## Art. IV.—The Descent of Man.

*The Descent of Man, and Selection in Relation to Sex.* By Charles Darwin. In Two Volumes, with Illustrations. London: John Murray. 1871.

WE are bound to apologize for having thus far delayed our notice of Mr. Darwin's latest work. Probably no work during the past year has so much attracted the attention of intelligent readers; assuredly not one has so well deserved it. Yet we feel convinced that those who are most competent to judge, who have studied Mr. Darwin's writings with the greatest diligence, who have best appreciated his facts and followed his arguments, will be the first to excuse us. The whole subject is so copious, so complex, so difficult, so varied in its aspects, and withal so suggestive, that one may well pause before venturing to pronounce a decided opinion upon it. Moreover, in his preface, Mr. Darwin has promised us yet another contribution to the same great topic, in the form of "an essay on the expression of the various emotions by man and the lower animals." For this, however, we shall not wait, but proceed forthwith to accomplish, as best we may, our long-protracted task.

Even our author's title-page must be read with care. He treats, in fact, of two subjects, which, though distinct, are closely connected with one another: (1) The Descent of Man, and (2) Selection in Relation to Sex. His book accordingly contains two Parts, which we shall discuss in turn.

The First Part may be regarded as one long attempt to show man's genetic relation to the rest of the animal world, in accordance with Mr. Darwin's views on the evolution of all organic beings.

Man is either an animal or not an animal. Those few naturalists who place him in a kingdom by himself, apart from the rest of the animal world, can only do so by finally disregarding those marks of resemblance in the structure and functions of his body to those of animals which at the outset, in their history of the subject, they must admit.

Those, on the other hand, who leave man in the animal kingdom, differ as to the rank to be assigned him there, from that of a species in one genus with the anthropoid apes to the more elevated position of a distinct province or even sub-kingdom. The founder of system, Linnæus, held the former view. With him man was only a species of the more extensive genus Simia. Let the unlearned reader note this, that he may see how pos-

sible it is to hold precise opinions as to the value of man's affinities to other creatures, without any reference to Darwinian controversies. Till within the last decade a majority of zoologists, following Blumenbach and Cuvier, have upheld man's title to the rank of an 'order.' Professor Owen proposed for his reception one of the four 'sub-classes' into which, having regard to cerebral characters, he divided the class of mammals. To this arrangement there are grave objections. By Professor Huxley man is held worthy to constitute a 'sub-order' of the modified Linnæan group Primates. In our own opinion, after a thoroughly eclectic and comparative review of all man's zoological characters, proper and common, the most just and useful estimate of man would seem to be that which allows him neither more nor less than the position of what is technically called a 'family.' Briefly, there are four families of Primates—(1) Man only; (2) the Catarrhines, or Apes, Monkeys, and Baboons of the Old World; (3) the Platyrrhines or Monkeys of the New World, with the exception of (4) the Marmosets. The Primates and Lemures may be regarded as two distinct sub-orders of the same ordinal group of mammals. Very similar views are expressed by Mr. Darwin, who justly hints that if "man had not been his own classifier, he would never have thought of founding a separate order for his own reception."

"As far as differences in certain important points of structure are concerned, man may no doubt rightly claim the rank of a Sub-order; and this rank is too low, if we look chiefly to his mental faculties. Nevertheless, under a genealogical point of view it appears that this rank is too high, and that man ought to form merely a Family, or possibly even only a Sub-family. If we imagine three lines of descent proceeding from a common source, it is quite conceivable that two of them might after the lapse of ages be so slightly changed as still to remain as species of the same genus; whilst the third line might become so greatly modified as to deserve to rank as a distinct Sub-family, Family, or even Order. But in this case it is almost certain that the third line would still retain through inheritance numerous small points of resemblance with the other two lines. Here then would occur the difficulty, at present insoluble, how much weight we ought to assign in our classifications to strongly-marked differences in some few points,—that is, to the amount of modification undergone; and how much to close resemblance in numerous unimportant points, as indicating the lines of descent or genealogy. The former alternative is the most obvious, and perhaps the safest, though the latter appears the most correct as giving a truly natural classification."

Mr. Darwin's first chapter on "The Evidence of the Descent of Man from some Lower Form," is chiefly devoted to reviewing man's structure as bearing on his origin. So much has of late

years been written on the question—how far is man like and how far unlike other animals, as to his form, parts, functions, mode of development, and other zoological characters, that Mr. Darwin does not deem it necessary to urge at length what to most biologists will seem a foregone conclusion—that the body of man is more like the body of certain apes than are these apes to some other members of their own order. He lays particular stress on three great classes of facts, the bearing of which is "unmistakeable." These are, the resemblances of homological structures in man and animals, the similarity of their embryonic development to his, and the existence of rudimentary organs. Many known facts and not a few new ones are admirably presented within the two sheets of printed matter to which this chapter extends. We quote the following, by way of sample, in hopes that the reader may be induced to seek the illustrative figure referred to in the work itself:—

"The celebrated sculptor, Mr. Woolner, informs me of one little peculiarity in the external ear, which he has often observed both in men and women, and of which he perceived the full signification. His attention was first called to the subject whilst at work on his figure of Puck, to which he had given pointed ears. He was thus led to examine the ears of various monkeys, and subsequently more carefully those of man. The peculiarity consists in a little blunt point, projecting from the inwardly folded margin, or helix. Mr. Woolner made an exact model of one such case. These points not only project inwards, but often a little outwards, so that they are visible when the head is viewed from directly in front or behind. They are variable in size and somewhat in position, standing either a little higher or lower; and they sometimes occur on one ear and not on the other. Now the meaning of these projections is not, I think, doubtful; but it may be thought that they offer too trifling a character to be worth notice. This thought, however, is as false as it is natural. Every character, however slight, must be the result of some definite cause; and if it occurs in many individuals deserves consideration. The helix obviously consists of the extreme margin of the ear folded inwards; and this folding appears to be in some manner connected with the whole external ear being permanently pressed backwards. In many monkeys, which do not stand high in the order, as baboons and some species of macacus, the upper portion of the ear is slightly pointed, and the margin is not at all folded inwards; but if the margin were to be thus folded, a slight point would necessarily project inwards and probably a little outwards. This could actually be observed in a specimen of the *Ateles beelzebuth* in the Zoological Gardens; and we may safely conclude that it is a similar structure—a vestige of formerly pointed ears—which occasionally reappears in man."

