly for the females; or, if we might assume that the females have become much more numerous than the males- and in the case of one Indian Turnix the females are said to be "much more commonly met with than the males"*- then it is not improbable that the females would have been led to court the males, instead of being courted by them. This indeed is the case to a certain extent with some birds, as we have seen with the peahen, wild turkey, and certain kinds of grouse. Taking as our guide the habits of most male birds, the greater size and strength as well as the extraordinary pugnacity of the females of the Turnix and emu, must mean that they endeavour to drive away rival females, in order to gain possession of the male; and on this view all the facts become clear; for the males would probably be most charmed or excited by the females which were the most attractive to them by their bright colours, other ornaments, or vocal powers. Sexual selection would then do its work, steadily adding to the attractions of the females; the males and the young being left not at all, or but little modified.

* Jerdon, Birds of India, vol. iii., p. 598.

CLASS III When the adult male resembles the adult female, the young of both sexes have a peculiar first plumage of their own.- In this class the sexes when adult resemble each other, and differ from the young. This occurs with many birds of many kinds. The male robin can hardly be distinguished from the female, but the young are widely different, with their mottled dusky-olive and brown plumage. The male and female of the splendid scarlet ibis are alike, whilst the young are brown; and the scarlet colour, though common to both sexes, is apparently a sexual character, for it is not well developed in either sex under confinement; and a loss of colour often occurs with brilliant males when they are confined. With many species of herons the young differ greatly from the adults; and the summer plumage of the latter, though common to both sexes, clearly has a nuptial character. Young swans are slate-coloured, whilst the mature birds are pure white; but it would be superfluous to give additional instances. These differences between the young and the old apparently depend, as in the last two classes, on the young having retained a former or ancient state of plumage, whilst the old of both sexes have acquired a new one. When the adults are bright coloured, we may conclude from the remarks just made in relation to the scarlet ibis and to many herons, and from the analogy of the species in the first class, that such colours have been acquired through sexual selection by the nearly mature males; but that, differently from what occurs in the first two classes, the transmission, though limited to the same age, has not been limited to the same sex. Consequently, the sexes when mature resemble each other and differ from the young.

CLASS IV When the adult male resembles the adult female, the young of both sexes in their first plumage resemble the adults.- In this class the young and the adults of both sexes, whether brilliantly or obscurely coloured, resemble each other. Such cases are, I think, more common than those in the last class. We have in England instances in the kingfisher, some woodpeckers, the jay, magpie, crow, and many small dull-coloured birds, such as the hedge-warbler or kitty-wren. But the similarity in plumage between the young and the old is never complete, and graduates away into dissimilarity. Thus the young of some members of the kingfisher family are not only less vividly coloured than the adults, but many of the feathers on the lower surface are edged with brown,*- a vestige probably of a former state of the plumage. Frequently in the same group of birds, even within the same genus, for instance in an Australian genus of parrakeets

(Platycercus), the young of some species closely resemble, whilst the young of other species differ considerably from, their parents of both sexes, which are alike.*(2) Both sexes and the young of the common jay are closely similar; but in the Canada jay (*Perisoreus canadensis*) the young differ so much from their parents that they were formerly described as distinct species.*(3)

* Jerdon, *Birds of India*, vol. i., pp. 222, 228. Gould's *Handbook to the Birds of Australia*, vol. i., pp. 124, 130.

*(2) Gould, *ibid.*, vol. ii., pp. 37, 46, 56.

*(3) Audubon, *Ornith. Biography*, vol. ii., p. 55.

I may remark before proceeding that, under the present and next two classes of cases, the facts are so complex and the conclusions so doubtful, that any one who feels no especial interest in the subject had better pass them over.

The brilliant or conspicuous colours which characterise many birds in the present class, can rarely or never be of service to them as a protection; so that they have probably been gained by the males through sexual selection, and then transferred to the females and the young. It is, however, possible that the males may have selected the more attractive females; and if these transmitted their characters to their offspring of both sexes, the same results would follow as from the selection of the more attractive males by the females. But there is evidence that this contingency has rarely, if ever, occurred in any of those groups of birds in which the sexes are generally alike; for, if even a few of the successive variations had failed to be transmitted to both sexes, the females would have slightly exceeded the males in beauty. Exactly the reverse occurs under nature; for, in almost every group in which the sexes generally resemble each other, the males of some few species are in a slight degree more brightly coloured than the females. It is again possible that the females may have selected the more beautiful males, these males having reciprocally selected the more beautiful females; but it is doubtful whether this double process of selection would be likely to occur, owing to the greater eagerness of one sex than the other, and whether it would be more efficient than selection on one side alone. It is, therefore, the most probable view that sexual selection has acted, in the present class, as far as ornamental characters are concerned, in accordance with the general rule throughout the animal kingdom, that is, on the males; and that these have transmitted their gradually-acquired colours, either equally or almost equally, to their offspring of both sexes.

Another point is more doubtful, namely, whether the successive variations first appeared in the males after had become nearly mature, or whilst quite young. In either case sexual selection must have acted on the male when he had to compete with rivals for the possession of the female; and in both cases the characters thus acquired have been transmitted to both sexes and all ages. But these characters if acquired by the males when adult, may have been transmitted at first to the adults alone, and at some subsequent period transferred to the young. For it is known that, when the law of inheritance at corresponding ages fails, the offspring often inherit characters at an earlier age than that at which they first appeared in their parents.* Cases apparently of this kind have been observed with birds in a state of nature. For instance Mr. Blyth has seen specimens of *Lanius rufus* and of *Colymbus glacialis* which had assumed whilst young, in a quite anomalous manner, the adult plumage of their parents.*(2) Again, the young of the common swan (*Cygnus olor*) do not cast off their dark feathers and become white until eighteen months or two years old; but Dr. F. Forel has described the case of three vigorous young birds, out of a brood of four, which were born pure white. These young birds were not albinos, as shewn by the color of their beaks and legs, which nearly resembled the same parts

in the adults.* (3)

* Variation of Animals and Plants under Domestication, vol. ii., p. 79.

