REVIEWS AND NOTICES OF BOOKS.

1. *The Descent of Man and Selection in Relation to Sex.* By C. DARWIN. John Murray, London.
2. *On the Genesis of Species.* By ST GEORGE MIVART, F.R.S. Macmillan and Co.
3. *On Natural Selection.* By A. R. WALLACE. Second edition. Macmillan and Co.

THOSE who have read the philosophical work through which Mr Darwin is best known to the public with the care it deserves, will not be surprised to learn that he had during many years been collecting notes on the descent of man without any intention of publishing, but rather with the determination not to publish anything on the subject, lest what he wrote on that subject should add to the prejudices against his views. A still larger number of people who talk of Mr Darwin's theory as though they had read the *Origin of Species* without having done so, will be surprised to find that the descent of man, which they have all along assumed to be the main feature of his previous work, was the very one which he purposely and studiously avoided. Very superficial as well as very profound minds adopt the maxim, "The proper study of mankind is man," and the undiscriminating public summarizes its ignorance by supposing that Darwin wrote a book to prove that man is descended from the gorilla. By this rough and ready supposition they of course shew that they know nothing either of the matter or manner of the theory of natural selection. The object of Mr Darwin's reticence, which was to disarm prejudice, has therefore been but very partially attained. If he wished to escape the *odium theologicum* by his omission to reason from phenomena found in that species which is "the wonder and glory of the universe," or to apply his reasoning to it, he can scarcely be said to have succeeded. Till the publication of this his latest work his attitude towards those who oppose themselves to his theory, from the mistaken notion that it is incompatible with other truths which they hold with great tenacity and with which they are better acquainted than with the facts and truths with which Mr Darwin deals, has been altogether exemplary. With the exception of the large and designed omission above referred to, his attitude was not indeed conciliatory towards the orthodox, for truth is not conciliatory, but it was never arrogant, presumptuous, or dogmatic; never failed in candour, caution, and moderation. Why both the thinking and unthinking should have jumped so universally to the conclusion that Mr Darwin held precisely the same theory with regard to the derivative origin of man which he enunciated concerning the origin of other species, when he was resolutely silent on the point, is not obvious. It is true that some similar facts to those on which he based his reasoning were to be found in man's well-studied physical frame; but, on the other hand, forcible arguments in favour of natural selection left him untouched, and difficulties which do not

present themselves to the derivative origin of other animals are patent in his case. The very potent arguments derived from geographical distribution, and from the relation of recent geological fauna to the existing inhabitants of the areas where these are found, had no application to man, for man has penetrated everywhere, and no fossil ape has been found which bears a nearer resemblance to him than do the extant apes with which he has been compared. Again, the mental and moral and even the physical constitution of man present some very awkward problems for solution to the advocates of his derivative origin from a lower form. Not only were there grounds for the acceptance of a theory of natural selection so far as animals were concerned while that theory was held to be inadequate to account for the existence of man, but such a doctrine has been actually enunciated by Mr Wallace, by whom the theory of natural selection was first foreshadowed. The public however was right in its assumption, and Mr Darwin has declared his conclusion that man is derived by lineal descent from a lower form not only as clearly and distinctly as we could wish, but as authoritatively and dogmatically as he has propounded the other parts of his theory modestly and temperately. Mr Darwin writes: "The main conclusion arrived at in this work and now held by many naturalists who are competent to form a sound judgment, is that man is descended from some less highly organized form. The ground upon which this conclusion rests *will never be shaken.* . . . It is incredible that all these facts should speak falsely. He who is not content to look, like a savage, at the phenomena of nature as disconnected, cannot any longer believe that man is the work of a separate act of creation."

