

is unable to respond to most of the electrical tests, these phenomena might perhaps be explained ; but such a supposition really begs all the questions at issue.

IV. BIOLOGICAL CONTROVERSY AND ITS LAWS.*

MANY edifying commonplaces might doubtless be written on the intellectual fermentation, if it may not rather be called confusion, of the age. Nor can it be denied that tendencies supposed to have been long ago slain and sepulchred have risen again, and are asserting themselves with a hardihood which our fathers would have deemed impossible. When we find a scientific work—at any rate a work written by an eminent scientific man, and devoted to the discussion of scientific questions—formally dedicated to a dignitary of the Catholic Church as a vindicator of the rights of conscience (!), we may well ask, not jeeringly but sadly, “What is truth ?” We have witnessed of late brilliant progress in various departments of science ; but we have also seen attacks made upon the very foundations of science. These onslaughts are increasing in frequency and in boldness. Metaphysicians and ecclesiastics are calling in question the inductive method, impugning the independence of Science, and seeking to re-assert over her the authority of “the Church.” The battles of the sixteenth century seem about to be repeated. And some, who might claim to be the heirs of Galileo, think it no ignominy to wear the livery of Bellarmine and Caccini.

When we first opened the book which has suggested our present article we fully expected to find an intellectual treat of the highest order : its subject is one on which a most valuable work might well be written, and few living men indeed are better qualified to undertake such a task than is Mr. Mivart. Anti-Darwinian polemics we awaited, but such criticism, if conducted on legitimate—that is, on purely scientific—principles, we should be among the first to welcome, well knowing that in any issue Science must be the gainer. Although believing in Evolution, we have never given to the hypothesis commonly known as “Darwinism” more than a qualified and provisional adhesion. Whilst admitting that

* *Lessons from Nature.* By ST. GEORGE MIVART, F.R.S. London : Murray.

it has thrown a flood of light over some of the most difficult questions in Natural History, and has brought into vital connection a previously incoherent mob of facts, and that it is still a powerful and valuable instrument in the hands of the enquirer, we cannot forget that it has its difficulties. Some of these we have, on former occasions, endeavoured to point out. Hence we should cordially recognise any theory which should either supplement the doctrines of "Natural Selection" and "Sexual Selection," or modify them so as to get rid of their drawbacks and shortcomings. Nay, we should be well pleased to find them superseded altogether by a new hypothesis, adapted at once to the phenomena they have explained and the residues and anomalies which they have hitherto left unsolved. Such a hypothesis we thought Mr. Mivart might have produced, or at least have attempted; and the very attempt could scarcely be made, from a legitimate point of view, without leading to valuable results. Never were we more signally disappointed, although in these days the title of a book is often intended to conceal, rather than to reveal, its nature and object. The strange dedication was, in truth, but too ominous of the contents. The work we found was not constructive, but destructive. It consists of a series of attacks upon a number of men who have done good service in different branches of Science, such as Darwin, Wallace, Huxley, Tyndall, Galton, Lubbock, Helmholtz, Oscar Schmidt,—or who have dealt with methodology, such as Comte, Mill, Spencer, Lewes, &c. The doctrines of Natural Selection and Sexual Selection are indeed discussed, and a desperate effort is made to resuscitate the fast-fading notion of a "great gulf" between man and the lower animals. It is a curious fact that in the old Natural History man is supposed to hold, in relation to other animals, a place very similar to that assigned by the Lavoisierian Chemistry to oxygen in relation to the remaining elements. Unfortunately in biology, passion, prejudice, and sophistry play a more important part than they do in chemistry and physics. The discussion is based upon false principles. We all know the passage in which Mr. Wallace specifies the kind of controversy which alone can be recognised. "As his hypothesis is one which claims acceptance solely as explaining and connecting facts which exist in Nature, he expects facts alone to be brought to disprove it."* This method of discussion finds here comparatively little favour. Theories are tested by their supposed

* *Contributions to the Theory of Natural Selection*, p. 13.

