APPOINTMENTS FOR NEXT WEEK.

SATURDAY, June 10.—3 P.M. Royal Institution: "On King Arthur's Place in English Literature," III., by Prof. H. Morley.
3 P.M. Physical: "On a Tangent Galvanometer," by W. J. Wilson; "On an Electric Clock," by S. P. Thompson.
MONDAY, June 12.—8 P.M. British Architects: "Historical Sketch of the Institute," by C. L. Eastlake.
8 P.M. Philharmonic Concert, St. James's Hall.
8.30 P.M. Geographical.
TUESDAY, June 13.—3 P.M. Crystal Palace: *Oedipus at Colonos.*
8 P.M. Anthropological Institute: "On Skulls from Mallicollo and Yanikoro," by Prof. Busk; "On the South Sea Islanders," by W. L. Rankin; "Note on M. d'Albertis' Recent Explorations in New Guinea," by A. W. Franks.
8 P.M. Photographic: "On the Preparation of Sensitive Dry Pellicle from Collodion and from Gelatine," by Col. Stuart Wortley; "Notes on a Dry Plate Exposed and Developed Fifteen Years after its Preparation," by W. Brooks.
WEDNESDAY, June 14.—3 P.M. Mr. F. Ralph's Third Chamber Concert, Langham Hall.
8 P.M. Meteor. Saunton-Dolby's Concert, St. James's Hall.
THURSDAY, June 15.—3 P.M. Zoological (Davis Lecture): "Reptiles," by Prof. Garrod.
7 P.M. Numismatic: Anniversary.
8 P.M. Linnean. Chemical.
8.30 P.M. Royal. Antiquaries.
FRIDAY, June 16.—3 P.M. Mr. C. Hall's Seventh Beethoven Recital, St. James's Hall.
8 P.M. Philological: "Words, Syllables, and Parts of Speech, and the Relation of Language to Logic," by H. Sweet.

SCIENCE.

Lessons from Nature, as manifested in Mind and Matter. By St. George Mivart, Ph.D., F.R.S., &c., &c. (London: John Murray, 1876.)

(*First Notice.*)

THIS book, though consisting chiefly of reprinted articles from periodicals, is a connected and very powerful criticism of modern philosophy, as exhibited in the works of Herbert Spencer, Mr. Darwin, Prof. Huxley, and other evolutionists. Not that Prof. Mivart is opposed to evolution. On the contrary, he upholds it strongly, and in some respects more consistently than many of his opponents; but he strenuously denies its power to account for the moral and higher intellectual nature of man as a development of the mind of brutes; while he can hardly find terms strong enough to express his condemnation of the purely material or non-theistic theory of the universe which, either expressly or implicitly, he finds in the writings of most of the eminent men above referred to.

The first three chapters deal with Self-existence, First Truths, and the External World; and it is held that our usual beliefs on these points are trustworthy, since it can be shown that, if we do not accept what are commonly held to be necessary truths, even the limited amount of real knowledge allowed us by philosophers turns out to be fallacious. Nothing, for example, has been more generally accepted than Mr. Mill's statement that all our knowledge is of "a series of states of consciousness." The most radical of modern sceptics have admitted this; yet Mr. Mivart shows conclusively that the same rigid logic which has compelled them to deny that we really know any more than this, if consistently followed, demonstrates that we must give up the "series," give up all past knowledge, all memory, and all "states of consciousness," and that all which really remains to us is the knowledge that "thoughts exist." For past thoughts can only be known to us as thoughts that we had thoughts, and memory as thoughts that we had a particular state or states of consciousness; but we have no more real knowledge that these "past thoughts" and "past states" ever existed than we have that an external world exists. Mr. Mill's "permanent possibilities of sensation" equally fall to the ground; for we cannot possibly "know" that any thing is permanent, or that we have ever existed except at the actual moment in which we are now thinking. The trustworthiness of memory as verified by experience is, therefore, from the sceptical point of view, as complete a fallacy as the trustworthiness of any of our other faculties.