Several other particulars of great interest, gleaned by Mr. Darwin from a variety of authentic sources, are given in the

same chapter. The whole mass of evidence adduced has led his mind to the following conclusion:—

"Thus we can understand how it has come to pass that man and all other vertebrate animals have been constructed on the same general model, why they pass through the same early stages of development, and why they retain certain rudiments in common. Consequently we ought frankly to admit their community of descent: to take any other view, is to admit that our own structure, and that of all the animals around us, is a mere snare laid to entrap our judgment. This conclusion is greatly strengthened, if we look to the members of the whole animal series, and consider the evidence derived from their affinities or classification, their geographical distribution and geological succession. It is only our natural prejudice, and that arrogance which made our forefathers declare that they were descended from demi-gods, which leads us to demur to this conclusion. But the time will before long come when it will be thought wonderful, that naturalists, who were well acquainted with the comparative structure and development of man and other mammals, should have believed that each was the work of a separate act of creation."

Turning now to man's mental powers, we find ourselves in a position of considerable difficulty. Mr. Darwin devotes two chapters to the "Comparison of the Mental Powers of Man and the Lower Animals." But the backward state of psychology will not permit us to distinguish man's mental powers with precision, and he would be a bold writer who should undertake to enumerate, much less define, the mental powers of animals. So that here the essential elements for exact comparison are wanting, and the subject is only susceptible of a mode of treatment which we must designate as vague, provisional, and contradictory. This is not the fault of Mr. Darwin.

Further, the whole matter is involved in a cloud of prejudice which, by a law of reaction unhappily too familiar to philosophers, has in its turn obscured and checked our thoughts. Independence and clearness of view very much above the average are necessary to him who would make any progress with these inquiries—nay, even to him who, without attaining to any height of discovery, would succeed in freeing his mind from vulgar errors. To some the statement that animals may reason seems almost profane. With many persons the word 'instinct' is a synonym for all the mental powers of animals and of these only, as 'reason,' on the other hand, is commonly understood to mean the sum total of the mental powers of man alone. But if these words are to have any meaning, the truer statement would be, that both instinct and reason are shared by man with many of the higher animals.

Mr. Darwin clearly shows that several animals possess the

faculties of Attention and Memory, together with some power of Imagination. (He does not sufficiently distinguish this last from Expectation, in Mr. J. S. Mill's sense of that term.) All of these may be regarded as subsidiary to the reasoning powers which such animals undoubtedly display. This is shown by their capacity for progress, and by their use of tools and weapons. Animals also use (inarticulate) language. They are not without a sense of the beautiful. They are profoundly affected, like man, by certain emotions—for example, that of curiosity. They imitate the actions, not only of their own kindred, but sometimes of other species, and finally of man himself. They "retain their mental individuality." Perhaps a few animals possess a rudiment of self-consciousness.

Mr. Darwin, in his second chapter, discusses all these topics with his accustomed fairness. He starts with the admission that man differs greatly in his mental power from all other animals, and that "the difference in this respect is enormous, even if we compare the mind of one of the lowest savages, who has no words to express any number higher than four, and who uses no abstract terms for the commonest objects or affections, with that of the most highly organized ape." On the other hand, all differences "of this kind between the highest men of the highest races and the lowest savages, are connected by the finest gradations. Therefore it is possible they might pass and be developed into each other." In spite of these difficulties, Mr. Darwin concludes "that there is no fundamental difference between man and the higher mammals in their mental faculties." The whole chapter abounds in sagacious reasonings, and is worth reading if only as a record of observations by the author and other naturalists. We quote his account of Reason in animals:—

"Of all the faculties of the human mind, it will, I presume, be admitted that *Reason* stands at the summit. Few persons any longer dispute that animals possess some power of reasoning. Animals may constantly be seen to pause, deliberate, and resolve. It is a significant fact, that the more the habits of any particular animal are studied by a naturalist, the more he attributes to reason and the less to unlearnt instincts. In future chapters we shall see that some animals extremely low in the scale apparently display a certain amount of reason. No doubt it is often difficult to distinguish between the power of reason and that of instinct. Thus Dr. Hayes, in his work on 'The Open Polar Sea,' repeatedly remarks that his dogs, instead of continuing to draw the sledges in a compact body, diverged and separated when they came to thin ice, so that their weight might be more evenly distributed. This was often the first warning and notice which the travellers received that the ice was becoming thin and dangerous. Now, did the dogs act thus from the experience of each individual, or from the example of the older and wiser dogs, or from an inherited habit,

that is, from an instinct? This instinct might possibly have arisen since the time, long ago, when dogs were first employed by the natives in drawing their sledges; or the Arctic wolves, the parent-stock of the Esquimaux dog, may have acquired this instinct, impelling them not to attack their prey in a close pack when on thin ice. Questions of this kind are most difficult to answer.