moral or religious bearings, or by their agreement with the author's *à priori* views. If we bring facts to prove the existence of reason in animals, we are told that we do not know what reason is; if we find in them evidences of moral life, it is said that we have "not even the faintest conception of what a moral nature is." If we show that they possess language, there follows the ready quirk that we confound emotional language with intellectual. That Mr. Mivart's own views of moral nature and of reason must be correct, no one, of course, is supposed to doubt; nor is the spirit of the argument sounder than its method. The author speaks, not as a judge calmly weighing the arguments on either side, and anxious merely that the truth should be ascertained, but as a passionate and eager prosecuting counsel, or rather as a *procureur du roi*, skilfully bringing forward every circumstance, every point—actual or inferred, relevant or irrelevant—which may in any wise damage the defendants, and with equal dexterity concealing whatsoever might tell in their favour. Deep personal hatred towards the "Agnostics" and their doctrines—the *odium theologicum* in its most malignant form—pervades the entire book. Mr. Mivart may doubtless be able to meet Mr. Darwin, Mr. Lewes, Mr. Spencer, or Dr. Huxley, on neutral ground or in private life, on terms of ordinary courtesy; but it is because the man is better and greater than his book. We find here nothing of that fine manly spirit expressed in the old adage—"Plato is my friend, but truth is more my friend." On the contrary, there is one passage in which Mr. Mivart almost seems to apologise for having, on some former occasion, spoken of Mr. Darwin with too much courtesy. For this he has now atoned to an extent almost ludicrous. We should not have felt in the least surprised had we found it proved—of course by strictly metaphysical arguments—that the author of the "Origin of Species" is the veritable transgressor who—

or who—
"Filled the butchers' shops with large blue flies,

"With foul earthquakes ravaged the Caraccas,
And raised the price of sugars and tobaccos."

Suppose, in all sober sadness, an enquirer knowing nothing more of Darwin than what he might learn out of "Lessons from Nature." Would he not go away with the impression that our great English naturalist had done little beyond launching a "puerile hypothesis," and had played a very unimportant—and, if anything, rather injurious—part in the development of biological science? Yet every candid critic

must admit that, were the theory of Natural Selection superseded to-morrow, to Darwin would still belong the merit of effecting in Natural History a transformation as signal as that wrought in astronomy by Galileo, Copernicus, and Kepler, or in chemistry by Lavoisier; of bestowing upon zoology and botany a definite purpose and a direction for research such as before were wanting. His works would still remain a treasury of observations and of suggestions, and the impulse he has given to the Science would never die away. In England, Germany, America, naturalists have sprung up as if by magic in obedience to his spell, and Mr. Mivart himself can hardly be excluded from their number.

We need scarcely add that a critic unjust to persons will not be much more trustworthy as regards their discoveries and their doctrines. The evidence in favour of Natural Selection—and indeed of Evolution altogether—is strictly cumulative, and as such, whatever weight it may carry to the patient and dispassionate enquirer, it is peculiarly open to the attacks of an opponent at once skilful and unscrupulous. We do not, of course, mean to accuse Mr. Mivart of deliberate unscrupulousness. We all know the words—in themselves literally reeking with hypocrisy—in which “the Church” pronounced sentence of death on Giordano Bruno:—*Ut quam clementissime et citra sanguinis effusionem puniretur.*” Yet even on that occasion we should be reluctant to declare that the judges were sinning against better light and knowledge. Just so here: Mr. Mivart doubtless believes and feels what he says, and considers his own line of criticism fair and honourable. We know that man is an adept in self-delusion, and of all men the metaphysician who has cultivated the art *s’égarer avec méthode* is most likely to go unconsciously astray.

We come now to a most painful subject, which, indeed, we would gladly pass over were not its consideration absolutely imperative. Mr. Mivart complains that in one particular instance Mr. Darwin departs from his ordinary courtesy to opponents. We are therefore justified in assuming that he regards courtesy to opponents as a duty—at least in others. Bearing in mind this circumstance we turn to page 144, and read:—“It is in one respect a calamity of our time and country that unbelievers, instead of, as in France, honestly avowing their sentiments, disguise them by studious reticence—as Mr. Darwin at first studiously disguised his views as to the bestiality (!) of man, and as the late Mr. Mill silently allowed himself to be represented to the

public as a thorough believer in God." Along with this passage we take the remarks on "Mr. Winwood Reade, a friend and ardent disciple of Mr. Darwin," and on the teachings of "our English physical expositors" (pp. 393 to 395), and then ask whether the author is not, by implication at least, charging Mr. Darwin with atheism? This is the more probable as we can find no saving clause, or limitation guarding against such a construction being put upon these passages. Still, in a charge so grave the accused is entitled to the benefit of the faintest doubt, and Mr. Mivart may therefore claim a verdict of "Not proven." It is time, however, that we came to a full understanding about the foul practice of introducing charges of atheism in scientific controversy. On this subject we beg to offer the following considerations:—

(1.) Charges of "heresy," "infidelity," or "atheism" are beside the question. If a theory in astronomy, in geology, in physics, chemistry, or biology is in doubt, let it be judged on its own evidence; that is, let it be compared respectively with astronomical, geological, physical, chemical, or biological facts, and, according as it is able or unable to account for and to harmonise such, let it stand or fall. The man who is unable or unwilling to do this convicts himself, from an intellectual point of view, either of impotence or perversity, and should leave controversy to others.