In the chapter on "First Truths" reference is made to Helmholtz's notion of intelligent beings living and moving in the surface of a sphere, and capable of perceiving nothing beyond that surface; and to his argument that to such beings our geometrical axioms would not be true, because, for example, two parallel lines would enclose a space. Mr. Mivart pronounces this "the enunciation of a transparent fallacy by a man of eminence," because "unless geometrical were necessary truths, it would be impossible for Prof. Helmholtz to declare what would or would not be the necessary results attending such imaginary conditions." Whether this argument will be held valid by metaphysicians or mathematicians is doubtful; but a more obvious difficulty seems to have been overlooked by the propounders and advocates of the hypothesis in question. The inhabitants of the "surface of a sphere" (if at all approaching terrestrial proportions) could not possibly know or perceive that the surface was spherical, any more than we can perceive the surface of the earth immediately around us to be so. To them the surface in which they lived would be a plane surface. They are supposed to be intellectually capable of geometrical investigations, and would, therefore, arrive at the same geometrical axioms as our own. Only when they carried out extensive geodetical researches would they find the contradiction between theory and experiment; and this would surely lead them, as it has led us, to deduce the spherical form of their world-surface. To make the argument more apparently valid, it should have been stated that the supposed spherical surface must be very small, compared with the beings inhabiting it, so that each of their bodies would be perceptibly curved, and every line, however short, perceived to be curved. But in that case these beings could never possibly acquire any knowledge of straight or parallel lines, or of plane triangles, but only of spherical geometry, the laws and axioms of which would strictly agree with those of our spherical geometry. But with a knowledge that their geometry was spherical, would it not be almost certain that they would be able to develope plane geometry as a possibility, and demonstrate that, if they could but get out of their spherical surface, straight and parallel lines, with their necessary properties, would exist? On neither supposition does it seem at all clear that, given the mental power to appreciate geometrical truths and the faculties necessary to become acquainted with geometrical figures, any difference as to the axioms of geometry could possibly arise.

Mr. Mivart makes what seems to us an important correction of the views of Mill and Spencer as to necessary truths, in distinguishing between "that negative inconceivability which comes from impotence or lack of experience, and that positive, active, perception of impossibility which comes from intellectual power and light." Our inability to imagine unextended colour comes under the first head; our judgment that the three angles of a plane triangle are together equal to two right angles, under the second. The one is unthinkable, but it may be from such ignorance as a blind man has of colour and visual form; the falsehood of the other is unthinkable, because we see the affirmative to be absolutely and necessarily true, Mill and Helmholtz notwithstanding. In like manner our author objects to Mr. Spencer's statement of the inconceivability of any resemblance between the external world and the ideas we obtain of it through our sense and intellect; and maintains that our senses *may* and probably do give us an approximately correct, though necessarily very imperfect, knowledge of the properties of objective existences.

In the next chapter, on Language, we first meet with the expression of Mr. Mivart's radical divergence from Mr. Darwin. He maintains that brutes have no germ, rudiment, or vestige whatever of the superior nature of man; that man alone possesses rational language, the power to communicate, not emotions only, but thoughts, by sounds or signs. Chapter V., on Duty and Pleasure, carries this divergence still further, being wholly occupied with a searching criticism of the well-known views of Darwin and Spencer on this subject. Mr. Mivart maintains that no act is truly moral which is not primarily performed with a distinct consciousness of its being right as distinguished from pleasant or beneficial; and to the objection that this would exclude those good actions of the highest natures which are performed without deliberation, and which we all admire, he replies:—

"An action which has ceased to be directly deliberate has ceased to be moral as a distinct act; but it is moral as the continuation of those preceding deliberate acts through which the good habit was originally formed, and the rapidity with which the will is directed in the case supposed may indicate the number and constancy of antecedent meritorious volitions."

Mr. Darwin's illustration, of a breach of etiquette often causing us as great and lasting pain as an offence against morality, is well answered by the remark, that in the one case we do not judge ourselves morally blameworthy, while in the other we do. But perhaps the best illustration of the inadequacy of praise and blame, however long continued, to produce a sense of right and wrong is the following:—

"What quality can have been more universally useful to social communities than courage? It has always been, and is still, greatly admired and highly appreciated, and is especially adapted, both directly and indirectly, to enable its possessors to become the fathers of succeeding generations. If the social instinct were the basis of the moral sense, it is infallibly certain that courage must have come to be regarded as supremely 'good,' and cowardice to be deserving of the deepest moral condemnation. And yet what is the fact? A coward feels probably self-contempt, and that he has incurred the contempt of his associates; but he does not feel 'wicked.' He is painfully conscious of his defective organisation; but he knows that an organisation, however defective, cannot in itself constitute moral demerit. Similarly we,

the observers, despise, avoid, or hate a coward; but we can clearly understand that a coward may be a more virtuous man than another who abounds in animal courage."