"So many facts have been recorded in various works showing that animals possess some degree of reason, that I will here give only two or three instances, authenticated by Rengger, and relating to American monkeys, which stand low in their order. He states that when he first gave eggs to his monkeys, they smashed them and thus lost much of their contents; afterwards they gently hit one end against some hard body, and picked off the bits of shell with their fingers. After cutting themselves only once with any sharp tool, they would not touch it again, or would handle it with the greatest care. Lumps of sugar were often given them wrapped up in paper; and Rengger sometimes put a live wasp in the paper, so that in hastily unfolding it they got stung; after this had once happened, they always first held the packet to their ears to detect any movement within. Any one who is not convinced by such facts as these, and by what he may observe with his own dogs, that animals can reason, would not be convinced by anything that I could add. Nevertheless I will give one case with respect to dogs, as it rests on two distinct observers, and can hardly depend on the modification of any instinct.

"Mr. Colquhoun winged two wild-ducks, which fell on the opposite side of a stream; his retriever tried to bring over both at once, but could not succeed; she then, though never before known to ruffle a feather, deliberately killed one, brought over the other, and returned for the dead bird. Colonel Hutchinson relates that two partridges were shot at once, one being killed, the other wounded; the latter ran away, and was caught by the retriever, who on her return came across the dead bird; 'she stopped, evidently greatly puzzled, and after one or two trials, finding she could not take it up without permitting the escape of the winged bird, she considered a moment, then deliberately murdered it by giving it a severe crunch, and afterwards brought away both together. This was the only known instance of her having ever wilfully injured any game.' Here we have reason, though not quite perfect, for the retriever might have brought the wounded bird first and then returned for the dead one, as in the case of the two wild ducks.

"The muleteers in S. America say, 'I will not give you the mule whose step is easiest, but *la mas racional*,—the one that reasons best;' and Humboldt adds, 'this popular expression, dictated by long experience, combats the system of animated machines, better perhaps than all the arguments of speculative philosophy.'"

We confess our inability to treat in a few paragraphs the subjects of language, also discussed in this chapter, and of ethics, to which the third chapter is devoted. These subjects, sufficiently vast in themselves, have their boundaries much enlarged when

considered from the point of view of the derivative hypothesis. Mr. Darwin "cannot doubt that language owes its origin to the imitation and modification, aided by signs and gestures, of various natural sounds, the voices of other animals, and man's own instinctive cries." This is the famous *bow-wow* theory.

"The imitation by articulate sounds of musical cries might have given rise to words expressive of various complex emotions. As bearng on the subject of imitation, the strong tendency in our nearest allies, the monkeys, in microcephalus idiots, and in the barbarous races of mankind, to imitate whatever they hear deserves notice. As monkeys certainly understand much that is said to them by man, and as in a state of nature they utter signal-cries of danger to their fellows, it does not appear altogether incredible that some unusually wise ape-like animal should have thought of imitating the growl of a beast of prey, so as to indicate to his fellow monkeys the nature of the expected danger. And this would have been a first step in the formation of a language."

Mr. Darwin, contrary to what hasty thinkers might erroneously have anticipated, is no upholder of the "selfish" school of morals. With him, "the moral sense is fundamentally identical with our social instincts; and in the case of the lower animals it would be absurd to speak of these instincts as having been developed from selfishness, or for the happiness of the community."

"They have, however, certainly been developed for the general good of the community. The term, general good, may be defined as the means by which the greatest possible number of individuals can be reared in full vigour and health, with all their faculties perfect, under the conditions to which they are exposed. As the social instincts both of man and the lower animals have no doubt been developed by the same steps, it would be advisable, if found practicable, to use the same definition in both cases, and to take as the test of morality, the general good or welfare of the community, rather than the general happiness; but this definition would perhaps require some limitation on account of political ethics.

"When a man risks his life to save that of a fellow-creature, it seems more appropriate to say that he acts for the general good or welfare, rather than for the general happiness of mankind. No doubt the welfare and the happiness of the individual usually coincide; and a contented, happy tribe will flourish better than one that is discontented and unhappy. We have seen that at an early period in the history of man, the expressed wishes of the community will have naturally influenced to a large extent the conduct of each member; and as all wish for happiness, the 'greatest happiness principle' will have become a most important secondary guide and object; the social instincts, including sympathy, always serving as the primary impulse and guide. Thus the reproach of laying the foundation of the most noble part of our nature in the base principle of selfishness is removed; unless

indeed the satisfaction which every animal feels when it follows its proper instincts, and the dissatisfaction felt when prevented, be called selfish."

Admitting that the differences, mental and bodily, between man and some animals are not such as to forbid the hypothesis of their descent from a common progenitor, Mr. Darwin proceeds, in his fourth chapter, to trace the manner of man's development. We do not think it necessary to analyse this chapter. The laws of the origin and development of man are presumably the same as those which govern the origin and development of other species. No doubt the conflict between these laws, and the more potent operations of some of them are, in his case, peculiarly interesting and are strikingly manifested when we come to study them in detail. But this would be to reopen the whole question of the origin of species.

How primitive man became civilized, especially by the development of his intellectual and moral faculties, and of the arts and institutions consequent thereon, is the subject of our author's fifth chapter. It is far too large and complex to be treated in the present article. The doctrine that civilized nations were once barbarous is an obvious consequence of Mr. Darwin's hypothesis. The opposite belief, that primitive man was civilized, urged by Archbishop Whately and again put forward by the Duke of Argyll, he does not think it necessary to refute, referring to the works of other writers for a full discussion of the subject.

"To believe that man was aboriginally civilized and then suffered utter degradation in so many regions, is to take a pitiably low view of human nature. It is apparently a truer and more cheerful view that progress has been much more general than retrogression; that man has risen, though by slow and interrupted steps, from a lowly condition to the highest standard as yet attained by him in knowledge, morals, and religion."

The stagnation, or what appears to be such, which the history of some peoples reveals, and the very unequal progress in civilization which the same nation may make at different periods, or at the same period among different sections of the population, tend much to complicate the subject of civilization in general. We know how different parts of the mental constitution of the same individual are liable to be affected in unequal degrees by the social and other conditions to which he is exposed. Hence arise some of the most noteworthy, though not always the most striking, points of disposition. For such inequalities, not harmonizing with those of our own minds, distract and mislead us in our estimate of the motives, and consequent interpretation of the actions of others.