(2.) Such charges, further, are delusive. Not to speak of the thoroughly trained scholar, even many of the "half-educated" know that almost every important discovery in Science has been denounced by the "*parti pretre*" as impious, heretical, and atheistic. A yearly volume of the "Quarterly Journal of Science" would not contain the abuse uttered by ecclesiastics against the Copernican theory of the solar system, against the doctrine of a plurality of worlds, the Newtonian view of the universe, the nebular hypothesis, the chronology of modern geologists, &c. Yet all these views, and many more which might be mentioned, were found—when passion had cooled and sober judgment had time to decide—perfectly compatible, not with theism merely, but with Christian revelation. What "the Church" has cursed in one generation she "assimilates" in the next. What educated man, then, after reviewing the past, can dare to set aside modern theories in such a manner?

(3.) Such charges are, further, distinctly immoral, and even criminal. All civilised countries brand with ignominy the suitor or the advocate who suborns false witnesses, forges or destroys documents, or corrupts judges and juries. But

the controversialist who charges his opponent with atheism stands in a precisely similar position. He well knows that although the public might not admit, *totidem verbis*, that "whatever an atheist advances must be false," or that "every theory once pronounced atheistic must be erroneous," yet it will practically act as if such propositions were established. Hence by making such charges he fraudulently attempts to steal from the public, through an appeal to their passions, a verdict which he has no hope of obtaining from their reason. Knowing and trading on the extreme animosity with which the heretic, the sceptic, and the atheist are—rightly or wrongly—regarded, he seeks to deprive his opponents of a fair hearing by applying to them these dreaded names. A meaner, a more infamous, stratagem can scarcely be conceived. Yet more: it is not the man conscious of the goodness of his cause who fights with such weapons. He who knows that his views are in harmony with facts has nothing to gain by foul play; but if he feels inward misgivings concerning the doctrines which he advocates, or doubts at least the possibility of bringing forward valid arguments in their defence, he may readily, if dishonest enough, seek to blacken the character of an opponent.

We may, therefore, safely and fairly conclude that whosoever in scientific controversy introduces accusations of atheism is, if not knowingly and wilfully, still decidedly in the wrong. We are consequently fully justified in shutting his book, and giving judgment against him.

But there is another consideration which here forces itself upon our attention. All writings calculated to bring a man into general "ridicule, hatred, or contempt," are by the law declared to be libellous. Now it is very questionable if, in England, any accusation is so much calculated to bring a man into "hatred and contempt" as a charge of atheism or "materialism," however ill-founded it may be. Surely therefore such charges, whether brought directly or by implication, are libellous, and as such they are more fitted to be dealt with by a criminal court than by reviewers. We should like to see such a case decided, and we believe that the result would be a great improvement in the tone of scientific and semi-scientific controversy.

But even if such accusations should be pronounced not libellous, and if those who resort to them have no legal penalties to dread, there is another tribunal which might interfere. Why should not scientific men, scientific societies, and scientific journals, agree that whosoever in a scientific controversy attempts to get rid of an opponent by

raising the cry of atheism should be held to be *ipse facto* an outlaw, and to be no longer entitled to the treatment of a gentleman and a scholar? Nay, why should not other charges affecting the personal character of an opponent be dealt with in a similar manner? We do not, of course, seek to screen the man who can be proved to have suppressed documents, cooked results, or claimed as his own discoveries those which he well knew belonged to another. We refer to those random charges of dishonesty and mendacity, and those sweeping ascriptions of motive, which are unfortunately so common. Thus we have often heard and seen it asserted that the authors of some particular theory were actuated by a desire to disprove the existence of a God, to subvert the Christian religion or some particular form of it, or to injure public morals. To such assertors we would reply—"Prove your charge by evidence such as would satisfy an impartial court of justice, or take the consequences, which will not be pleasant!" We are here reminded that in the very passage in Mr. Mivart's book (p. 144) in which he comes unpleasantly near charging Mr. Darwin with atheism, he brings forward against the same gentleman something very like an accusation of dishonesty. It is perfectly true that in the "Origin of Species" Mr. Darwin does not pronounce as to whether mankind had or had not been gradually evolved from some lower form of animal life. But reticence is very different from dishonesty. A thinker is not absolutely bound to bring his speculations to light at all; for keeping them back whilst he is accumulating and weighing the evidence for and against them, he deserves praise rather than censure. Nay, even for introducing doctrines gradually, as the public are able to bear them, there is certainly authority which Mr. Mivart cannot consistently impugn. Nor must we forget that Mr. Darwin has, from the first, nowise courted publicity for his views. But for the fact that Mr. Wallace was known to be preparing a work of a somewhat similar nature, even the "Origin of Species" might never have seen the light.