In his speculation as to the genealogical descent of man and the way in which he emerges from the ancestral tree of the animal creation, Mr Darwin is almost wholly guided by the rudimentary organs found in man. Mr Darwin is quite consistent in this method. No doubt rudimentary organs which are functionless in one species and have dwindled almost to nothing, but are developed and have a palpable use in other allied forms, present the greatest difficulties to those who do not believe in a derivative origin of species, and also afford the strongest support to the selection theory. After enumerating the aborted organs, the transient and fœtal structures, and the often recurring abnormalities found in man, the author works out his theory of origin almost strictly in accordance with the plan of associating the ancestors of man proximately with those species which possess the most of these analogous structures, and so on to those larger divisions in which a fewer number of them have a wider distribution. This plan is, no doubt, philosophical, but it leads the author into some strange speculations. By similar reasoning it is demonstrable that our ancestors were hermaphrodite, and, that long after they had ceased to be so both sexes yielded milk to nourish their young, and perhaps carried them in marsupial sacs. Many of these structures, which on the Darwinian hypothesis must be considered as heirlooms of the species of wondrous antiquity, which man does not cherish but which he cannot lose, and which, like the the slave of the triumphant

emperor, will through long ages check his pride with the reminder, "Thou also art a beast," will be remembered by all. As examples of transient organs, the lunago or hairy covering of the fœtus, extending all over the body except on the palms of the hands and the soles of the feet; the clefts in the neck of the embryo, with the early fish-like disposition of the great vessels proceeding from the heart; the corpora wolffiana and chorda dorsalis may be mentioned. The rudimentary structure which will occur to every one are the cæcum, fragmentary relics of the panniculus of which the plastyrma myoides is the most remarkable, and the nictitating membrane of the eye. The evidence of a tail rests on a double foundation derived from both classes, for the excert termination longer than the limbs in the fœtus may be called a transient structure, while the coccygeal bones which support it after it is included are certainly rudiments. Mr Darwin cites sixteen or seventeen such structures, and there is little that is novel in the citation. The solitary novel feature, which is brought out in a peculiarly Darwinian style, is the point of the ear. This is the point which of all others will be marked by the public. This is the feature which will be seized upon by the popular instinct. It has already run through society like flame among the heather. The ears of ladies, as they sit at the social table, have ceased to "blush at the praise of their own loveliness" and learned to redden as they tell the tale of their own origin. It may be confidently predicted that Darwin's ear will become as notorious as that of Jenkins.

By following out the suggestions which these aborted organs and transient structures embody in a somewhat crude and servile manner, it is easy to see that Mr Darwin could arrive at no other conclusion but that man is a lineal descendant, proximately, of "a hairy quadruped furnished with a tail and pointed ears, probably arboreal in its habits and an inhabitant of the Old World," remotely, "of an animal more like the larvæ of existing ascidians" (living sacs) "than any other known form."

In judging of the portion of the work in which the descent of man is thus traced from the phenomena of his physical frame alone, it must be remembered that Mr Darwin stands, and professes to stand, on a different platform from that which he occupied when discussing the origin of species generally. In his introduction he speaks of his theory as having been adopted by a large number of naturalists, and he treats this theory as though it were accepted and demonstrated. If it were not recognised that Mr Darwin is, in the present work, following a deductive process of which the "Origin" was the converse inductive one, all would certainly pronounce this part of the work very unsatisfactory. The physical phenomena which tell against the theory of man's descent are scarcely touched upon, or dismissed with a few remarks which shew little grasp of their logical bearings upon the discussion. Take as an instance of this the very scanty treatment of the phenomena of arrested development. Arrested development as distinguished from arrested growth might be expected, on *a priori* grounds, to cast a flood of light on the early condition of the species. In the structures which

present arrested development, we have the work of the microscope and of the museum done for the investigator, and done in a more perfect way than he could possibly perform it. In these structures we might expect to find early conditions of an organ enlarged, and, being still included in the living organism, offering themselves to direct experiment not only as to their intimate structure, but also as to their function. Some of these, such, for instance, as flat-nose and epispadias, may corroborate the theory, but very many others, like cleft palate, ectopia vesicæ, imperforate anus, hypospadias, spina bifida, sternal fissures, seem to give quite a contrary testimony. Doubtless these problems, which nature herself propounds, may admit of solutions which leave this theory of the descent of man unimpaired, and "pangenesis" may be such a solution; but surely the matter not only admits of but requires discussion. It is by no means clear why cleft palate is so often asymmetrical. According to Mr Darwin's theory every transient condition of an organ is not only a means to an end, but once was an end in itself; but, on the other hand, in many cases of arrest of development, we have the end known and the means patent, but the latter so presented as to shew that it never could have been anything else but a means to accomplish the very end of which it failed To dismiss the whole of this subject with the remark that microcephalous idiots are prognathous and fond of running on all-fours, seems unworthy of the author of the *Origin of Species*. Mr Darwin's defence no doubt is that his more recent works are the amplification of his grand sketch—the application of a demonstration established elsewhere—the synthesis of his former analysis;—nevertheless, after all the admissions in Mr Darwin's favour with regard to the matter of his present treatise, there is a falling off from the superlative excellence of his other works, as to the manner of it, in the direction of the faults of crudity and dogmatism, which discordant faults are so often combined in the productions of less careful authors.