* (2) Charlesworth's Magazine of Natural History, vol. i., 1837, pp. 305, 306.

* (3) Bulletin de la Soc. Vaudoise des Sc. Nat., vol. x., 1869, p. 132. The young of the Polish swan, *Cygnus immutabilis* of Yarrell, are always white; but this species, as Mr. Sclater informs me, is believed to be nothing more than a variety of the domestic swan (*Cygnus olor*).

It may be worth while to illustrate the above three modes by which, in the present class, the two sexes and the young may have come to resemble each other, by the curious case of the genus *Passer*.* In the house-sparrow (*P. domesticus*) the male differs much from the female and from the young. The young and the females are alike, and resemble to a large extent both sexes and the young of the sparrow of Palestine (*P. brachydactylus*), as well as of some allied species. We may therefore assume that the female and young of the house-sparrow approximately shew us the plumage of the progenitor of the genus. Now with the tree-sparrow (*P. montanus*) both sexes and the young closely resemble the male of the house-sparrow; so that they have all been modified in the same manner, and all depart from the typical colouring of their early progenitor. This may have been effected by a male ancestor of the tree-sparrow having varied, firstly, when nearly mature; or, secondly, whilst quite young, and by having in either case transmitted his modified plumage to the females and the young; or, thirdly, he may have varied when adult and transmitted his plumage to both adult sexes, and, owing to the failure of the law of inheritance at corresponding ages, at some subsequent period to his young.

* I am indebted to Mr. Blyth for information in regard to this genus. The sparrow of Palestine belongs to the sub-genus *Petronia*.

It is impossible to decide which of these three modes has generally prevailed throughout the present class of cases. That the males varied whilst young, and transmitted their variations to their offspring of both sexes, is the most probable. I may here add that I have, with little success, endeavoured, by consulting various works, to decide how far the period of variation in birds has generally determined the transmission of characters to one sex or to both. The two rules, often referred to (namely, that variations occurring late in life are transmitted to one and the same sex, whilst those which occur early in life are transmitted to both sexes), apparently hold good in the first,* second, and fourth classes of cases; but they fail in the third, often in the fifth,* (2) and in the sixth small class. They apply, however, as far as I can judge, to a considerable majority of the species; and we must not forget the striking generalisation by Dr. W. Marshall with respect to the protuberances on the heads of birds. Whether or not the two rules generally hold good, we may conclude from the facts given in the eighth chapter, that the period of variation is one important element in determining the form of transmission.

* For instance, the males of *Tanagra aestiva* and *Fringilla cyanea* require three years, the male of *Fringilla ciris* four years, to complete their beautiful plumage. (See Audubon, Ornith. Biography, vol. i., pp. 233, 280, 378). The harlequin duck takes three years (*ibid.*, vol. iii., p. 614). The male of the gold pheasant, as I hear from Mr. Jenner Weir, can be distinguished from the female when about three months old, but he does not acquire his full splendour until the end of the September in the following year.

* (2) Thus the Ibis *tantalus* and *Grus americanus* take four years, the

Flamingo several years, and the *Ardea ludoviciana* two years, before they acquire their perfect plumage. See Audubon, *ibid.*, vol. i., p. 221; vol. iii., pp. 133, 139, 211.

With birds it is difficult to decide by what standard we ought to judge of the earliness or lateness of the period of variation, whether by the age in reference to the duration of life, or to the power of reproduction, or to the number of moults through which the species passes. The moulting of birds, even within the same family, sometimes differs much without any assignable cause. Some birds moult so early, that nearly all the body feathers are cast off before the first wing-feathers are fully grown; and we cannot believe that this was the primordial state of things. When the period of moulting has been accelerated, the age at which the colours of the adult plumage are first developed will falsely appear to us to be earlier than it really is. This may be illustrated by the practice followed by some bird-fanciers, who pull out a few feathers from the breast of nestling bullfinches, and from the head or neck of young gold-pheasants, in order to ascertain their sex; for in the males, these feathers are immediately replaced by coloured ones.* The actual duration of life is known in but few birds, so that we can hardly judge by this standard. And, with reference to the period at which the power of reproduction is gained, it is a remarkable fact that various birds occasionally breed whilst retaining their immature plumage.*(2) The fact of birds breeding in their immature plumage seems opposed to the belief that sexual selection has played as important a part, as I believe it has, in giving ornamental colours, plumes, &c., to the males, and, by means of equal transmission, to the females of many species. The objection would be a valid one, if the younger and less ornamental males were as successful in winning females and propagating their kind, as the older and more beautiful males. But we have no reason to suppose that this is the case. Audubon speaks of the breeding of the immature males of *Ibis tantalus* as a rare event, as does Mr. Swinhoe, in regard to the immature males of *Oriolus*.*(3) If the young of any species in their immature plumage were more successful in winning partners than the adults, the adult plumage would probably soon be lost, as the males would prevail, which retained their immature dress for the longest period, and thus the character of the species would ultimately be modified.*(4) If, on the other hand, the young never succeeded in obtaining a female, the habit of early reproduction would perhaps be sooner or later eliminated, from being superfluous and entailing waste of power.

* Mr. Blyth, in Charlesworth's Magazine of Natural History, vol. i., 1837, p. 300. Mr. Bartlett has informed me in regard to gold pheasants.