There may be persons who will be aggrieved at this expression of our views on the subject of scientific controversies; but if they feel themselves guiltless they may cheerfully exclaim—"Let the galled jade wince." As for those who have actually made the kind of charges we protest against, they have no claim to lenity or forbearance.

Controversies on theories in the various inorganic sciences have been carried on with no little acrimony. But charges of atheism are, at least, banished. Why may not this

reform be extended to biology and psychology? Those who cannot treat these subjects from a purely scientific point of view may serve to test the patience of unfortunate reviewers, but they cannot lead us to the truth.

Let us now return to the subject-matter of the controversy before us;—In one passage we find it asserted that the Darwinian theories have met with wide-spread acceptance among the “half-educated.” This is quite contrary to our own observation. The most numerous and most virulent opponents of the doctrine of Natural Selection, and indeed of Evolution altogether, are to be found among the following classes:—Retail tradesmen, clerks, shopmen, commercial travellers, “smart” writers in the political press and in purely literary organs, Sunday-school teachers, ministers of the less intellectual dissenting communities, and clergymen who have not had the advantage of a university training. On the other hand, its popularity among working naturalists—“*Maenner vom Fach*”—is great, and that in proportion as they are working naturalists, men accustomed to deal with things rather than with words or with dreams.

Among the weapons employed against Darwinism a prominent place belongs to the admissions of its author and supporters. But these are almost invariably magnified and distorted, as is often the case, with isolated passages taken out of their connection. If an enquirer avows that his system needs modification, it by no means follows that he abandons it altogether, in any other sense than as we abandon a tentative hypothesis in favour of a closer approximation to the truth. Of the ingenious rather than ingenuous style in which the writings of Evolutionists in general, and of Darwinians in particular, are travestied, we cite the following as a typical instance:—Mr. Darwin having remarked that if man had not been his own classifier the notion of founding a separate order for his own reception would never have arisen, the comment is added;—“That is to say, the irrational classifier would necessarily have excluded the unknown element of reason as a basis of classification!” Mr. Darwin never suggested the possibility of such a contradiction as an “irrational classifier,” but assumed animals to be surveyed by a hypothetical being higher than man, or at least totally distinct from him and free from his prepossessions. This “bull”—more absurd, if less humorous, than those of Irish origin—is from “*Caliban; the Missing Link*,” a work written not by Caliban, but by a Mr. D. Watson.

Of course the most satisfactory manner of refuting the

doctrine of Natural Selection must be to supersede it by some better hypothesis, just as the "emission theory" of light was refuted by the production of the "undulatory theory." What, therefore, does Mr. Mivart bring forward to account for the genesis of species? We will take his own words:—"It is quite conceivable that the material organic world may be so constituted that the simultaneous action upon it of all known forces—mechanical, physical, chemical, magnetic, terrestrial, and cosmical,* together with other as yet unknown forces—which probably exist, may result in changes which are harmonious and symmetrical; just as the internal nature of vibrating plates causes particles of sand scattered over them to assume definite and symmetrical figures when made to oscillate in different ways by the bow of a violin being drawn along their edges. The results of these combined internal powers and external influences might be represented under the symbols of complex series of vibrations (analogous to those of sound or light), forming a most complex harmony or a display of most varied colours. In such a way the reparation of local injuries might be symbolised as a filling up and completion of an interrupted rhythm. Thus, also, monstrous aberrations from typical structure might correspond to a discord, and sterility from crossing with the darkness resulting from the interference of waves of light.

"Such symbolism will harmonise with the peculiar reproduction of heads in the body of certain annelids, with the facts of serial homology as well as those of bilateral and vertical symmetry. Also, as the atoms (?) of a resonant body may be made to give out sound by the juxtaposition of a tuning-fork, so it is conceivable that the physiological units of a living organism may be so influenced by surrounding conditions (organic and other) that the accumulation of these conditions may upset the previous rhythm of such units, producing modifications in them,—a fresh chord in the harmony of Nature,—a new species.

Elsewhere he informs us that species arise in virtue of an "internal force or tendency," manifesting themselves "with suddenness, and by modifications appearing at once."

Mr. Mivart therefore does not, with Cuvier and the orthodox naturalists of the old school, maintain that every kind of animal and plant has been separately formed by a distinct

* It is interesting to note the case of "cross division" presented to the reader in this enumeration of forces.

act of Divine intervention, and endowed once for all with its present form, powers, and habits, and has been allotted to some particular district, there to exercise a given function for which it is especially adapted. He is therefore an Evolutionist as decidedly as Lamarck or Darwin, and is necessarily at issue with all who oppose the doctrine of Evolution *in toto*.