Holding, as he does, the view, that man's higher intellectual and moral nature has not arisen by any mere development of the mind of brutes, Mr. Mivart is consistent in maintaining that we possess freedom of will, in the sense that this higher nature is capable of impelling us to act in direct opposition to those physical and emotional motives which alone determine the wills and acts of animals and of grosser human natures. Being incited to action by the sum of pleasures and motives, none of which may be injurious to ourselves or to our fellows, we are yet able to will and act differently if we think it abstractedly right to do so. This, of course, is no real answer to the necessitarians, but it accords with the inherent feeling of our freedom of will, and it marks the distinction of our animal and our moral nature; the one due to development and subject to the law of intellectual necessity, the other derived from a higher source and influenced by a radically distinct set of motives.

The next two chapters, "Man" and "The Brute," are very interesting. Much use is made of Mr. E. B. Tylor's works, and it is argued with great force that man differs fundamentally from brutes, and that his origin, so far as regards his mind at all events, is distinct from theirs. Brutes are said to be wholly devoid of reason, and the various cases adduced by Mr. Darwin and others as proving the contrary are carefully examined. An important point is made of the fact that, as we pass from the lower animals to those forms which, physically, most resemble man, we find no corresponding approach to him in mental powers. The Anthropoid apes are in no degree more intelligent than the dog, the horse, the elephant, or even the beaver; while the instances of apparent intelligence in the actions of insects, and even of snails, place them, in this respect, on a level with the gorilla. Mr. Mivart thinks that a book requires to be written on "the stupidity of animals," to balance the tendency to exaggerate so-called animal intelligence. A dog may have seen fuel put upon fire a hundred times, but he never puts on any himself to maintain the heat he so greatly enjoys; while Mr. Darwin himself states (on the authority of Mr. Harrison Weir) that, if a pair of birds "which would naturally remain mated for life be separated for a few weeks during the winter, and matched with other birds, the two, when brought together again rarely, if ever, recognise each other."

Chapter VIII., on "Likenesses in Animals and Plants," deals, first, with the phenomena of "mimicry" and maintains, on what seem to us to be insufficient grounds, that such likenesses could not have been produced by natural selection. The chief difficulty alleged is that "minute" and "insignificant" variations would not be useful enough to be preserved, while the number and variety of the variations would favour their mutual neutralisation and obliteration. This objection derives its chief force from a false premiss—that variations are exclusively or even usually "minute" or "insignificant" in the sense required. In the first edition of *The Genesis of Species*, Mr. Mivart used the word "infinitesimal" as applied to the variations supposed to be effective in the modification of animals by natural selection. This was a term Mr. Darwin never used, and, though he does speak of "extremely slight" variations being useful, this cannot be held to mean that they are usually so "minute" and "imperceptible" as *not* to be useful, which is what Professor Mivart's argument requires. However small a variation may be, if it is useful natural selection must come into play; and as a matter of fact every naturalist knows that variations are by no means slight. By an elaborate series of measurements, Mr. J. A. Allen has shown that in a large number of North American birds every part of the external structure varies in size from twelve to eighteen per cent. In general tint there is also great variation, but in the markings which distinguish species from species usually much less, probably due to the fact that these particular markings are in each case especially useful, and thus all decided variations get rapidly eliminated by natural selection. But there are other species in which a great variation of marking is a common phenomenon; so that there are no grounds whatever for the statement that the only variations occurring with sufficient frequency are minute or insignificant. Another incorrect assumption which runs through Mr. Mivart's argument on this point is that variations "in all conceivable directions" are constantly and simultaneously occurring. But this is not the fact. Variation is primarily indefinite, and in many, perhaps all, directions; but it is itself subject to laws and conditions, and thus certain species and certain localities are subject to definite preponderant variations, offering materials for natural selection to act upon to more advantage in some directions than in others. The so-called mimicry in plants seems to be a totally distinct phenomenon produced by different causes. In some cases similar external conditions of a very marked kind acting upon plants, widely separated indeed in our classifications but radically alike in fundamental structure, have led to such resemblances as the African *Euphorbiaceae* to the American *Cacti*, and the foliage of some Australian *Mimosae* to the *Eucalypti*. The case of certain Brazilian fruits belonging to different natural orders closely resembling each other is parallel to the peculiarities of form in unrelated species of Celebesian butterflies, and has no resemblance whatever to mimicry. Mr. Mivart seems to forget that mimicry among animals has been shown in almost every case to be a protection to the mimicking species, and that this is its essential character; while no such protection has been even suggested in any one of the resemblances among plants which have been adduced as analogous to it. If there is one case more than another which simple variation and natural selection seem fully and completely to explain, it is that of mimicry; and the suggestion that there is an innate tendency implanted in certain races of animals and plants to assume the external semblance of creatures very different from them is utterly uncalled for, even if we adopt Mr. Mivart's view of the generally subordinate part played by natural selection.