Our author's views on man's affinities and genealogy, discussed in his sixth chapter, may easily be anticipated from what has been said. In short, the phylogeny of man, so far as our space permits, may be indicated by enumerating the following list of common progenitors—namely, the common progenitor of

1. Man and the Monkeys of the Old World.
2. All the Primates.
3. The Primates and Lemures.
4. The above and other 'disco-placental' mammals.
5. All placental mammals.
6. All mammals, placental and implacental.
7. Mammals and other vertebrate animals.

The phylogeny of the vertebrate animals is not easily discerned. From the time that Von Baer first pointed out the important characters which mark the Vertebrata at an early period in their embryonic development, almost every scientific zoologist has acknowledged the existence of a great gulf fixed between them and the higher invertebrates. But recently a Russian naturalist has made the startling discovery, since corroborated by others, that the free-swimming young of certain ascidians (the simplest in structure of all animals which are furnished with a distinct heart) exhibit structures which, in their relative position, resemble the highly characteristic nervous axis and dorsal chord of the Vertebrata; a primitive segmentation, like that of vertebrates, also shows itself. There is therefore some probability that ascidians and vertebrates had a common progenitor. This conclusion is strengthened when we consider the lowest and most aberrant of all vertebrate animals, the lancelet or Amphioxus. In this strange creature the heart is quite rudimentary, and no trace of an organ of hearing exists. Since the dorsal chord runs to the end of the pointed anterior extremity, while in other vertebrate animals it stops short close to where the young skull joins the spinal region, there is reason to infer that in Amphioxus all those important structures which, in other vertebrate animals lie in front of the termination of the notochord, are wanting. The brain of a lamprey, next to Amphioxus, the lowest vertebrate animal, more resembles the brain of man than it does that of the lancelet, or rather the scarcely modified anterior end of the nervous axis in this brainless animal. Lastly, the breathing apparatus of the lancelet is more like that of an ascidian than of a fish.

The affinities of the ascidians are very complicated. Placed by Milne-Edwards with the molluscoids, they are also allied to the true (or higher) molluscs, and even to the worms. No other

invertebrate class has such diverse relationships with several groups, and this fact renders their possible connexion with vertebrates the more interesting.

In the seventh chapter, with which the First Part of his work concludes, Mr. Darwin considers the races of man, with a view "to inquire what is the value of the differences between them under a classificatory point of view, and how they have originated." After summing up the facts and arguments on both sides of the question, and pointing out the difficulties which impede its complete solution, he comes to the conclusion that the differences among men are not sufficient to justify the division of mankind into several species, and that the various races of man rather correspond, in systematic value, with what have been termed 'sub-species' in other departments of natural history.

It is certain that races may become extinct, and some, we know, are verging on extinction. In producing such extinction, untoward physical conditions, according to our author, have had little influence. But along with other causes, in the case of half-civilized nations, between whom the direct struggle for life is often strong, or when civilized nations clash with barbarians, their effect may possibly be more potent.

Mr. Darwin, in attempting to account for the origin of races, while admitting the existence of such causes as crossing, natural selection, and the direct action of the conditions of life, is of opinion that none of these are fully competent to produce such great results. Thus he is led to ask—what other causes are here in operation? Of these, neglecting the unknown agencies which produce spontaneous (or inexplicable) modifications, the most important is SEXUAL SELECTION, the detailed consideration of which occupies the Second Part of his work. This Part is nearly twice the length of the First. With the exception of its introductory and concluding chapters and one chapter on sexual selection in man, it is altogether devoted to a review of sexual selection and of the characters associated therewith in the several classes of the animal kingdom.

Sexual selection takes place whenever one animal mates with another of the opposite sex, preferring it to its fellows of the same sex. All acts of this kind, together with the conditions which of necessity immediately precede or accompany them, constitute the phenomena of sexual selection.

That sex which chooses must obviously have senses and a mind to perceive the differences which obtain among the individuals of the other. Hence two essential conditions of sexual selection, objective and subjective. We see also that powers of locomotion are necessary to bring the sexes into the neighbour-

hood of each other and thus afford due opportunity for the exercise of their respective abilities.

The act of sexual selection, apart from collateral circumstances and neglecting exceptional instances, may at once be described as the choice by the female of one out of many males of her own species. "The law is, that the male shall seek the female." Thus Kirby (as quoted by Mr. Darwin) wrote of insects, and might have written of most animals. But why is it so? Let us hear Mr. Darwin's answer.

"We are naturally led to inquire why the male in so many and such widely distinct classes has been rendered more eager than the female, so that he searches for her and plays the more active part in courtship. It would be no advantage and some loss of power if both sexes were mutually to search for each other; but why should the male almost always be the seeker? With plants, the ovules after fertilization have to be nourished for a time; hence the pollen is necessarily brought to the female organs—being placed on the stigma, through the agency of insects or of the wind, or by the spontaneous movements of the stamens; and with the Algæ, &c., by the locomotive power of the antherozooids. With lowly-organized animals permanently affixed to the same spot and having their sexes separate, the male element is invariably brought to the female; and we can see the reason; for the ova, even if detached before being fertilized and not requiring subsequent nourishment or protection, would be, from their larger relative size, less easily transported than the male element. Hence plants* and many of the lower animals are, in this respect, analogous. In the case of animals not affixed to the same spot, but enclosed within a shell with no power of protruding any part of their bodies, and in the case of animals having little power of locomotion, the male must trust the fertilizing element to the risk of at least a short transit through the waters of the sea. It would, therefore, be a great advantage to such animals, as their organization became perfected, if the males when ready to emit the fertilizing element, were to acquire the habit of approaching the female as closely as possible. The males of various lowly-organized animals having thus aboriginally acquired the habit of approaching and seeking the females, the same habit would naturally be transmitted to their more highly developed male descendants; and in order that they should become efficient seekers, they would have to be endowed with strong passions. The acquirement of such passions would naturally follow from the more eager males leaving a larger number of offspring than the less eager."