*(2) I have noticed the following cases in Audubon's Ornith. Biography. The red-start of America (*Muscapica ruticilla*, vol. i., p. 203). The *Ibis tantalus* takes four years to come to full maturity, but sometimes breeds in the second year (vol. iii., p. 133). The *Grus americanus* takes the same time, but breeds before acquiring its full plumage (vol. iii., p. 211). The adults of *Ardea caerulea* are blue, and the young white; and white, mottled, and mature blue birds may all be seen breeding together (vol. iv., p. 58): but Mr. Blyth informs me that certain herons apparently are dimorphic, for white and coloured individuals of the same age may be observed. The harlequin duck (*Anas histrionica*, Linn.) takes three years to acquire its full plumage, though many birds breed in the second year (vol. iii., p. 614). The white-beaded eagle (*Falco leucocephalus*, vol. iii., p. 210) is likewise known to breed in its immature state. Some species of *Oriolus* (according to Mr. Blyth and Mr. Swinhoe, in *Ibis*, July, 1863, p. 68) likewise breed before they attain their full plumage.

*(3) See the last footnote.

*(4) Other animals, belonging to quite distinct classes, are

either habitually or occasionally capable of breeding before they have fully acquired their adult characters. This is the case with the young males of the salmon. Several amphibians have been known to breed whilst retaining their larval structure. Fritz Muller has shewn (Facts and Arguments for Darwin, Eng. trans., 1869, p. 79) that the males of several amphipod crustaceans become sexually mature whilst young; and I infer that this is a case of premature breeding, because they have not as yet acquired their fully-developed claspers. All such facts are highly interesting, as bearing on one means by which species may undergo great modifications of character.

The plumage of certain birds goes on increasing in beauty during many years after they are fully mature; this is the case with the train of the peacock, with some of the birds of paradise, and with the crest and plumes of certain herons, for instance, the *Ardea ludovicana*.* But it is doubtful whether the continued development of such feathers is the result of the selection of successive beneficial variations (though this is the most probable view with birds of paradise) or merely of continuous growth. Most fishes continue increasing in size, as long as they are in good health and have plenty of food; and a somewhat similar law may prevail with the plumes of birds.

* Jerdon, Birds of India, vol. iii., p. 507, on the peacock. Dr. Marshall thinks that the older and more brilliant males of birds of paradise, have an advantage over the younger males; see Archives Neerlandaises, tom. vi., 1871. - On *Ardea*, Audubon, *ibid.*, vol. iii., p. 139.

CLASS V When the adults of both sexes have a distinct winter and summer plumage, whether or not the male differs from the female, the young resemble the adults of both sexes in their winter dress, or much more rarely in their summer dress, or they resemble the females alone. Or the young may have an intermediate character; or, again, they may differ greatly from the adults in both their seasonal plumages. - The cases in this class are singularly complex; nor is this surprising, as they depend on inheritance, limited in a greater or less degree in three different ways, namely, by sex, age, and the season of the year. In some cases the individuals of the same species pass through at least five distinct states of plumage. With the species, in which the male differs from the female during the summer season alone, or, which is rarer, during both seasons,* the young generally resemble the females, - as with the so-called gold-finch of North America, and apparently with the splendid Maluri of Australia.*(2) With these species, the sexes of which are alike during both the summer and winter, the young may resemble the adults, firstly, in their winter dress; secondly, and this is of much rarer occurrence, in their summer dress; thirdly, they may be intermediate between these two states; and, fourthly, they may differ greatly from the adults at all seasons. We have an instance of the first of these four cases in one of the egrets of India (*Buphus coromandus*), in which the young and the adults of both sexes are white during the winter, the adults becoming golden-buff during the summer.

* For illustrative cases, see vol. iv. of Macgillivray's History of British Birds; on *Tringa*, &c., pp. 229, 271; on the *Machetes*, p. 172; on the *Charadrius hiaticula*, p. 118; on the *Charadrius pluvialis*, p. 94.

*(2) For the goldfinch of N. America, *Fringilla tristis*, Linn., see Audubon, Ornithological Biography vol. i., p. 172. For the Maluri, Gould's Handbook of the Birds of Australia, vol. i., p. 318.

With the gaper (*Anastomus oscitans*) of India we have a similar case, but the colours are reversed: for the young and the adults of both sexes are grey and black during the winter, the adults becoming white during the summer.* As an instance of the second case, the young

of the razor-bill (*Alca Linn.*), in an early state of plumage, are coloured like the adults during the summer; and the young of the white-crowned sparrow of North America (*Fringilla leucophrys*), as soon as fledged, have elegant white stripes on their heads, which are lost by the young and the old during the winter.*⁽²⁾ With respect to the third case, namely, that of the young having an intermediate character between the summer and winter adult plumages, Yarrell*⁽³⁾ insists that this occurs with many waders. Lastly, in regard to the young differing greatly from both sexes in their adult summer and winter plumages, this occurs with some herons and egrets of North America and India, - the young alone being white.

* I am indebted to Mr. Blyth for information as to the Buphus; see also Jerdon, *Birds of India*, vol. iii., p. 749. On the *Anastomus*, see Blyth, in *Ibis*, 1867, p. 173.

*⁽²⁾ On the *Alca*, see Macgillivray, *Hist. Brit. Birds*, vol. v., p. 347. On the *Fringilla leucophrys*, Audubon, *ibid.*, vol. ii., p. 89. I shall have hereafter to refer to the young of certain herons and egrets being white.

*⁽³⁾ *History of British Birds*, vol. i., 1839, p. 159.