The remainder of this chapter is devoted to an account of the various kinds of internal resemblance among animals, and in particular to the serial, lateral, vertical, and other homologies between the different parts of animals. Doubt is thrown on the extreme value of development as a guide to affinity, and it is maintained that an animal is to be classed according to what it is, not according to the mode by which it has become what it is. Thus, if it should ever be proved that birds have been developed not from one, but from several distinct reptilian ancestors, they will be none the less all birds.

ALFRED R. WALLACE.

The Dinkard. The original Pehlwi Text, the same transliterated in Zend characters, Translations in Gujrati and English, a Commentary, and a Glossary of Select Terms. By Peshotun Dustoor Behramjee Sunjana. Volume I. (Bombay: published under the patronage of the Sir Jamsedji Jijibhai Translation Fund.)

THE *Dînkard*, or "Acts of the Religion," is a large collection of fragments regarding the doctrines, customs, history, traditions, and literature of the Mazdayasnian religion, the "good religion" of the Parsis. It is written in the Pahlavi character, and its language is often complicated and obscure, so that no attempt has hitherto been made to translate more than a few fragments of this important book. Its existence was probably unknown to Europeans till a few extracts were published, about forty-five years ago, by Dastur Edalji Dârâbji and Mulla Firoz in their controversial works *Khorek-Vehîjak* and *Avîjeh-Dîn*; and it seems to have been first seen by a European when Professor Haug, during his tour in Gujrat, met with a MS. of it in the library of the Dastûr-i-Dastûrân at Nâwsârî; this and all other copies in India were taken from a MS. said to have been brought from Persia, about a century ago, by Mulla Bahman, son of Mulla Behrâm, and presented by him to Aspandiârshâh Ratanjishâh of Surat. This original MS. from Persia passed into the library of Mulla Firoz, and is now in the possession of his descendant, Dastur Sorâbji Rustamji, high-priest of the Kadmi section of the Parsis in Bombay.

The legendary history of the *Dînkard*, extracted from the end of its third book (the first of those now extant), has been published by Professor Haug in his introduction to the Zand-Pahlavi Glossary. It attributes the compilation of the work to a disciple of Zarathushtra in the time of King Vishtâsp, who ordered a copy of it to be written; this copy was burnt during Alexander's invasion of Persia, but the original fell into the hands of the Greeks, and was translated. It was re-edited by the priest Tosar, in the time of King Ardashîr Pâpakân; again by Adarpâd Adarfrobag Farukhzâdân after the fall of the Sasanian monarchy; and a third time by Adarpâd Admîtân at a later date; each editor collecting and re-arranging such fragments of the original work as he could find.

this very book of Becanus. The letter, which should be read entire, does the kindliest justice to Becanus:—

"Many have laughed at his attempt. And what is my opinion? I confess I love the man. His quick, amiable, happy intelligence has always won my admiration. But he would have been happier had he turned his mind to other things. What can a man hope for who tries to prove the antiquity, the mysteries, the wisdom of our Belgian language? Whom can he convince? As regards antiquity I fear the Holy Scriptures are against him, and the ancient fathers, who assert precedence for the Hebrew" (de antiquitate vereor ut sacrae ipsae literae et prisci patres annuant, qui Hebraeam proponunt).