With the female it is otherwise. She "with the rarest exceptions, is less eager than the male."

"As the illustrious Hunter long ago observed, she generally 're-

* Prof. Sachs ('Lehrbuch der Botanik,' 1870, s. 633) in speaking of the male and female reproductive cells, remarks, "verhält sich die eine bei der Vereinigung activ, . . . die andere erschient bei der Vereinigung passiv."

quires to be courted;' she is coy, and may often be seen endeavouring for a long time to escape from the male. Every one who has attended to the habits of animals will be able to call to mind instances of this kind. Judging from various facts, hereafter to be given, and from the results which may fairly be attributed to sexual selection, the female, though comparatively passive, generally exerts some choice and accepts one male in preference to others. Or she may accept, as appearances would sometimes lead us to believe, not the male which is the most attractive to her, but the one which is the least distasteful. The exertion of some choice on the part of the female seems almost as general a law as the eagerness of the male."

When a strong pugnacious male succeeds in defeating his opponents of the same sex the female may easily content herself with the victor. She does not, however, invariably do so, though the exceptions are probably unfrequent. But should the males contend, in a more peaceful fashion, by the production of musical sounds, the display of ornaments, and such other like methods, the possession on her part of more refined selective powers becomes necessary. That the gentler sex among animals is often highly gifted in this respect seems more than probable. When we note, for example, the splendid colours of the males of many birds, and consider how sedulously, and with what wonderful adjuncts, they are displayed with increased effect during the season of courtship, can we doubt that one female for whose sake, since in her presence only, these gorgeous exhibitions take place, is capable of appreciating, at least, their general effect?

Exceptions to the ruling law of sexual selection take place when the female seeks the male of her own species, or when, as must occur with the parents of hybrids, she prefers the male of another.

We can easily see how important in regard to sexual selection is the relative proportion of the sexes, a subject which on other grounds claims our attention. A more extended acquaintance with facts is here much needed. Most of our statistics under this head refer to man or domestic animals. In their case we find it easier to obtain results, or even seek to modify them by a change of external conditions. Such facts, though not to be despised, are plainly less valuable, because less varied and more remote from the circumstances of unimpeded selection, than those affecting *ferœ naturœ*. We have no means of estimating, in a vast majority of animals, which sex most abounds at birth. In the case of several species the males appear to predominate, but to this rule there are some exceptions. What determines the proportion of the sexes at birth—is another interesting question. Often, we must answer, unknown influences, whether

internal, depending on mental and material constitution, or external, such as food and temperature, the action of which cannot in this connexion be ascertained.* Some of these influences may be constant, others variable. The period at which impregnation takes place and the circumstances of polygamous as opposed to monogamous unions are not here operating conditions. More potent is the relative age of the parents. Illegitimate births show an increased proportion of females. It would seem as if the sex of the more vigorous† parent were likely to be inherited.

"Sectetur partem conclusio deteriorem,"

is not the rule in such cases, for love in its effects, as in its causes, is illogical. Noteworthy is the fact that with Jewish women the number of male births is very much above the Christian average.

"For our present purpose we are concerned with the proportion of the sexes, not at birth, but at maturity." Mr. Darwin has collected from a variety of sources all the accessible information on this head, and he sums up the results in a special supplement to his eighth chapter. It is known that with many animals the male is not only more exposed to danger than the female, but has a greater inherent viability, "for it is a well-ascertained fact that with man a considerably larger proportion of males than of females die before or during birth, and during the first few years of infancy. So it almost certainly is with male lambs, and so it may be with the males of other animals." We might therefore suppose that, with certain exceptions, the number of mature males must be less than that of females.‡ But our author is far too cautious to accept this conclusion unre-

* See, however, Falstaff's soliloquy on Prince John in *Henry IV.* Part 2.

† More vigorous, that is, at the period of fecundation.

‡ So that given M+F or M=F, the altered expression M—F might be worked out in different ways. Not only do males succumb to influences purely external or internal, as above stated, but they are also visited by a third class of catastrophes which cannot strictly be referred to either. We speak of dangers within the limits of their own species. The males of fishes are smaller than the females, who devour them freely. Baron De Geer saw a male spider which "in the midst of his preparatory caresses was seized by the object of his attentions, enveloped by her in a web, and then devoured—a sight which, as he adds, filled him with horror and indignation." Why are not these facts cited by those who believe in the existence of a great gulf fixed between men and animals? Uncivilized men, it is true, kill and eat their wives. Some civilized men kill but do not eat them, having so far lost the habits of their ancestors. But with no race of savages has a single instance occurred of a wife eating her husband. Mankind has never reached this lowest depth of animal degradation.

servedly. Practically, males are less numerous wherever polygamy obtains. Polygamy is unknown among the lower animals, and is only exhibited by those who possess obvious mental powers. Under ordinary circumstances it involves the exclusion of the weaker and less attractive males.

The practical disproportion between the sexes may arise from other causes. Thus in migratory birds the males first arrive and are ready to breed before the females. The females, when they begin to appear, since not all arrive simultaneously, are in the minority. Accordingly the males contend for their possession. The females have therefore every opportunity for selection. Now those females which are most vigorous will, in their turn, have the first choice, for they will be ready to breed before their fellows. They will also be able to rear the greatest number of offspring. So that, the best males uniting with the best females, the best and most numerous offspring will result. Allowing for the effects of inheritance and further variation, we begin to understand something of the part played by sexual selection. Let the above conditions be reversed, the males choosing the females, and a like result may easily be inferred.