I will make only a few remarks on these complicated cases. When the young resemble the females in their summer dress, or the adults of both sexes in their winter dress, the cases differ from those given under Classes I and III only in the characters originally acquired by the males during the breeding-season, having been limited in their transmission to the corresponding season. When the adults have a distinct summer and winter plumage, and the young differ from both, the case is more difficult to understand. We may admit as probable that the young have retained an ancient state of plumage; we can account by sexual selection for the summer or nuptial plumage of the adults, but how are we to account for their distinct winter plumage? If we could admit that this plumage serves in all cases as a protection, its acquirement would be a simple affair; but there seems no good reason for this admission. It may be suggested that the widely different conditions of life during the winter and summer have acted in a direct manner on the plumage; this may have had some effect, but I have not much confidence in so great a difference as we sometimes see between the two plumages, having been thus caused. A more probable explanation is, that an ancient style of plumage, partially modified through the transference of some characters from the summer plumage, has been retained by the adults during the winter. Finally, all the cases in our present class apparently depend on characters acquired by the adult males, having been variously limited in their transmission according to age, season, and sex; but it would not be worth while to attempt to follow out these complex relations.

CLASS VI The young in their first plumage differ from each other according to sex; the young males resembling more or less closely the adult males, and the young females more or less closely the adult females. - The cases in the present class, though occurring in various groups, are not numerous; yet it seems the most natural thing that the young should at first somewhat resemble the adults of the same sex, and gradually become more and more like them. The adult male blackcap (*Sylvia atricapilla*) has a black head, that of the female being reddish-brown; and I am informed by Mr. Blyth, that the young of both sexes can be distinguished by this character even as nestlings. In the family of thrushes an unusual number of similar cases have been noticed; thus, the male blackbird (*Turdus merula*) can be distinguished in the nest from the female. The two sexes of the mocking bird (*Turdus polyglottus*, Linn.) differ very little from each other, yet the males can easily be distinguished at a very early age from the females by showing more pure white.* The males of a forest-thrush and of a rock-thrush (*Orocetes erythrogastra* and *Petrocincla cyanea*) have much of their plumage of a fine blue,

whilst the females are brown, and the nestling males of both species have their main wing and tail-feathers edged with blue whilst those of the female are edged with brown.*(2) In the young blackbird the wing-feathers assume their mature character and become black after the others; on the other hand, in the two species just named the wing-feather become blue before the others. The most probable view with reference to the cases in the present class is that the males, differently from what occurs in Class I, have transmitted their colours to their male offspring at an earlier age than that at which they were first acquired; for, if the males had varied whilst quite young, their characters would probably have been transmitted to both sexes.*(3)

* Audubon, Ornith. Biography, vol. i., p. 113.

*(2) Mr. C. A. Wright, in Ibis, vol. vi., 1864, p. 65. Jerdon, Birds of India, vol. i., p. 515. See also on the blackbird, Blyth in Charlesworth's Magazine of Natural History, vol. i., 1837, p. 113.

*(3) The following additional cases may be mentioned; the young males of *Tanagra rubra* can be distinguished from the young females (Audubon, Ornith. Biography, vol. iv., p. 392), and so it is within the nestlings of a blue nuthatch, *Dendrophila frontalis* of India (Jerdon, Birds of India, vol. i., p. 389). Mr. Blyth also informs me that the sexes of the stonechat, *Saxicola rubicola*, are distinguishable at a very early age. Mr. Salvin gives (Proc. Zoolog. Soc., 1870, p. 206) the case of a humming-bird, like the following one of *Eustephanus*.

In *Aithurus polytmus*, a humming-bird, the male is splendidly coloured black and green, and two of the tail-feathers are immensely lengthened; the female has an ordinary tail and inconspicuous colours; now the young males, instead of resembling the adult female, in accordance with the common rule, begin from the first to assume the colours proper to their sex, and their tail-feathers soon become elongated. I owe this information to Mr. Gould, who has given me the following more striking and as yet unpublished case. Two humming-birds belonging to the genus *Eustephanus*, both beautifully coloured, inhabit the small island of Juan Fernandez, and have always been ranked as specifically distinct. But it has lately been ascertained that the one which is of a rich chestnut-brown colour with a golden-red head, is the male, whilst the other which is elegantly variegated with green and white with a metallic green head is the female. Now the young from the first somewhat resemble the adults of the corresponding sex, the resemblance gradually becoming more and more complete.

In considering this last case, if as before we take the plumage of the young as our guide, it would appear that both sexes have been rendered beautiful independently; and not that one sex has partially transferred its beauty to the other. The male apparently has acquired his bright colours through sexual selection in the same manner as, for instance, the peacock or pheasant in our first class of cases; and the female in the same manner as the female *Rhynchaea* or *Turnix* in our second class of cases. But there is much difficulty in understanding how this could have been effected at the same time with the two sexes of the same species. Mr. Salvin states, as we have seen in the eighth chapter, that with certain humming-birds the males greatly exceed the females in number, whilst with other species inhabiting the same country the females greatly exceed the males. If, then, we might assume that during some former lengthened period the males of the Juan Fernandez species had greatly exceeded the females in number, but that during another lengthened period the females had far exceeded the males, we could understand how the males at one time, and the females at another, might have been rendered beautiful by the selection of the brighter coloured individuals of either sex; both sexes transmitting their characters to their young at a rather earlier age than usual. Whether this is the true explanation I will not pretend to say; but the case is too

remarkable to be passed over without notice.

We have now seen in all six classes, that an intimate relation exists between the plumage of the young and the adults, either of one sex or both. These relations are fairly well explained on the principle that one sex- this being in the great majority of cases the male- first acquired through variation and sexual selection bright colours or other ornaments, and transmitted them in various ways, in accordance with the recognised laws of inheritance. Why variations have occurred at different periods of life, even sometimes with species of the same group, we do not know, but with respect to the form of transmission, one important determining cause seems to be the age at which the variations first appear.