Mr Darwin's doctrine, of course, involves metaphysical and moral problems hard to solve and demonstrate, but the author seems to consider the difficulty arises from the solutions and demonstrations being hard to find, and not because the doctrine which involves them is, in the least degree, doubtful. Mr Darwin admits that the difference between the highest apes and the lowest savage is immense, and this mental severance suggests some error in the conclusion to which the study of his bodily structure has led him; but, in shewing that memory, imagination and reason are possessed by brutes, Mr Darwin does not address himself with sufficient attention to the most difficult step in the problem of mental evolution.

Rightly or wrongly the power of forming, and reasoning upon, abstract ideas has been thought to be a faculty differing not only in degree but also in kind from any exhibited by brutes; and here is the gulf Mr Darwin ought to have bridged. Doubtless, much might be written to shew that the power of abstraction is intimately associated with the use of language, and is dependent rather upon the rapidity and precision of ordinary processes of thought than an

evidence of a different power, but Mr Darwin has contributed nothing, or next to nothing, to this demonstration. The matter which appears under the head of "abstraction," and which is almost exhausted by the comparison of an old hound reflecting on the pleasures of the chase, and the Australian wife who uses hardly any abstract words, and cannot count above four, is quite inadequate, and rests upon a positive assumption with regard to the brute and a negative one with regard to the woman which are quite unproved.

That other great problem of the evolution of the moral sense is treated with far greater ability, and one of the most interesting chapters of the work is devoted to an explanation of the production of the human conscience. The existence of the moral sense in man is traced to those social instincts which man has in common with all gregarious animals. The strengthening and growth of the memory and judgment would enable man to compare his past actions, and the more abiding satisfaction of acts prompted by some motives as compared with those prompted by others would create a distinction between the higher and the lower law, or motive, which is all that some modern moralists require. "Ultimately a highly complex sentiment having its first origin in the social instincts, largely guided by the approbation of our fellow-men, ruled by reason, self-interest, and in the later times by deep religious feeling, confirmed by instruction and habit all combined, constitute our moral sense or conscience."

It is unfortunate that the subject of the first portion of the work is so very fascinating to the public that it quite overshadows the far more valuable portion which treats of sexual selection. In dealing with this subject Mr Darwin is himself again. Here caution again tempers his courage, and a manifest candour in stating the whole case gives weight to his conclusions. Again, we have, as in the *Domestication of Animals*, a repertory of facts, carefully collected from the whole range of the animal kingdom. The dogmatic is once more exchanged for the inductive style.

The writer endeavoured to point out the difficulties which the phenomena of beauty presented to the acceptance of the theory of natural selection even when supplemented by the theory of sexual selection, in a review of Mr Wallace's book which appeared in the last No. of this *Journal*, and also in some critical notices of that and the present work of Mr Darwin which appeared in the *British Quarterly Review*, from which a few of the sentences which follow are transcribed.

"Beauty as distinguished from use has always been a stumbling-block to the disciples of the natural selection school. That which, in any species, pleases our minds by the immediate agency of the senses, as distinguished from that which is of service to that species in adapting it to external conditions, is quite unaccounted for by the survival of the fittest, at least so far as wild and untamed species are concerned. Some evolutionists would cut the knot by denying the evidence of beauty apart from fitness. Suitability, symmetry, conspicuousness, and an imposing appearance, are, no doubt, desiderata which