In regard to animals with superfluous males or females, Mr. Darwin asks—"Could the sexes be equalized through natural selection?" He shows how in more ways than one equalization might be effected, directly or indirectly. The indirect action of natural selection will scarcely be felt where the disproportion between the sexes is slight. When it is greater, and natural selection has room to operate, the varying fertility of the same species becomes an important factor. A high degree of productivity is sometimes disadvantageous, in accordance with one aspect of the physiological law of individuation *versus* genesis; here natural selection may come strikingly into play, as both Mr. Herbert Spencer and Mr. Darwin have demonstrated. "In some peculiar cases, an excess in the number of one sex over the other might be a great advantage to a species, as with the sterile females of social insects, or with those animals in which more than one male is requisite to fertilize the female, as with certa n cirripedes, and perhaps certain fishes." These exceptional instances of 'imperative polyandry' are probably due to natural selection. "In all ordinary cases an inequality would be no advantage or disadvantage to certain individuals more than to others; and therefore it could hardly have resulted from natural selection." We can only, in our ignorance, ascribe it to unknown conditions.

Let us now consider the differences on which sexual selection depends. These are chiefly of the kind called by Hunter secondary sexual characters—

"which are not directly connected with the act of reproduction;

for instance, in the male possessing certain organs of sense or locomotion, of which the female is quite destitute, or in having them more highly-developed, in order that he may readily find or reach her; or again, in the male having special organs of prehension so as to hold her securely. These latter organs of infinitely diversified kinds graduate into, and in some cases can hardly be distinguished from, those which are commonly ranked as primary, such as the complex appendages at the apex of the abdomen in male insects. Unless indeed we confine the term 'primary' to the reproductive glands, it is scarcely possible to decide, as far as the organs of prehension are concerned, which ought to be called primary and which secondary."

Apart from their mental powers, their habits and actions, the sexes of the same species may differ as to number, form, size, colour, and structure. They may also differ in their relations to time, as when one sex comes to maturity and acquires or loses certain characters sooner than another. Not all sexual differences have to do with sexual selection. We except such characters as are obviously correlated with the diverse modes of life of the two sexes, seen in some species.

The male more frequently than the female exhibits secondary sexual characters; and these, with other characters which may accompany them, are in him eminently variable. In accordance with the law of sexually limited transmission (as opposed to that of equal transmission) the male usually transmits the peculiarities he acquires to his own sex only. It also frequently happens that their appearance or more conspicuous development coincides approximately with the period at which sexual selection takes place, and this fact points to the probability that the characters in question first arose at the beginning of adult life. Again, these characters, accumulated and inherited from parent to child, tend still further to differentiate the male, who is thus ever subject to increased modification by means of sexual selection. The female remains more like the young of her own or the adults of allied species. In her, however, must be latent the secondary sexual characters manifest in her male parent. Otherwise, how could these be transmitted to her offspring when she is made to pair with a male belonging to a different species?

From our present point of view the animal kingdom is divisible into two groups, in one of which secondary sexual characters are of frequent occurrence, in the other usually absent. We commonly find these characters in mammals, birds, reptiles, batrachians, fishes, insects, and crustaceans—that is, in what zoologists term 'vertebrate' and 'arthropod' animals. Not all these exhibit them, some of the exceptions being very puzzling and suggestive of curious considerations. They are very obvious in

man. They are wanting in the lowest animals (the 'Vermes' of Linnæus). Polygamy is favourable to their occurrence. Mr. Darwin asked Mr. Bartlett, Superintendent of our Zoological Gardens, whether the male tragopan (an exotic ally of the pheasants) was polygamous, and was much struck by his answer —"I do not know, but should think so from his splendid colours."

Our limits will not allow us to notice Mr. Darwin's account of sexual selection in each of the above classes. We can refer to one only, that of birds. This class is more interesting than any other, as illustrating the phenomena of sexual selection. The preferences and antipathies of birds are so wonderful and their opportunities for displaying them so varied, in consequence of the marvellous complexity and beauty of their secondary sexual characters, that "they appear to be the most æsthetic of all animals, excepting of course man, and they have nearly the same taste for the beautiful." It is therefore no wonder that Mr. Darwin devotes two hundred pages, about one-fourth of his entire work, to these animals.

"Most male birds are highly pugnacious during the breeding-season, and some possess weapons especially 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 emitting strange cries, or of producing 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 commoner 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 of 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 very 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 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 shown that they

have a taste for the beautiful. The females, moreover, are known occasionally to exhibit a marked preference or antipathy to certain males.

If it be admitted that the females prefer, or are unconsciously excited by the more beautiful males, then the males would slowly and surely be rendered more attractive through sexual selection."

The plumage of birds, in connexion with secondary sexual characters and their transmission, is noted at much length by Mr. Darwin. He distinguishes six "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 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 the adult females."

In the rare instances of the females being more conspicuous than the males, the habits and dispositions of the sexes are likewise transposed: the male sits on the eggs; the females are pugnacious. The disparity between the sexes in such birds, however, is never so extreme as when the male excels the female.

To show that the secondary sexual characters of birds are not causeless, Mr. Darwin appeals to their gradations. In this way he demonstrates how the beautiful and complex eye-like spots on the plumage of such birds as the peacock and argus pheasant may have been produced, the laws of variation and inheritance being also taken into account. His very ingenious explanation of these 'ocelli' is accompanied with several illustrations.

A few cases are cited by Mr. Darwin of differences between the sexes of birds which do not now appear to have any relation to sexual selection. Thus, the males of goldfinches have somewhat longer beaks than the females, and the two sexes do not commonly feed on the seeds of the same plant.

The author compares his views with those of Mr. Wallace and the Duke of Argyll in regard to the colours of birds as related to nidification and protection. We do not enter here into this controversy, no adequate discussion of which is possible without a lengthened analysis of the facts.