And yet we find Justus Lipsius himself, after breaking a lance in honour of the philological orthodoxy of the day, at work hunting out curious words in the old Teutonic tongue, "quae abire ab hodierna lingua videbantur." Among these we find "*Eldi*, senecta, et *Vreldi*, senium, nam *Vr* auget." Have we not here a clue to the *Wr-Alda* of the manuscript? The mistake of Lipsius, who did not know the true etymology – Icelandic *Ver* (vir) + öld (old) = *verōld*, Swedish *Wärld*, Anglo-Saxon *Weorold*, English *World*, and the corrupt German form *Welt*—is exactly what has led the Frisian to make his Wr-Alda ("nam *Vr* auget") the Ancient of Ancients, the Ancient of days, Time immutable, the progenitor of changing Time.

It will have been observed that I say nothing of *forgery*. I avoid the word, because, as I conceive, we have not the thing. There is no more forgery here than there would have been had *Telemachus* appeared anonymously in Greek. In my opinion, where the Dutch editor and the English editor of the *Oera Linda Book* are most to blame is in not having recognised from the first, and called attention to the full import of the work that they were giving to the public; in not having made a serious study of its antecedents; in not having associated with a text at once so destructive and so constructive the history of Holland between 1685 and 1700. What made the author go so far about to his end? It was that the Protestants and politicians of Amsterdam were not used to play with questions of religion or of radical opinions. The brothers De Witt had died—and what a death—in 1672. The freethinker, who in his *Oera Linda Book* dreams of a Republic based on justice, truth, and purity of morals, and having for its religion an impersonal Deism without forms of worship, would not have found friends even among the Herrenhüters then beginning to thrive under Count Zinzendorf's protection.

How came the book to lie for two centuries concealed? Did the author's enthusiasm cool, and his Dutch impassiveness abandon the MS. to its fate? Or did his measures for its timely disinterment fail? We cannot tell. Be this as it may, MM. J. O. Ottema and William R. Sandbach have done a good and useful deed in having brought to light this work of a new Hotman, a second Marnix de Ste. Aldegonde.

JULES ANDRIEU.

A NEW AUTHORITY FOR THE TEXT OF THE EPISTLES OF CLEMENT TO THE CORINTHIANS.

University Library, Cambridge: June 13, 1876.

I have much pleasure in announcing that a new authority for settling the text of the two epistles of Clement of Rome to the Corinthians has been brought to light.

A Syriac MS. containing the Harklensian version of the New Testament has just been purchased by the Syndics of our library at the sale of the books of the late Jules Mohl in Paris. It is true that in the sale catalogue, the two epistles of Clement to the Corinthians are described as following the Catholic epistles in this MS., but I concluded that they would prove on inspection to be, at best, the epistles of Clement "De Virginitate," which are found in a similar position in the Amsterdam MS. On receiving our purchase from Mr. Quaritch, I was agreeably surprised to find that we had really become possessed of the Syriac version, hitherto unknown, of the Epistles of Clement to the Corinthians. The MS. is dated 1170 A.D.; the *lacunae* in the text of the Alexandrian Cod. are filled up in the same way as in the Greek MS. (I) lately published by Bryennius. The version itself is attributed in the colophon to the Harklensian recension, and, on account of its extreme accuracy, is well adapted in doubtful cases to decide the balance between MSS. A and I, while it will be especially welcome as an aid in correcting the text of the newly-recovered chapters. For instance, Epist. II. 10 (ed. Bryen, p. 140), Τοῦτο γὰρ ποιήσαντες κόπον πᾶσι τοῖς νέοις θήσομεν, for κόπον I suggested some weeks ago in a letter to Prof. Lightfoot σκοπὸν; I now find my conjecture confirmed by our MS. I have already begun the printing of the Syriac translation, and will do my best to bring it out shortly.

ROBERT L. BENSLY.

MITHRAIC SCULPTURE.

Ventnor: June 10.

The very curious specimen of mystical sculpture referred to by Mr. Hemans, representing "a monstrous figure of a man with a lion-like head," is evidently Mithraic.