natural selection may seize upon and secure, and these may incidentally and necessarily involve that which is beautiful in our eyes. But after all these have been eliminated or satisfied, there yet remains in a large number of species an element of beauty the contemplation of which brings pleasure to all human beings, whether educated or uneducated, refined or unrefined. This is especially the case throughout those large, numerously represented, and dominant classes taken from two separate sub-kingdoms, and called insects and birds. These two classes occupy a great deal of the attention of Mr Darwin. If we assume any evolutionary theory, and abjure the doctrine of final causes, all the varied beauty of butterflies and humming-birds have but one probable explanation, namely, that of sexual selection. To make even this explanation possible, we must assume a keen, discriminating æsthetic faculty in animals which is like in quality with our own, as that faculty is possessed by the most refined of our species. Moreover, this faculty must be intimately connected with the sexual appetency in each species. Such a connection is, judging from analogy, not improbable. In forming an opinion how far these views are correct, it is important to isolate the operation of sexual selection from that of natural selection. Nature has throughout almost the whole animal kingdom afforded to us the means of isolation. For, as a general rule, the sexes in species are not absolutely alike, and often there is great difference between them. All sexual peculiarities therefore which cannot be explained on the principle of division of labour, throw light upon the æsthetic faculty of animals as a selective, and therefore by the theory, of a creative agency. Mr Darwin has collected a vast mass of facts about sexual peculiarities, which being in no way connected with the sexual function, he calls *secondary sexual characters*. Of course, sexual secondary characters so limited point to a difference in the modification of the sexual desire by æsthetic appetite in the two sexes. Generally speaking, the adorned sex is the male. Have, then, the females a greater appreciation of beauty than their males? Mr Darwin thinks the ardour of the male destroys his discrimination. Some facts produced, however, seem to run directly counter to this supposition. On all hands the peacock is considered the most splendid of birds, and the difference between the sexes in this species is carried to an extreme point. Yet, one of Mr Darwin's best authenticated facts is, that the pea-hen differs from most birds in being the ardent wooer.

"One of the happiest and most satisfactory episodes in the book is the account of the genesis of the eye-spot in the plumage of birds, and specially of that of the ball-and-socket ornament in the secondary wing-feathers of the Argus pheasant. The treatment of this subject reminds us, by its clearness and beauty, of the author's treatises on coral islands and the fertilization of orchids. How simple a phenomenon may disclose a world of interest and wonder when in the hands of a man of genius! It seems to us, however, that that wonderfully faithful representation of a round ball lying in a hollow socket, expressed on the flat of the web of a feather, offers a striking example of the inadequacy of either natural or sexual selection to

explain such phenomena. 'That these ornaments,' says Mr Darwin, 'should have been formed through the selection of many successive generations, not one of which was originally intended to produce the ball-and-socket effect, seems as incredible as that one of Raphael's Madonnas should have been formed by the selection of chance daubs of paint made by a long succession of artists, not one of whom intended to draw the human figure.' Exactly so! We must attribute to the hen Argus pheasant the æsthetic powers of a Raphael in order to account for the decorations of her mate, or, more properly, we must assign to a succession of multitudes of generations of birds a correctness of appreciation of the draughtsman's art, such as is a rare excellence among men. This may be a fact, but if so, it opens up a new realm to our investigation."

Some very novel conclusions are incidentally arrived at in the course of the main discussion, and yet if we do not reject the hypothesis of sexual selection altogether they appear quite legitimate. It would hardly have been supposed that the stridulating organs of the male cicada, whose loud ingratitude for the boon of a silent wife disturbs the stillness of the Italian groves, were intended not to call the attention but to charm his mate. Beautiful as they are in their sweep and contour one would yet hardly have supposed that the horns of deer and antelopes had an ornamental quite as much as a defensive function, or that, generally speaking, the arms of the males are employed so little in international and so much in civil warfare, if these adjectives may be used for interspecific and internecine. That the differences of the sexes should so little depend on what was complementary to the partnership and so much to the exegencies of a competition which is of no service to the species, is a curious fact; and that these differences should be due to some quite unexplained cause whose action admits of such an unlimited diversity both of degree and quality, is more curious still. To explain this last sentence it may be necessary to state that this tendency to secondary sexual differences, transmitted to one sex and not to the other, is, according to Mr Darwin, an ultimate law without which neither natural nor sexual selection could conserve these differences, and yet a law which has a different action in each species, graduating from a persistent zero to cases in which it is enormous. This enormous sexual difference is, further, not a like enormity. It may be in size, as in the case of some seals, or in colours, as in some butterflies, or in vocal power, as in birds, or in a thousand other ways. This view of the question gives rise to a curious and somewhat subtle difference of opinion between the two great advocates of natural and sexual selection. Mr Wallace thinks that in the case of splendid cock-birds who have plain hens, who sit on open nests, the tendency for both sexes to become brilliant has been checked by natural selection. On the other hand, Mr Darwin thinks that secondary sexual splendour was from the first developed only in the male and transmitted by him to his male offspring alone; and in the converse case, where the female is also gay, natural selection causes her to build a covered nest for protection. Mr Darwin grounds his views on the difficulty, if not the impossibility, of any kind