From the principle of inheritance at corresponding ages, and from any variations in colour which occurred in the males at an early age not being then selected- on the contrary being often eliminated as dangerous- whilst similar variations occurring at or near the period of reproduction have been preserved, it follows that the plumage of the young will often have been left unmodified, or but little modified. We thus get some insight into the colouring of the progenitors of our existing species. In a vast number of species in five out of our six classes of cases, the adults of one sex or of both are bright coloured, at least during the breeding-season, whilst the young are invariably less brightly coloured than the adults, or are quite dull coloured; for no instance is known, as far as I can discover, of the young of dull-coloured species displaying bright colours, or of the young of bright-coloured species being more brilliant than their parents. In the fourth class, however, in which the young and the old resemble each other, there are many species (though by no means all), of which the young are bright-coloured, and as these form old groups, we may infer that their early progenitors were likewise bright. With this exception, if we look to the birds of the world, it appears that their beauty has been much increased since that period, of which their immature plumage gives us a partial record.

On the Colour of the Plumage in relation to Protection.- It will have been seen that I cannot follow Mr. Wallace in the belief that dull colours, when confined to the females, have been in most cases specially gained for the sake of protection. There can, however, be no doubt, as formerly remarked, that both sexes of many birds have had their colours modified, so as to escape the notice of their enemies; or in some instances, so as to approach their prey unobserved, just as owls have had their plumage rendered soft, that their flight may not be overheard. Mr. Wallace remarks* that "it is only in the tropics, among forests which never lose their foliage, that we find whole groups of birds, whose chief colour is green." It will be admitted by every one, who has ever tried, how difficult it is to distinguish parrots in a leaf-covered tree. Nevertheless, we must remember that many parrots are ornamented with crimson, blue, and orange tints, which can hardly be protective. Woodpeckers are eminently arboreal, but besides green species, there are many black, and black-and-white kinds- all the species being apparently exposed to nearly the same dangers. It is therefore probable that with tree-haunting birds, strongly-pronounced colours have been acquired through sexual selection, but that a green tint has been acquired oftener than any other, from the additional advantage of protection.

* Westminster Review, July, 1867, p. 5.

In regard to birds which live on the ground, every one admits that they are coloured so as to imitate the surrounding surface. How difficult it is to see a partridge, snipe, woodcock, certain plovers, larks, and night-jars when crouched on ground. Animals inhabiting deserts offer the most striking cases, for the bare surface

affords no concealment, and nearly all the smaller quadrupeds, reptiles, and birds depend for safety on their colours. Mr. Tristram has remarked in regard to the inhabitants of the Sahara, that all are protected by their "isabelline or sand-colour."* Calling to my recollection the desert-birds of South America, as well as most of the ground-birds of Great Britain, it appeared to me that both sexes in such cases are generally coloured nearly alike. Accordingly, I applied to Mr. Tristram with respect to the birds of the Sahara, and he has kindly given me the following information. There are twenty-six species belonging to fifteen genera, which manifestly have their plumage coloured in a protective manner; and this colouring is all the more striking, as with most of these birds it differs from that of their congeners. Both sexes of thirteen out of the twenty-six species are coloured in the same manner; but these belong to genera in which this rule commonly prevails, so that they tell us nothing about the protective colours being the same in both sexes of desert-birds. Of the other thirteen species, three belong to genera in which the sexes usually differ from each other, yet here they have the sexes alike. In the remaining ten species, the male differs from the female; but the difference is confined chiefly to the under surface of the plumage, which is concealed when the bird crouches on the ground; the head and back being of the same sand-coloured hue in the two sexes. So that in these ten species the upper surfaces of both sexes have been acted on and rendered alike, through natural selection, for the sake of protection; whilst the lower surfaces of the males alone have been diversified, through sexual selection, for the sake of ornament. Here, as both sexes are equally well protected, we clearly see that the females have not been prevented by natural selection from inheriting the colours of their male parents; so that we must look to the law of sexually-limited transmission.

* Ibis, 1859, vol. i., p. 429, et seq. Dr. Rohlfs, however, remarks to me in a letter that according to his experience of the Sahara, this statement is too strong.

In all parts of the world both sexes of many soft-billed birds, especially those which frequent reeds or sedges, are obscurely coloured. No doubt if their colours had been brilliant, they would have been much more conspicuous to their enemies; but whether their dull tints have been specially gained for the sake of protection seems, as far as I can judge, rather doubtful. It is still more doubtful whether such dull tints can have been gained for the sake of ornament. We must, however, bear in mind that male birds, though dull-coloured, often differ much from their females (as with the common sparrow), and this leads to the belief that such colours have been gained through sexual selection, from being attractive. Many of the soft-billed birds are songsters; and a discussion in a former chapter should not be forgotten, in which it was shewn that the best songsters are rarely ornamented with bright tints. It would appear that female birds, as a general rule, have selected their mates either for their sweet voices or gay colours, but not for both charms combined. Some species, which are manifestly coloured for the sake of protection, such as the jack-snipe, woodcock, and night-jar, are likewise marked and shaded, according to our standard of taste, with extreme elegance. In such cases we may conclude that both natural and sexual selection have acted conjointly for protection and ornament. Whether any bird exists which does not possess some special attraction, by which to charm the opposite sex, may be doubted. When both sexes are so obscurely coloured that it would be rash to assume the agency of sexual selection, and when no direct evidence can be advanced shewing that such colours serve as a protection, it is best to own complete ignorance of the cause, or, which comes to nearly the same thing, to attribute the result to the direct action of the conditions of life.