Whilst holding that species are mutable, he contends that their changes are not necessarily and invariably gradual, but may have been sudden. Borrowing the terms from geology, he is not a "uniformitarian," but a "catastrophist." The cause of such changes he considers to be not "natural selection," a hypothesis which he dismisses as puerile; not sexual selection; not the influence of changing climate, diet, and other external causes; not to the efforts of animals to adapt themselves to modified circumstances; but to a complex of agencies, internal and external, which might almost be designated "things in general," and of which the author himself, being only able to shadow forth his meaning in metaphorical language, has not, probably, the most distinct conception.

The first objection to Mr. Mivart's views is one which has often been urged against Evolution in general, but which is exceptionally formidable to the theory of sudden modifications. The champions of the Old Zoology are accustomed to say that no change of species has ever yet been actually observed; that animals constantly give birth to young in their own likeness; and that, arguing from the known to the unknown, such must have been the case from the creation of the world, or at least from the dawn of the present order of things, whatever that may mean. To this objection Darwin and Wallace, and all who hold that the difference between species and species has been produced by gradual divergence, have a ready answer. "The variation," they may say, "visible in the life-time of an observer is so trifling as to escape notice." To borrow an illustration from the author of the "Vestiges," as well might an ephemeron deny the development of the frog from the tadpole state, because during his life-time and within the range of the traditions of his ancestors the tadpoles in the pool had remained tailed creatures, breathing through gills. But such a reply is scarcely possible for Mr. Mivart. The appearance of a new mammal, bird, reptile, perhaps we may even add insect, would at once attract attention in any civilised country, often even among barbarians. Can Mr. Mivart adduce an instance in point? We know that species are

continually discovered which are altogether new to Science. But such discoveries are most plentiful—

a. In countries imperfectly explored, becoming rarer and rarer as any region has been more fully explored by naturalists.

b. In the lower forms of animal life, and especially in very minute species.

In England the discovery of a new beetle an inch in length, or of a butterfly the size of *Vanessa Io*, and not obviously imported from some other part of the world, causes no little sensation. On the Continent the occurrence of a nondescript bird or reptile would certainly not be passed over as an every-day affair. Even in India, a buffalo, a deer, or a cat, unknown alike to native and British sportsmen, would excite astonishment. But if such sudden modifications ever have taken place, is it not likely that they would—occasionally at least—still occur, and that they would not be exclusively confined to imperfectly known countries, to microscopic species, and to the lower groups of the animal kingdom? Perhaps Mr. Mivart may say that the “internal forces or tendencies” of species and the external circumstances under which they are placed, have already reacted upon each other, and that no further changes are now possible. We reply that external circumstances continue to alter, and that, consequently, if a perfect equilibrium was at one time attained, the conditions under which it exists being no longer the same, it is liable to be disturbed, thus necessitating on his hypothesis fresh changes. The production of some authenticated case of a new animal or vegetable form evolved out of an old or known one, unessential for Mr. Darwin, is for Mr. Mivart an absolute necessity.

The illustration in which the new hypothesis is conveyed makes, after all, very little room for inward tendencies. The sand, or other powder in which the sound-figures are embodied, lends itself with the same facility to one kind of vibrations as another. The plate, its supports, and the violin-bow are all outward circumstances acting upon the sand. Thus the entire illustration is one which might have been very appropriately used by Lamarck, and in so far forth as it is fully and fairly herein expressed “Mivartism” is merely Lamarckism under a new terminology. Lamarck makes, indeed, no explicit reference to the internal nature of animals; but he must have implicitly assumed it, otherwise there would have been nothing upon which outward circumstances or forces might react. One distinction is, however, that Lamarck, like Darwin, supposed the variation of species

to be gradual, whilst in Mr. Mivart's opinion it may be sudden. But are sudden changes of climate or other outward circumstances sudden? As to the latent internal tendencies they seem to involve greater difficulties and a more frequent recurrence to miracle than the old hypothesis of special creation.

But passing over these minor difficulties we come to the main question—the working of the hypothesis. We have before us certain phenomena, facts, and their relations. A new theory is placed in our hands: how far does it accommodate itself to phenomena? Can we show that it explains what we actually find, whilst if the facts were different they would clash with the theory? Does it give us any hints into what channel we are to direct our observations? Scarcely; it lays before us two unknown powers,—the internal tendencies and the complex of external influences,—and bids us from these deduce the animal kingdom. How are we to discover the magnitude, the direction, the *modus operandi* of either, much less mutual reactions? Surely such a theory is too accommodating, and would lend itself as readily to the monsters of heraldry and the phantoms of mythology as to animals that ever have existed.