of selection establishing and developing a peculiarity and retaining it in one sex only, if this peculiarity persistently reappeared in the offspring of both sexes, as it most certainly would do if there were no other law to modify the law that like begets like with only minute and fortuitous differences. His view also derives support from the greater likeness of the females to the young in the same species, and their greater likeness to one another throughout many allied species, and in the case of birds with a double moult, the retention of the character of their plumage by the females and not by the males. These considerations seem logically conclusive from the premises, and it is a matter of disappointment that Mr Wallace in the recent Edition of his work has not noticed them. Mr Wallace has, however, introduced into the new Edition of his work a singular speculation with regard to birds, which gives some support to the idea of sexual division of labour, which is the rival of sexual selection in the explanation of secondary sexual differences. This speculation is taken from Mr Richard Spruce, who thinks old birds pair with young ones just as some Indians do, in order that there may be some experience in the family.

It is somewhat unfortunate that the elaborate criticism of Mr Darwin's hypothesis by Mr St George Mivart was published before these last volumes on man's descent. Not that Mr Mivart would find much to retract after the perusal of them, but he would probably find much more to insert. His volume is certainly as good a compendium of the difficulties of the Darwinian theory as has yet appeared, unless we except the article in the *North British Review* for June 1867 and Mr Darwin's works themselves. Mr Mivart seems to have had three objects in view in writing the book: 1. To criticise the Darwinian hypothesis. 2. To establish an evolutionary hypothesis of his own. 3. To reconcile this hypothesis with strictly orthodox views of religion. The first object, however, is that which he has best succeeded in attaining. In the second he appears to have failed, and the third is not much advanced by his method of treatment. The endeavour to show that evolutionism was a cherished idea of the early Christian Fathers, and the cutting of the knot by the dogma that whether the bodily form of man were derived from a lower one by any special Providence or not, "the soul of every individual man is absolutely *created* in the strict and primary sense of the word," without defining what the soul is and what its powers are, will hardly satisfy either scientific men or theologians. Mr Mivart's special theory of evolution may be thus summarized. Evolution proceeds from some internal force directed towards definite ends, and its process is by sudden and distinct and not gradual changes. He adopts for his theory Mr Galton's simile of a spheroid whose spheroidity is due to the multitude of planes which bound it, which resting on a plane is in stable equilibrium and remains so till some force causes it to revolve on to an adjacent plane to that on which it previously stood; while Mr Darwin's theory must be represented by a perfect sphere in neutral equilibrium. Prof. Humphry in his address on Physiology at Nottingham (Vol. I. of this *Journal*, p. 12)

had already suggested this staircase progression of the transmutation of species by an analogy taken from the inorganic world, wherein the successive augmentation of the negative element in the various oxides of nitrogen is made to apply to the succession of species. Mr Mivart however has produced scarcely any facts to support this theory, and has dealt very feebly with the facts adduced. The instance of the sudden appearance of the black-shouldered peacock (Pavo nigri pennis) is the almost solitary instance quoted of an order of phenomena which would attract general attention. Inasmuch too, as the fixity of species as defined by the sterility of hybrids, is one of the objections advanced by Mr Mivart against the Darwinian hypothesis, he was bound to show that the black-shouldered peacock was infertile with the ordinary kind, yet he has not done this. When we compare the few and scattered evidences in favour of abrupt transmutation, which have been far more ably summarized by Mr Darwin himself than the present author, with the almost unlimited evidence of the accumulation of minute and fortuitous variations to an almost unlimited extent, Mr Mivart's theory sinks into insignificance beside the rival theory he criticises. It is not meant that the Darwinian theory is necessarily the correct one in contradistinction to what may be called evolution by cascade, but the labours of Mr Darwin in collecting facts in support of his theory have been enormous, and those of Mr Mivart in support of his theory almost nil.