The fate of unpaired birds, the bachelors, old maids, widows and widowers of their kind, is also dwelt on by Mr Darwin. These constitute a reserve fund which is largely drawn on to recoup the losses caused by death. When one of a pair of birds is shot, we soon find the survivor in the company of a new mate, and this if the act of destruction be again and again repeated.

"These facts are certainly remarkable. How is it that so many birds are ready immediately to replace a lost mate? Magpies, jays, carrion-crows, partridges, and some other birds, are never seen during the spring by themselves, and these offer at first sight the most perplexing case. But birds of the same sex, although of course not truly paired, sometimes live in pairs or in small parties, as is known to be the case with pigeons and partridges. Birds also sometimes live in triplets, as has been observed with starlings, carrion-crows, parrots, and partridgee. With partridges two females have been known to live with one male, and two males with one female. In all such cases it is probable that the union would be easily broken. The males of certain birds may occasionally be heard pouring forth their love-song long after the proper time, showing that they have either lost or never gained a mate. Death from accident or disease of either one of a pair, would leave the other bird free and single; and there is reason to believe that female birds during the breeding-season are especially liable to premature death. Again, birds which have had their nests destroyed, or barren pairs, or retarded individuals, would easily be induced to desert their mates, and would probably be glad to take what share they could of the pleasures and duties of rearing offspring, although not their own. Such contingencies as these probably explain most of the foregoing cases. Nevertheless, it is a strange fact that within the same district, during the height of the breeding season, there should be so many males and females always ready to repair the loss of a mated pair. Why do not such spare birds immediately pair together? Have we not some reason to suspect—and the suspicion has occurred to Mr. Jenner Weir—that inasmuch as the act of courtship appears to be with many birds a prolonged and tedious affair, so it occasionally happens that certain males and females do not succeed during the proper season in exciting each other's love, and consequently do not pair."

It may please our gentler readers to learn that the fierce

method of trial by battle does not always avail the combatants. Our author has "been assured by Mr. W. Kowalevsky, that the female capercailzie sometimes steals away with a young male who has not dared to enter the arena with the older cocks; in the same manner as occasionally happens with the does of the red-deer in Scotland."

Since young animals are more generalized than adults, probably resembling the early progenitors of their kind, and since the young of most birds are duller than their parents, or quite dull, "if we look to the birds of the world, it appears that their beauty has been greatly increased since that period, of which we have a partial record in their immature plumage."

Thus, by an overwhelming accumulation of facts, Mr. Darwin has established the importance of secondary sexual characters. These characters, though not exhibited by all, obtain in the majority, certainly in a very large number of the species of the animal world. They will doubtless be proved to exist in very many animals not yet examined in this connexion. They may very probably be acquired by other animals which do not now possess them. How far, in certain cases, it is within our power to aid or extend their production, is a problem, of very great interest, which judicious observations and experiments must decide.

We do not know how secondary sexual characters first arise. Perhaps they are the result of spontaneous modifications. They may be due to the direct influence of the outward conditions of life. This problem, which now appears so obscure, ought not to be deemed incapable of solution. It may well be imagined that at their dawning they are manifested so faintly as to require for their recognition every aid to minute and repeated investigations.

But when once produced, they become amenable to the laws of inheritance and variation. These laws are ever in action. We are not able to point to any characters able to escape their operation. So that secondary sexual characters, like others, will be intensified, accumulated, and transmitted from generation to generation. Moreover, they have, so to speak, within themselves, or related to them by a quite peculiar intimacy, a cause very capable of extending their sphere and promoting their utility—namely, sexual selection.

Sexual selection bears to secondary sexual characters a relation both of cause and effect. Given secondary sexual characters, sexual selection must follow, if we grant that one sex is able to perceive the differences which mark the individuals of the other. From observations of the habits of animals, especially during the

season of courtship, it seems impossible to deny that they possess in various degrees this kind of mental power. Such inference is strengthened by the analogy of our own minds. An inhabitant of another planet, gifted with human intelligence, but without human desires, having watched both men and animals when in love, might surely ask—which is imitating the conduct of the other?

The marvellous diversities of habit which animals display, their repugnances and attractions, their curious behaviour towards one another, offer to our notice a crowd of striking phenomena. Much of what they do and think (for it is allowable to use this phrase) seems to us eminently natural. Their caprices, on the other hand, are sometimes quite unaccountable. In both respects they parody man, their observer. What we cannot explain in ourselves should not surprise us when we regard the actions of those whom, however active and intelligent our sympathies, we have not yet learned, never fully can learn, how to appreciate.

The student of sexual selection is not, *per se*, required to account for the intellectual and moral qualities of animals. These may be otherwise explained, and so explained must be acknowledged. Those animals which display secondary sexual characters are, in most cases, intelligent enough in other respects. If not so, the strongest and most typical of our unselfish desires is surely capable of utilizing to the utmost degree as much mental power as can be contributed towards its gratification. It may even react upon the higher nervous centres, and, other influences coming to its aid, the mental power of the species might thus become increased.

Sexual selections may transpose secondary sexual characters into primary, and *vice versâ*. It may even cause to become sexual characters not so originally, the master-passion love, with animals as with man, asserting its rights and acting on their material no less than on their mental constitution. For what else it can effect we refer to Mr. Darwin's book. He of course especially dwells on two kinds of results—(1) that sexual selection tends to enhance secondary sexual characters themselves, and (2) that it indirectly favours the transmission of variations not sexual, whenever these are associated with the former. Thus both, with all their proneness to further variation, are handed down to succeeding generations.

How extended is the view such considerations afford of the grand rôle which this agency performs in the scheme of organized nature.

> "'Tis love, 'tis love, 'tis love,
> Which makes the world go round."