Let us once more take Mr. Mivart at his own words, or rather at his own illustration. On the glass disc, then, lie the sound-figures traced in sand, resulting from the last application of the violin-bow. Let it be now applied in a different manner. Instantly, not one, not some, but all of the figures are altered. Translating the symbol into the thing symbolised, this would mean that in a certain organic species—say a butterfly—all the eggs deposited after the new external influences had come into play would yield insects not slightly but abruptly modified, and the old form in a few weeks, or at most months, would entirely disappear. So far this would suit Mr. Mivart perfectly, dissenting as he does from the old maxim that *Natura facit nihil per saltum*, for which he would substitute "*facit multa*," if not "*omnia*." But how does it agree with facts? On this supposition the rise of a new species would always be attended by the extinction of an old one. Never would a species branch out into two or more, nor would the old form survive the appearance of the new, save in some region to which the modifying influences might not have extended. Thus on Mr. Mivart's principle the multiplication of species, if it took place at all, would be exceedingly slow, and there could be no branching out into a number of closely approximating forms.

On the hypothesis of Natural Selection the process would be very different, and we think more accordant with observation. Suppose a new enemy makes its appearance in the country inhabited by our butterfly before mentioned. One modification of the original stock might escape with relative impunity by reason of superior swiftness ; another by being of a shade less easily discerned, or by simulating some more formidable creature ; another, perhaps, by being of an evil odour. Thus several species would branch out in different directions, whilst the original type might still exist for some time in gradually decreasing numbers. Thus in one of the very few cases where this Proteus of Mr. Mivart's can be fairly bound, and forced to give a definite reply, the oracle is not in accordance with facts. Whilst, therefore, we confess that Natural Selection has robbed us of no little of the pleasure with which we used to contemplate the animal and the vegetable world, and gladly as we should see it superseded, we cannot pronounce Mr. Mivart's attempt successful, and we doubt whether he is working in the right direction. In any case a vast amount of work requires to be done before his theory can admit even of precise verification. Might we suggest that such work would be infinitely more useful than the metaphysical warfare in which he is now engaged, and would far better merit the title of Lessons from Nature ?

The most unsatisfactory, and at the same time the most painfully instructive, portion of the whole work is the attempted demonstration of a "great gulf" between man and the rest of the animal kingdom. The difference he considers as one not of degree, but of kind. Hence he is at issue not merely with Mr. Darwin and the more thorough-going Evolutionist of his immediate school, but with many naturalists who totally reject Evolution. Before Mr. Darwin was known, save as the author of the charming "Voyage of a Naturalist," we had carefully examined the respective position of man and "brutes," and had come to the conclusion that the vulgar doctrine of a great gulf, of a distinction *toto cælo*, was utterly untenable. We saw that it was one of the lurking remnants of a vicious system of classification which has survived here longer than in other spheres of enquiry, because it panders to man's egotism and vanity. Since then we have met with no facts, no arguments, calculated to subvert our views, but with many, both facts and arguments, by which they are corroborated. It is our full conviction that Mr. Mivart's attempt is a signal failure. His position may be said most nearly to approach that of Swainson ; but

the great Quinarian excluded man altogether from the zoological circle proclaiming his structural resemblance to the apes,—relations not of affinity, but merely of analogy, and consequently of no value in determining his rank in the scale of Nature. To him man was not the highest animal, not “an animal and something more,” but the lowest, aberrant, member of the spiritual kingdom. Such a doctrine might be hard to substantiate, but it was no less hard to refute, and must at all events be pronounced self-consistent. Mr. Mivart takes up different ground. He admits man to be an animal, but yet proclaims him to be an animal differing more widely from those nearest him in structure, such as the gorilla, than they do from the unorganised lifeless sand beneath their feet. This somewhat sensational deliverance occurs, in substance, more than once, so that it is no mere casual inadvertence. Let us look more clearly into its meaning. Let A denote inorganic matter, B the vegetable world, and C the animal kingdom. In the class C occurs a certain form, *c*, which differs more widely from the other members of the class, *a*, *b*, *d*, &c., than they do from B, or even from A. What kind of classification is this? If *c* differs thus widely from everything else contained in C, we doubt its right to be included in that class at all. Let us take a few instances:—Suppose a curvilinear figure differing more widely from other curvilinear figures than they do in turn from rectilinear figures; suppose a crystal differing more from other crystals than they do from amorphous matter; suppose an acid differing more widely from other acids than they do from bases; suppose a triad differing more widely from other triads than they do from dyads or tetrads; suppose a shade of red differing more widely from other shades of red than they do from yellows or blues; suppose a bird differing more widely from other birds than they do from mammals! Let our readers, if they can, suppose some, any, or all of this, and they will be in a position to understand and appreciate Mr. Mivart’s exposition of man’s rank in creation. We fear that if any of the “Agnostics” had made a statement half so peculiar it might have received a notice more outspoken than courteous.