Both sexes of many birds are conspicuously, though not brilliantly coloured, such as the numerous black, white, or piebald species; and these colours are probably the result of sexual selection. With the common blackbird, capercaillie, blackcock, black scoter-duck (*Oidemia*), and even with one of the birds of paradise (*Lophorina atra*), the males alone are black, whilst the females are brown or mottled; and there can hardly be a doubt that blackness in these cases has been a sexually selected character. Therefore it is in some degree probable that the complete or partial blackness of both sexes in such birds as crows, certain cockatoos, storks, and swans, and many marine birds, is likewise the result of sexual selection, accompanied by equal transmission to both sexes; for blackness can hardly serve in any case as a protection. With several birds, in which the male alone is black, and in others in which both sexes are black, the beak or skin about the head is brightly coloured, and the contrast thus afforded adds much to their beauty; we see this in the bright yellow beak of the male blackbird, in the crimson skin over the eyes of the blackcock and capercaillie, in the brightly and variously coloured beak of the scoter-drake (*Oidemia*), in the red beak of the chough (*Corvus graculus*, Linn.), of the black swan, and the black stork. This leads me to remark that it is not incredible that toucans may owe the enormous size of their beaks to sexual selection, for the sake of displaying the diversified and vivid stripes of colour, with which these organs are ornamented.* The naked skin, also, at the base of the beak and round the eyes is likewise often brilliantly coloured; and Mr. Gould, in speaking of one species,*⁽²⁾ says that the colours of the beak "are doubtless in the finest and most brilliant state during the time of pairing." There is no greater improbability that toucans should be encumbered with immense beaks, though rendered as light as possible by their cancellated structure, for the display of fine colours (an object falsely appearing to us unimportant), than that the male Argus pheasant and some other birds should be encumbered with plumes so long as to impede their flight.

* No satisfactory explanation has ever been offered of the immense size, and still less of the bright colours, of the toucan's beak. Mr. Bates (*The Naturalist on the Amazons*, vol. ii., 1863, p. 341) states that they use their beaks for reaching fruit at the extreme tips of the branches; and likewise, as stated by other authors, for extracting eggs and young birds from the nests of other birds. But, as Mr. Bates admits, the beak "can scarcely be considered a very perfectly-formed instrument for the end to which it is applied." The great bulk of the beak, as shown by its breadth, depth, as well as length, is not intelligible on the view that it serves merely as an organ of prehension. Mr. Belt believes (*The Naturalist in Nicaragua*, p. 197) that the principal use of the beak is as a defence against enemies, especially to the female whilst nesting in a hole in a tree.

*⁽²⁾ *Rhamphastos carinatus*, Gould's Monograph of Ramphastidae.

In the same manner, as the males alone of various species are black, the females being dull-coloured; so in a few cases the males alone are either wholly or partially white, as with the several bell-birds of South America (*Chasmorhynchus*), the Antarctic goose (*Bernicla antarctica*), the silver pheasant, &c., whilst the females are brown or obscurely mottled. Therefore, on the same principle as before, it is probable that both sexes of many birds, such as white cockatoos, several egrets with their beautiful plumes, certain ibises, gulls, terns, &c., have acquired their more or less completely white plumage through sexual selection. In some of these cases the plumage becomes white only at maturity. This is the case with certain gannets, tropic-birds, &c., and with the snow-goose (*Anser hyperboreus*). As the latter breeds on the "barren grounds," when not covered with snow, and as it migrates southward during the winter, there is no reason to suppose that its snow-white adult plumage serves as a protection. In

the *Anastomus oscitans*, we have still better evidence that the white plumage is nuptial character, for it is developed only during the summer; the young in their immature state, and the adults in their winter dress, being grey and black. With many kinds of gulls (*Larus*), the head and neck become pure white during the summer, being grey or mottled during the winter and in the young state. On the other hand, with the smaller gulls, or sea-mews (*Gavia*), and with some terns (*Sterna*), exactly the reverse occurs; for the heads of the young birds during the first year, and of the adults during the winter, are either pure white, or much paler coloured than during the breeding-season. These latter cases offer another instance of the capricious manner in which sexual selection appears often to have acted.*

* On *Larus*, *Gavia*, and *Sterna*, see Macgillivray, History of British Birds, vol. v., pp. 515, 584, 626. On the *Anser hyperboreus*, Audubon, Ornithological Biography, vol. iv., p. 562. On the *Anastomus*, Mr. Blyth, in *Ibis*, 1867, p. 173.

That aquatic birds have acquired a white plumage so much oftener than terrestrial birds, probably depends on their large size and strong powers of flight, so that they can easily defend themselves or escape from birds of prey, to which moreover they are not much exposed. Consequently, sexual selection has not here been interfered with or guided for the sake of protection. No doubt with birds which roam over the open ocean, the males and females could find each other much more easily, when made conspicuous either by being perfectly white or intensely black; so that these colours may possibly serve the same end as the call-notes of many land-birds.* A white or black bird when it discovers and flies down to a carcass floating on the sea or cast up on the beach, will be seen from a great distance, and will guide other birds of the same and other species, to the prey; but as this would be a disadvantage to the first finders, the individuals which were the whitest or blackest would not thus procure more food than the less strongly coloured individuals. Hence conspicuous colours cannot have been gradually acquired for this purpose through natural selection.

* It may be noticed that with vultures, which roam far and wide high in the air, like marine birds over the ocean, three or four species are almost wholly or largely white, and that many others are black. So that here again conspicuous colours may possibly aid the sexes in finding each other during the breeding-season.

As sexual selection depends on so fluctuating an element as taste, we can understand how it is that, within the same group of birds having nearly the same habits, there should exist white or nearly white, as well as black, or nearly black species, - for instance, both white and black cockatoos, storks, ibises, swans, terns, and petrels. Piebald birds likewise sometimes occur in the same groups together with black and white species; for instance, the black-necked swan, certain terns, and the common magpie. That a strong contrast in colour is agreeable to birds, we may conclude by looking through any large collection, for the sexes often differ from each other in the male having the pale parts of a purer white, and the variously coloured dark parts of still darker tints than the female.

It would even appear that mere novelty, or slight changes for the sake of change, have sometimes acted on female birds as a charm, like changes of fashion with us. Thus the males of some parrots can hardly be said to be more beautiful than the females, at least according to our taste, but they differ in such points, as in having a rose-coloured collar instead of "a bright emeraldine narrow green collar"; or in the male having a black collar instead of "a yellow demi-collar in front," with a pale roseate instead of a plum-blue head.* As so many male birds have elongated tail-feathers or elongated

crests for their chief ornament, the shortened tail, formerly described in the male of a humming-bird, and the shortened crest of the male goosander, seem like one of the many changes of fashion which we admire in our own dresses.