A stone bearing a Mithraic figure with a lion's head, holding a serpent and a lustral vase, is engraved in Mr. King's *Antique Gems and Rings*, Plate ix., fig. 7. Inscribed on the reverse of the stone is ΦΡΗΝ—Egyptian name of the sun.

HODDER M. WESTROPP.

The EDITOR *will be glad if the Secretaries of Institutions, and other persons concerned, will lend their aid in making this Calendar as complete as possible.*

APPOINTMENTS FOR NEXT WEEK.

MONDAY, June 19.—3 P.M. Asiatic.
3.30 P.M. Philharmonic Society: Second Morning Concert (St. James's Hall).
8 P.M. Medical.
TUESDAY, June 20.—7.45 P.M. Statistical.
8.30 P.M. Zoological.
WEDNESDAY, June 21.—3.30 P.M. Royal Horticultural.
7 P.M. Meteorological: "The Climate of Scarborough," by F. Shaw, and three other papers.
8 P.M. Geological.
THURSDAY, June 22.—5 P.M. Davis Lecture at the Zoological Gardens: "The Beaver and its Distributions," by J. W. Clarke.
8.30 P.M. Antiquaries. Royal Italian Opera: Verdi's *Aida*.
FRIDAY, June 23.—3 P.M. Mr. C. Halle's Last Beethoven Recital (St. James's Hall).
3 P.M. Physical.
6.30 P.M. Royal Society Club (Anniversary).
8 P.M. Quekett Club.

SCIENCE.

Lessons from Nature, as manifested in Mind and Matter. By St. George Mivart, Ph.D., F.R.S., &c., &c. (London: John Murray, 1876.)

(*Second Notice.*)

HITHERTO we have been skirmishing; but in Chapters IX. and X.—on Natural and Sexual Selection—we get into the thick of the battle. In his violent attack on Mr. Darwin's theories our author uses unusually strong language. Not content with mere argument, he expresses "reprobation of Mr. Darwin's views;" and asserts that, although he (Mr. Darwin) has been obliged virtually to give up his theory, it is still maintained by Darwinians with "unscrupulous audacity," and the actual repudiation of it concealed by the "conspiracy of silence." But the reader of Mr. Mivart's book, if he is also acquainted with Mr. Darwin's works, will find it difficult to discover a justification of these harsh terms. If there is one thing more than another for which Mr. Darwin is pre-eminent among modern literary and scientific men, it is for his perfect literary honesty, his self-abnegation in confessing himself wrong, and the eager haste with which he proclaims and even magnifies small errors in his works, for the most part discovered by himself. This is a quality so rare, so admirable, and so truly "moral," in Mr. Mivart's own interpretation of the term, that we regret to find no adequate recognition of it by him; while he makes use of it to damage Mr. Darwin's scientific reputation on the ground that a man who has confessed to so many "overhasty conclusions and erroneous calculations" should be distrusted in other matters. This is no doubt a telling argument to such of Mr. Mivart's readers as have never read Mr. Darwin's works, while to most of those who are acquainted with them it will appear thoroughly inconclusive. Probably no man living has made so many and such varied original investigations in Biology, involving such an overwhelming multitude of details, and bound together by such an amount of subtle and ingenious reasoning, as Mr. Darwin; and it is almost certain that no other man has promulgated so small a proportion of erroneous facts or proved fallacies. On a careful examination of the passages quoted by Mr. Mivart, as showing that Mr. Darwin has virtually given up his theory but will not acknowledge it, we can find no such admissions. Mr. Darwin, indeed, has repeatedly said that if any complex organ existed which could not possibly have been formed by numerous slight modifications, or if it could be proved that any structure of any one species had been formed for the exclusive good of another species, in either case his theory would, he thinks, absolutely break down. Now, in the five quotations from Mr. Darwin's later writings given by Mr. Mivart, which express modification of opinion or admission of error, none apply in any way to these cases, but to structures which are "neither beneficial nor injurious," or to the causes of variation itself, which were always admitted to be unknown. No one useful character, or such as usually distinguish species from species, has been shown to be due to any other cause than variation guided by natural selection. Mr. Darwin admits that there are unknown laws of development and variation, and certain direct actions of external conditions, which to some extent modify animal forms; but, so far as yet known, these can only be permanently preserved or increased, when useful, by means of natural selection. We are not now discussing whether this view is strictly correct, or whether there are not probably unknown laws determining the lines or directions in which alone natural selection can profitably and permanently act. There may be such, and the present writer is disposed to think there are such; but these have not been proved to exist, while natural selection is admitted by Mr. Mivart himself to be a *vera causa*, and has been proved to act so widely and so effectually that it may well be considered, as Mr. Darwin and his followers still consider it, the most important agent in the determination and limitation of specific forms.