Mr. Darwin gives a wider meaning to these words. Yet, with modesty and caution all his own, he makes a temperate use of his discovery. For him sexual selection is but one out of many forces acting within and upon the living world, all tending towards one combined result.

In one sense selection is a less fundamental power than natural selection. Natural selection favours variation, and variation must first have furnished the materials on which sexual selection depends. Sexual selection, in its turn, by helping to transmit variations promotes them, and thus it acts along with natural selection, or rather, in many instances, begins where natural selection ends. Both have a destructive as well as a constructive operation. When males fight to the death for the possession of the female, sexual selection acts by destroying, and so far resembles in its results the more striking aspect of natural selection. But its ordinary effects are essentially peaceful and life-giving. It is a far higher power than natural selection, since it involves the element of mind, and aids the further development, while contributing to the transmission of mental qualities.

Doubtless, sexual selection has played an important part in the history of our race. Alike with savage and with civilized men its operation continues, though checked by various hindrances. The standard of beauty among men changes with time and place. Savages choose their wives and savage women esteem their husbands because of peculiarities which we regard as exaggerations or defects of characters already sufficiently hideous. With these characters are associated others, so that unconscious selection must also occur. And thus the characters which distinguish races were, in all probability, established.

Let us remember that sexual selection, as we now see it among men, has lost much of its ancient freedom of action. It still appears to predominate over artificial influences (between which and natural selection it holds a curiously intermediate place), but these retard if they do not otherwise diminish its operation. It must have acted much more strongly in early times, with us as with higher beings—

> "In der heroischen Zeit, da Gotter und Göttingen liebten,
> Folgte Begierde dem Blick, folgte Genuss der Begier,"

than, "when man had advanced in his intellectual powers, but had retrograded in his instincts." According to our author, no other cause so potent has led to the differences which distinguish the races of men, and in a lesser degree man from the lower animals.

Our readers will now ask—has Mr. Darwin succeeded in proving his case, and is man descended from other animals?

Linnæus, we know, went further than Mr. Darwin in the view which he took of man's present zoological position. Successive anatomists have done their best to exaggerate every point of difference between man and the apes. The controversies thus provoked have led to a thorough and renewed investigation of the facts. These facts must be admitted in a sense very favourable to the reception of Mr. Darwin's opinions. Likeness in what we deem essential characters must ever strongly suggest relationship. The double meaning of 'affinity' (significant term) can no longer be neglected.

How primitive man arose from animal ancestors, and how he subsequently became civilized are two questions which cannot be separated from each other, particularly when we consider the origin of man's mental powers. It is more difficult to deal with these than with his bodily structure. Nor can we here employ a terminology so precise as that of anatomical science. But mental, like vital, phenomena obey the laws of gradation, variation, selection, inheritance, and accumulation. They also react powerfully on one another and their instrument, the nervous system. Hence any species which achieved early, though slight, superiority in this respect, would rapidly tend to surpass its fellows. Keeping in view the distinctions which obtain among men themselves, we may grant that man's possession of high mental qualities does not offer insuperable objections to the doctrine of his descent.

If man be descended from animals his genealogy cannot be doubtful. His nearest relations are the 'catarrhine' apes, and through these other vertebrates. As to the manner of his descent, the causes which have acted in the production of other species must have had their usual operation. The part played by sexual selection was probably, in his case, more effective.

The doctrine of man's descent from animals must stand or fall with that of descent in general. We cannot admit Mr. Darwin's hypothesis of the origin of species, and not apply it to ourselves. We cannot hold the intermediate view of man's body being the result of natural, his mind of supernatural, causes. Regarding the descent of man as a test of the Darwinian hypothesis, some will say that this hypothesis has been at once strengthened and weakened thereby. Admitting, as is obvious, man's case to be the most interesting, is it, on purely scientific grounds the best, the one most likely to yield exact results? It is indeed so important, that if we consider it as settled, the whole doctrine of development makes thereby a great step in advance, and we are introduced to the study of the genesis of all the higher mental phenomena.

Worthy of note is the position held by Mr. Darwin towards his own opinions. He is strongly convinced of their truth, yet he states them in moderate language. He feels more keenly than any one else the difficulties which surround him. He has altered some of his earlier beliefs, more especially in regard to the great importance of sexual selection. His work on this subject is a noble contribution to science, for the doctrine of development is truly independent of much that has been urged in its favour. The views of none of its supporters need be accepted in their entirety. An eminent palæontologist, now dead, compared it to the Duomo of Milan, so many years in building, that in process of time it underwent a change from a lower to a higher order of architecture. Mr. Darwin has distinguished himself above all his predecessors. Future investigators, grateful for what he has done, may elaborate his work still further, and carry it upwards towards its destined limits. The theory of development, when most truly expressed, will be the last of the grand series of facts which it must expound.

The case of man's descent does not yet admit of proof. The same may be said of the origin of any other species, of Mr. Darwin's hypothesis in general, and of the hypothesis of special creations, which it denies. Probability is the guide of life, and if it can be shown that the derivate hypothesis, applied to man, accounts for much that is otherwise inexplicable, that it colligates facts which the doctrine of special creations does not touch, that certain facts, which it does not explain are not inconsistent with it, that the objections to it are less formidable than those which the rival assumption must encounter, and that in truth it is worthy to be called an hypothesis, while that to which it is opposed is no hypothesis at all, but merely a confession that the subject is unknown and unknowable;—if all this be so, then must we accept, for a time at least, Mr. Darwin's view of this great question as more probable and presumably more true than any doctrine which has hitherto been substituted in its stead. Common fairness suggests this course; the interests of science demand it.

Let us hear the conclusion of the whole matter. He is a bold man who, testing Mr. Darwin's facts and arguments, believes in man's descent from the animal kingdom. He is a bolder who, resting on the evidence of ignorance, ventures to hold any other opinion.