* See Jerdon on the genus *Palaeornis*, *Birds of India*, vol. i., pp. 258-260.

Some members of the heron family offer a still more curious case of novelty in colouring having, as it appears, been appreciated for the sake of novelty. The young of the *Ardea asha* are white, the adults being dark slate-coloured; and not only the young, but the adults in their winter plumage, of the allied *Buphus coromandus* are white, this colour changing into a rich golden-buff during the breeding-season. It is incredible that the young of these two species, as well as of some other members of the same family,* should for any special purpose have been rendered pure white and thus made conspicuous to their enemies; or that the adults of one of these two species should have been specially rendered white during the winter in a country which is never covered with snow. On the other hand we have good reason to believe that whiteness has been gained by many birds as a sexual ornament. We may therefore conclude that some early progenitor of the *Ardea asha* and the *Buphus* acquired a white plumage for nuptial purposes, and transmitted this colour to their young; so that the young and the old became white like certain existing egrets; and that the whiteness was afterwards retained by the young, whilst it was exchanged by the adults for more strongly-pronounced tints. But if we could look still further back to the still earlier progenitors of these two species, we should probably see the adults dark-coloured. I infer that this would be the case, from the analogy of many other birds, which are dark whilst young, and when adult are white; and more especially from the case of the *Ardea gularis*, the colours of which are the reverse of those of *A. asha*, for the young are dark-coloured and the adults white, the young having retained a former state of plumage. It appears therefore that, during a long line of descent, the adult progenitors of the *Ardea asha*, the *Buphus*, and of some allies, have undergone the following changes of colour: first, a dark shade; secondly, pure white; and thirdly, owing to another change of fashion (if I may so express myself), their present slaty reddish, or golden-buff tints. These successive changes are intelligible only on the principle of novelty having been admired by birds for its own sake.

* The young of *Ardea rufescens* and *A. caerulea* of the United States are likewise white, the adults being coloured in accordance with their specific names. Audubon (*Ornithological Biography*, vol. iii., p. 416; vol. iv., p. 58) seems rather pleased at the thought that this remarkable change of plumage will greatly "disconcert the systematists."

Several writers have objected to the whole theory of sexual selection, by assuming that with animals and savages the taste of the female for certain colours or other ornaments would not remain constant for many generations; that first one colour and then another would be admired, and consequently that no permanent effect could be produced. We may admit that taste is fluctuating, but it is not quite arbitrary. It depends much on habit, as we see in mankind; and we may infer that this would hold good with birds and other animals. Even in our own dress, the general character lasts long, and the changes are to a certain extent graduated. Abundant evidence will be given in two places in a future chapter, that savages of many races have admired for many generations the same cicatrices on the skin, the same hideously perforated lips, nostrils, or ears, distorted heads, &c.; and these deformities present some analogy to the natural ornaments of various animals. Nevertheless, with savages

such fashions do not endure for ever, as we may infer from the differences in this respect between allied tribes on the same continent. So again the raisers of fancy animals certainly have admired for many generations and still admire the same breeds; they earnestly desire slight changes, which are considered as improvements, but any great or sudden change is looked at as the greatest blemish. With birds in a state of nature we have no reason to suppose that they would admire an entirely new style of colouration, even if great and sudden variations often occurred, which is far from being the case. We know that dovecot pigeons do not willingly associate with the variously coloured fancy breeds; that albino birds do not commonly get partners in marriage; and that the black ravens of the Feroe Islands chase away their piebald brethren. But this dislike of a sudden change would not preclude their appreciating slight changes, any more than it does in the case of man. Hence with respect to taste, which depends on many elements, but partly on habit and partly on a love of novelty, there seems no improbability in animals admiring for a very long period the same general style of ornamentation or other attractions, and yet appreciating slight changes in colours, form, or sound.

Summary of the Four Chapters on Birds. - Most male birds are highly pugnacious during the breeding-season, and some possess weapons adapted for fighting with their rivals. But the most pugnacious and the best armed males rarely or never depend for success solely on their power to drive away or kill their rivals, but have special means for charming the female. With some it is the power of song, or of giving forth strange cries, or instrumental music, and the males in consequence differ from the females in their vocal organs, or in the structure of certain feathers. From the curiously diversified means for producing various sounds, we gain a high idea of the importance of this means of courtship. Many birds endeavour to charm the females by love-dances or antics, performed on the ground or in the air, and sometimes at prepared places. But ornaments of many kinds, the most brilliant tints, combs and wattles, beautiful plumes, elongated feathers, top-knots, and so forth, are by far the commonest means. In some cases mere novelty appears to have acted as a charm. The ornaments of the males must be highly important to them, for they have been acquired in not a few cases at the cost of increased danger from enemies, and even at some loss of power in fighting with their rivals. The males of very many species do not assume their ornamental dress until they arrive at maturity, or they assume it only during the breeding-season, or the tints then become more vivid. Certain ornamental appendages become enlarged, turgid, and brightly coloured during the act of courtship. The males display their charms with elaborate care and to the best effect; and this is done in the presence of the females. The courtship is sometimes a prolonged affair, and many males and females congregate at an appointed place. To suppose that the females do not appreciate the beauty of the males, is to admit that their splendid decorations, all their pomp and display, are useless; and this is incredible. Birds have fine powers of discrimination, and in some few instances it can be shewn that they have a taste for the beautiful. The females, moreover, are known occasionally to exhibit a marked preference or antipathy for certain individual males.