The specialty of the work then is its criticism of Darwinianism. This criticism can however scarcely be called an assault either in manner or force. It is rather a siege in which the whole *enceinte* is invested, but no practical breach has been made, or at least none which has been followed by an overwhelming onslaught. Like the Robin Hood of *Ivanhoe* he has tried with his shafts every joint in the Norman armour of his Front de Bœuf, and with nearly a like result. His objections, though separately well put, have for the most part been urged before, and some of them seem to be ill-considered and self-conflicting. Thus the hood of the cobra and the rattle of the rattlesnake are given as structures which natural selection would not only not evolve but would suppress as injurious to their possessors. These very objections have been stated by Mr Darwin himself and many after him, and a little thought might furnish a solution. When we consider the habit of reptiles in general, and of snakes in particular, and remember that they are capable of rapid motion for a short time and within a short compass only, and are slow and inert in the intermediate time, we think it by no means certain that the sound produced, which is more like a hiss than a rattle, may not be a valuable aid to a predacious serpent. Creeping along in search of small animals which are hidden while at rest by similative colouring but visible at once when any motion is made, it every now and then emits a sound which at a distance is not very noticeable, but when near is very startling, and so attains its object; for the start of the quarry when within range of the rapid darting motion of its neck would reveal it without enabling it to escape. The hood of the cobra again, dilated at the moment of its striking, is

probably not only a means of appalling its foe, but also of absolutely preventing that foe from seizing the neck, which is just the seizure which would paralyze all the actions of the serpent.

Mr Mivart inquires why the camelopard is the only ungulate animal in South Africa which has an elongated neck. The same conditions ought to have produced the same result in other species. On the other hand he points out very well and truthfully the similarity of structure of the production of the larynx across the pharynx in the young kangaroo and the dolphin. Now these objections seem to neutralize one another, and both of them rather strengthen the hypothesis of natural selection; for adaptive characters are likely to appear in every species, but when they bring their owners into competition they will be likely to be suppressed in all save in that species where the most perfect adaptation is present, while when they do not do so they will all be retained. Long-necked ruminants would be forestalled by the giraffe in South Africa, but the dolphin and kangaroo are not competitors at all, and if they were they would not compete in this particular.

Mr Mivart has also produced some numerical calculations to show the improbability of concurrent variations and the probability of numbers overbearing slightly useful variatious. In the first calculation we meet with the following equation, which will astound our mathematicians: $\frac{1}{m^n} = \frac{1}{1000^{10}} = \frac{1}{10^{30}}$. Mr A. Bennett, in his controversy with Mr Wallace, anticipates Mr Mivart; but in such calculations the statement of the case is everything, and in these instances the statements can be shewn to be inexact.

Notwithstanding these and similar shortcomings, *The Genesis of Species* is a very interesting book, and will be a standard contribution to this alluring study. Further inquiry into the origin of species is pressing the scientific world towards the conclusions that while the facts of nature give evidence of evolution, and natural selection is a *vera causa* in that evolution, it is but one cause among many others, which causes for convenience sake may be called laws, but which are but the indications of the orderly procedure of a divine agent. All the facts are not only consistent with, but what might have been expected of the theory, otherwise suggested, of a Creator who sees the end while we only see the process; who knows the means where we only see the end to be desirable; and who has left on that nature which is at once means and end the indelible mark of His own operation.

NEVILLE GOODMAN, M.A., St Peter's College, Cambridge.

Die Lumbal-gegend in Anatomisch-Chirurgischer Hinsicht. Von Prof. LESSHAFT. Berlin, 1870.

IN this memoir, reprinted from *Reichert u. du Bois Reymond's Archiv*, Professor Lesshaft gives an excellent anatomical description of the connections of the muscles and fasciæ in the lumbar region. He