But if Mr. Mivart, as we think, wholly fails to prove that natural selection holds

but a subordinate place among the causes which have led to the production of what we term species, he adduces much more cogent arguments against the theory of sexual selection, as developed in Mr. Darwin's great work on the *Descent of Man*. To that branch of sexual selection which depends on the struggles and combats of male animals, and the development thereby of greater strength and of offensive or defensive weapons, no objection is made; while a powerful array of facts and arguments are brought against that active and special selection by the female which is supposed by Mr. Darwin to be almost the sole cause of the wondrous display of beauty and melody confined to the male sex, and of the larger portion of the beauty that pervades the entire animal kingdom. The subject is far too large and too complicated to admit of discussion here but it may be stated that after again reading carefully Mr. Darwin's chapters on this subject, and considering the mass of facts and arguments he adduces in the light of Mr. Mivart's criticisms, it certainly appears to the present writer that on this important question Mr. Darwin's views are altogether erroneous. It is undoubtedly proved that beauty of various kinds is very largely confined to the male sex, and that in birds, and in some few of the lower animals, this beauty is displayed before the female. There is also some evidence that the female exerts a limited amount of choice, though there is also much in a directly contrary direction; but there is no evidence whatever that this choice is usually determined by small variations in the display. Two or three considerations appear fatal to the theory of the production of the special colours, patterns, and ornaments of the male by the choice of the female, even among birds, where alone there is any evidence on the subject. In the first place, it seems quite incredible, without direct evidence on the point, that a large majority of the females of any species, over the whole area of its range and for many successive generations, should agree in being pleased by the same particular kind of variation. But in addition to this they must also agree in rejecting all other counteracting variations, and also in largely rejecting mates which are a little below the normal standard of beauty; otherwise the selection would hardly be rigorous enough to produce any definite cumulative effect. But there does not seem to be a particle of evidence that any large number of male birds are year by year left mateless. The facts adduced by Mr. Darwin rather go the other way, for they show that any bird, male or female, always finds a new mate when its own is killed; and this is sufficiently explained by the ordinary daily mortality among birds. But if the evidence required is scanty among birds, it is altogether wanting in insects, or the facts are directly opposed to the hypothesis. Yet the sexual differences of colour among butterflies are so closely parallel to those among birds that Mr. Darwin is compelled to apply the same explanation in one case as in the other. The mass of facts accumulated by Mr. Darwin is so great, the subject is so interesting, and his explanations are supported by so many ingenious analogies, that the real difficulties seem to have been overlooked, and the great reputation of the author has led many to accept his views without much consideration.

But, although rejecting the theory propounded by Mr. Darwin, it is by no means easy to find any adequate substitute for it; yet there are several indications of the directions in which important clues will be found. We have first such cases as the colours of shells, of caterpillars, and of sea-slugs, which are admitted to be due to other causes than sexual selection. The nature of the tissues and the laws of growth are probably among the causes which have produced the elegant patterns of shells; and there seems no reason why the colours of butterflies' wings and of birds' feathers should not have been primarily due to the same causes. In shells, the action of light is in some way influential, since the lower surfaces and the parts covered by the mantle are generally less coloured—the latter point offering a striking analogy to the uncoloured state of the habitually covered portions of a butterfly's or moth's wings and those parts of a bird's plumage which are never or rarely exposed to the light. Again, although I take this opportunity of acknowledging that some portion of the views I have put forward as to the relation of sexual coloration to protection are erroneous or exaggerated, yet in other respects I am firmly convinced that the principle of protective coloration is far more effective than Mr. Darwin admits it to be, and that it acts in a variety of complex ways which have not yet been sufficiently investigated. But the most important agency of all is, I believe, a correlation of general vigour and sexual excitability with intensity of coloration and the development of dermal appendages. To these several causes, combined in various ways, and aided by sexual selection, inasmuch as strength and ardour (as manifested in the excited display of the male) is attractive to the other sex, we shall perhaps some day be able to trace much of the beauty of the animal kingdon, and the special ornaments so characteristic of the males. But, should this ever be done, our great obligations to Mr. Darwin will be, if possible, increased. For it is almost certain that, without his indomitable perseverance in collecting and arranging the evidence, his almost unexampled literary honesty in giving full prominence to every fact telling against himself, and the rigorous logic with which he has applied his theory to every available part of the animal kingdom, and thus enabled us the more readily to discover its weak points, the whole subject might have long remained in obscurity, and one of the most interesting pages of the book of nature been closed to the present generation.