Mr. Mivart makes no attempt to base the distinction between man and the lower animals upon points of structure,—in short, upon anything visible. He is far too profoundly versed in animal morphology to make such an attempt. Nay, in a most interesting little work, he has declared that the structure of the frog is by far more isolated and exceptional, with reference to other forms of animal life, than is

that of man. Now, when an army retreats from the open country into quagmires, forests, and deserts, both enemies and neutral on-lookers regard the movement as a confession of weakness. In the very same manner, when a doctrine or a theory changes its ground and recedes, opponents know what this implies. The doctrine of abiogenesis has thus receded. Time was when the world believed that insects of highly complicated organisation could thus be produced. Now it is held, if at all, only with regard to bacteria, invisible to the naked eye. In like manner the doctrine of the "great gulf" was once maintained on points of structure, visible and tangible marks. Now all these supposed characteristics are given up, and the alleged distinction is based on matters invisible—points to be inferred or guessed at. The signification of such a retreat is immense. Mr. Mivart rests his case on a triple assertion:—

Man has language ; brutes have none.

Man has reason ; brutes have merely instinct or *quasi*-intelligence.

Man has an innate perception of right and wrong ; brutes are devoid of moral life.

The three distinctions here brought forward are by no means novel. They have all been previously adopted, and have all in turn been explicitly or tacitly rejected by thinkers who still admit a difference of kind between man and beast. Mivart combines them all, doubtless in the hope that if two wrongs do not make one right, three may possibly be found adequate. We do not find that he is able to bring forward, on any of these points, any argument which may not fairly be considered as already refuted.

The claims of language as a decisive criterion have been urged by Prof. Max Müller—a high authority, doubtless, on human tongues, but, we submit, scarcely so well acquainted with the languages of brutes as to warrant him in pronouncing on the question. Popular opinion, embodied in the phrase "dumb animals," takes a similar view ; but dumb means, after all, little more than speaking a language which we cannot understand. The ancient Greek and the modern Pole both pronounced their neighbours, of different races, "tongueless," or "mute." On the other hand, Quatrefages, a believer in the "great gulf," and a most decided unbeliever in Mr. Darwin, is of opinion that language does not constitute the boundary line. The late Archbishop Whateley was, we believe, of the same opinion.

But turning from authorities, how eminent soever, let us

consider that domestic animals have been found capable of understanding words addressed to them, or merely uttered in their presence, of a more complicated nature than a mere command, and where the tone and gestures of the speaker could supply no clue to the meaning of the speaker.* Now we consider it self-evident that a being absolutely devoid of language, and therefore not fitted for receiving communications from without through any such medium, could at all understand the language of man. Mr. Mivart would probably pronounce all such instances "sensational," and seek to get rid of them by the very compendious process of denial—the way in which inconvenient facts are commonly treated by men of "first principles." We hold, however, that cases of this nature are far too numerous and too well established to be thus summarily dismissed. That the words were actually understood was shown by the events, and the events are generally recorded by observers who had no theory either to defend or to overthrow.

The languages of animals may, doubtless, be poor in abstract terms; but even Prof. Max Müller admits that in human languages abstractions are expressed by words originally concrete in their meaning. Coleridge was of opinion that thought and language were not necessarily connected, and that, had the latter never originated, mankind might have been able to reason without it, and perhaps in a superior manner. The reasoning process in animals may thus be conducted without anything equivalent to words.

It must be further considered that language does establish a break much lower down in the animal kingdom. There are animals which have demonstrable organs of hearing, which possess voices, or instead are endowed with delicate instruments for communicating their meaning by signs. On the other hand, there are other animals which have neither voices nor organs for exchanging signs, nor, as far as we can observe, any auditory apparatus. Surely, then, if we are to take "language" as the test, there is a greater gap, a more complete break, between such absolutely dumb animals and those which can at all events call to each other. Surely there is a wider difference between "nothing" and "something" than between "something" and a greater and more perfect something. The difference of *kind*, according to the language criterion, does not fall between man and apes, but between the higher animals—man included—and certain of the very lowest. We strike out, therefore, at once, the first of Mr. Mivart's three points.

* See Quarterly Journal of Science, v., 70, 71.

What, then, of reason? Is it the exclusive attribute of man? Here, again, we have on our side the suffrages of men perfectly free from the least trace of Darwinian views. Cicero ascribes to the ant—"Mens, ratio et memoria." Milton, a man familiar with metaphysical and scholastic subtleties, makes one of his angels say concerning the lower animals—

"They also reason, not contemptibly."