If it be admitted that the females prefer, or are unconsciously excited by the more beautiful males, then the males would slowly but surely be rendered more and more attractive through sexual selection. That it is this sex which has been chiefly modified, we may infer from the fact that, in almost every genus where the sexes differ, the males differ much more from one another than do the females; this is well shewn in certain closely-allied representative species, in which the females can hardly be distinguished, whilst the males are quite distinct. Birds in a state of nature offer individual differences which would amply suffice for the work of sexual selection; but we have seen that they occasionally present more

strongly marked variations which recur so frequently that they could immediately be fixed, if they served to allure the female. The laws of variation must determine the nature of the initial changes, and will have largely influenced the final result. The gradations, which may be observed between the males of allied species, indicate the nature of the steps through which they have passed. They explain also in the most interesting manner how certain characters have originated, such as the indented ocelli on the tail-feathers of the peacock, and the ball-and-socket ocelli on the wing-feathers of the Argus pheasant. It is evident that the brilliant colours, top-knots, fine plumes, &c., of many male birds cannot have been acquired as a protection; indeed, they sometimes lead to danger. That they are not due to the direct and definite action of the conditions of life, we may feel assured, because the females have been exposed to the same conditions, and yet often differ from the males to an extreme degree. Although it is probable that changed conditions acting during a lengthened period have in some cases produced a definite effect on both sexes, or sometimes on one sex alone, the more important result will have been an increased tendency to vary or to present more strongly-marked individual differences; and such differences will have afforded an excellent ground-work for the action of sexual selection.

The laws of inheritance, irrespectively of selection, appear to have determined whether the characters acquired by the males for the sake of ornament, for producing various sounds, and for fighting together, have been transmitted to the males alone or to both sexes, either permanently, or periodically during certain seasons of the year. Why various characters should have been transmitted sometimes in one way and sometimes in another, is not in most cases known; but the period of variability seems often to have been the determining cause. When the two sexes have inherited all characters in common they necessarily resemble each other; but as the successive variations may be differently transmitted, every possible gradation may be found, even within the same genus, from the closest similarity to the widest dissimilarity between the sexes. With many closely-allied species, following nearly the same habits of life, the males have come to differ from each other chiefly through the action of sexual selection; whilst the females have come to differ chiefly from partaking more or less of the characters thus acquired by the males. The effects, moreover, of the definite action of the conditions of life, will not have been masked in the females, as in the males, by the accumulation through sexual selection of strongly-pronounced colours and other ornaments. The individuals of both sexes, however affected, will have been kept at each successive period nearly uniform by the free intercrossing of many individuals.

With species, in which the sexes differ in colour, it is possible or probable that some of the successive variations often tended to be transmitted equally to both sexes; but that when this occurred the females were prevented from acquiring the bright colours of the males, by the destruction which they suffered during incubation. There is no evidence that it is possible by natural selection to convert one form of transmission into another. But there would not be the least difficulty in rendering a female dull-coloured, the male being still kept bright-coloured, by the selection of successive variations, which were from the first limited in their transmission to the same sex. Whether the females of many species have actually been thus modified, must at present remain doubtful. When, through the law of the equal transmission of characters to both sexes, the females were rendered as conspicuously coloured as the males, their instincts appear often to have been modified so that they were led to build domed or concealed nests.

In one small and curious class of cases the characters and habits of the two sexes have been completely transposed, for the females are larger, stronger, more vociferous and brighter coloured than the males. They have, also, become so quarrelsome that they often fight together for the possession of the males, like the males of other

pugnacious species for the possession of the females. If, as seems probable, such females habitually drive away their rivals, and by the display of their bright colours or other charms endeavour to attract the males, we can understand how it is that they have gradually been rendered, by sexual selection and sexually-limited transmission, more beautiful than the males- the latter being left unmodified or only slightly modified.

Whenever the law of inheritance at corresponding ages prevails but not that of sexually-limited transmission, then if the parents vary late in life- and we know that this constantly occurs with our poultry, and occasionally with other birds- the young will be left unaffected, whilst the adults of both sexes will be modified. If both these laws of inheritance prevail and either sex varies late in life, that sex alone will be modified, the other sex and the young being unaffected. When variations in brightness or in other conspicuous characters occur early in life, as no doubt often happens, they will not be acted on through sexual selection until the period of reproduction arrives; consequently if dangerous to the young, they will be eliminated through natural selection. Thus we can understand how it is that variations arising late in life have so often been preserved for the ornamentation of the males; the females and the young being left almost unaffected, and therefore like each other. With species having a distinct summer and winter plumage, the males of which either resemble or differ from the females during both seasons or during the summer alone, the degrees and kinds of resemblance between the young and the old are exceedingly complex; and this complexity apparently depends on characters, first acquired by the males, being transmitted in various ways and degrees, as limited by age, sex, and season.

As the young of so many species have been but little modified in colour and in other ornaments we are enabled to form some judgment with respect to the plumage of their early progenitors; and we may infer that the beauty of our existing species, if we look to the whole class, has been largely increased since that period, of which the immature plumage gives us an indirect record. Many birds, especially those which live much on the ground, have undoubtedly been obscurely coloured for the sake of protection. In some instances the upper exposed surface of the plumage has been thus coloured in both sexes, whilst the lower surface in the males alone has been variously ornamented through sexual selection. Finally, from the facts given in these four chapters, we may conclude that weapons for battle, organs for producing sound, ornaments of many kinds, bright and conspicuous colours, have generally been acquired by the males through variation and sexual selection, and have been transmitted in various ways according to the several laws of inheritance- the females and the young being left comparatively but little modified.*

* I am greatly indebted to the kindness of Mr. Sclater for having looked over these four chapters on birds, and the two following ones on mammals. In this way I have been saved from making mistakes about the names of the species, and from stating anything as a fact which is known to this distinguished naturalist to be erroneous. But, of course, he is not at all answerable for the accuracy of the statements quoted by me from various authorities.