The application of the theory of sexual selection to account for some of the peculiarities of the human race, has generally been felt to be one of the weakest parts of Mr. Darwin's book, and the usual arguments against it are advanced by Mr. Mivart. If, however, the main theory as applied to animals is unsound, its application to man will necessarily have to be reconsidered.

The remaining part of Mr. Mivart's book consists of replies to the criticisms of Mr. Chauncey Wright and Prof. Huxley, and of two chapters on a First Cause and on the consequences of the acceptance or rejection of the theistic philosophy as developed by our author. They contain much interesting matter, and some acute criticism on Mr. Herbert Spencer, Prof. Tyndall, and other modern writers of the same school; but the present article has already run to a sufficient length. We have endeavoured to give our readers some adequate idea of a very interesting book, and a very valuable contribution to philosophy and to biological science; but we much regret that its value and usefulness are likely to be diminished, by the prominence given to personal controversy, and by imputations against Mr. Darwin which, in our judgment, the facts adduced do not bear out.

ALFRED R. WALLACE.

LOAN COLLECTION OF SCIENTIFIC INSTRUMENTS.

(*Fifth and Concluding Notice.*)

Sections XIII. and XVII. Chemistry, Mineralogy, etc.—Of the treasures of great historical importance exhibited in these Sections none will excite more interest than the selection of "home-made" apparatus employed by Dalton in the prosecution of chemical and physical research, and made for the most part with his own hands. They are sent by the Literary and Philosophical Society of Manchester, and comprise barometers, thermometers, with scale graduated by himself, and bearing his initials; tubes for measuring the tension of water, ether and other liquids, by aid of which "Dalton's Law of Tensions" was deduced; graduated vessels employed for the measurement of gases and the determination of their solubility in water; as well as a number of weights, balances, reagents, and specimens. It need hardly be said that they are all of the simplest kind, and recall to mind the familiar story of the apparatus of Wollaston. No. 49 in the list of the relics of Dalton is a paper containing grain weights made of iron wire; the paper forms part of a note from one of Dalton's pupils (he lived, as is well known, by teaching mathematics at half-a-crown per lesson), in which the writer presents "his complements to Mr. Dalton, and is sorry that he will not be able to wait upon him to-day, as he is going to Liverpool with a few friends, who are trying the railway for the first time." Prof. Roscoe, who has provided the interesting descriptive notice incorporated in the catalogue, also exhibits a portrait of Dalton, copied from a daguerreotype taken from life. The Edinburgh Museum of Science and Art sends Black's pneumatic trough and a balance, or rather what is more familiarly known as a pair of scales, used by him while professor in the university from 1766 to 1799, and some picturesque chemical vessels in use in the university chemical laboratory during the latter half of the last century. The Royal Institution, as might be expected, has a wealth of treasures to contribute. First among them we find the balance used by Cavendish, remarkable for its great height, there being a distance of more than two feet between the end of the beam and the pans; it was designed by Cavendish and made by Harrison, and at the death of the great philosopher was presented to Davy. The next balance, one with a very ponderous beam and pans, and with an index-needle placed at the end of the beam, was used by Young, Davy, and Faraday. While on the subject of balances—to which we shall, however, have cause to recur—attention should be directed to another and a modern instrument placed in this room (Section XVII.), specially made by Oertling of London for Messrs. Lawes and Gilbert and used by them for the determination