The orthodox Cuvier, antagonistic as he was to Evolutionism in every guise, speaking of brutes, declares—"Leur intelligence exécute des opérations du même genre." Agassiz holds that we cannot draw any definite boundary between the faculties of a young child and those of a baby-chimpanzee.

We are told, indeed, that were animals rational they would be capable of using language which we could understand. This by no means follows. To us it seems more than merely probable that a great difference in the degree of the mental faculties on either side may be quite sufficient to account for the imperfect understanding that prevails between brutes and ourselves. Perhaps beings as much superior to us as we are to *Acari* may be at this very moment rejecting our claims to reason as flatly as Mr. Mivart rejects those of "our poor relations."

An attempt is also made to show that if working naturalists consider animals to be rational, it is because they do not know what reason is. They ought, forsooth, to study metaphysics, and then might rise to a belief in the great gulf! This suggestion reminds us of the fox, in the fable, who had lost his tail in a trap, and who promised great advantages to his companions if they likewise would submit to amputation. Of course if we allow Mr. Mivart to frame a definition of reason to suit his own objects, the result may be foreseen. We hold that "reason," like "life" or like "poison," may be much more usefully illustrated than defined. We find animals arriving at results similar in nature, though of a lower degree, than what we attain ourselves. We conclude, therefore, that they reach these results not by the aid of a totally different faculty, gratuitously assumed for the occasion, but by a lower grade of the power which we acknowledge in ourselves. Brutes can, as we see, trace effects to their causes; they can devise means to an end under circumstances which forbid recourse to the usual explanation of instinct; they can invent; can be struck with an inward suggestion, can try its feasibility, and put it into

execution. They are even not altogether unable to deal with pure abstractions. Let us take a significant, though very simple, case. Suppose a man required to carry two boxes, not heavy, but too bulky to be conveniently grasped at once. A "happy thought" strikes him; he examines them, compares their sizes, finds that one can be conveniently nested within the other, and completes his task with ease. This case, simple as it is, manifestly involves reason. Nay, most of our readers will have met with men who, when they encounter some such difficulty, seem incapable of devising any expedient to escape it. What, then, must we say of the dog referred to in the following case?—"One of the most unmistakable examples of dog-reason I can call to mind is that of a Newfoundland dog sent across a stream to fetch a couple of hats, whilst his master and a friend had gone on some distance. The dog went after them, and the gentlemen saw him attempt to carry both hats, and fail, for the two were too much for him. Presently he paused in his endeavour, took a careful survey of the hats, discovered that one was larger than the other, put the small one in the larger, and took the latter in his teeth by the brim."* Or, again, suppose that a savage observes game frequenting a certain track in a forest. A suitable locality suggests to him the possibility of catching them by a stratagem. He makes an experiment to test the practicability of the scheme, and feeling satisfied on this score, puts it in successful operation. Were such a case narrated it would be at once accepted as a proof of reason in the savage, and might be made the subject of much sensational comment. Yet here is the very action performed not by "a man and a brother," but by a fox:—"On coming home from shooting I observed, at some distance, a fox jumping continually up to a trunk of a tree of a middling height, holding something in his mouth. On examination I saw it to be a branch of a considerable size. Anxious to learn the reason I laid myself quietly down. In a very short time the fox laid down the branch and sat down on the trunk, prepared for a jump. Soon after I heard the approach of a family of wild pigs, which after some time were quite near to the stump. At the moment when they passed the fox, he jumped down on one of the young pigs, and returned with it to his elevated perch, preparing himself to begin a fat breakfast, quite careless of the impotent anger of the wild sow."† With the man who can venture to refer

* SHIRLEY HIBBERD, *Clever Dogs*, &c.

† *Zoologist*, p. 1365.

this case to instinct it is a mere waste of time to argue. Those who dispute the fact are reminded that lions have been seen in a very similar manner practising a manœuvre, and even conferring together on the subject.*

The following fact, which has never been questioned, is a clear case of a discovery made by insects, and forthwith turned to practical account:—Ants have been observed, both by Réaumur and Bonnet, to place their eggs between the outer wooden casing and the inner panes of a glass beehive, a situation where, without any trouble on their part, a regular and sufficient temperature exists. By so doing they are enabled to dispense with a great amount of labour in removing the eggs from one part of the nest to another, according to the weather. On this subject Messrs. Kirby and Spence remark†—"It is impossible to account for this without supposing some stray ant that had insinuated herself into this tropical crevice first to have been struck with the *thought* of what a prodigious saving of labour and anxiety would accrue to her compatriots by establishing their society here; that she had communicated her views to them, and that they had resolved upon an emigration to this newly-discovered country, whose genial climate presented advantages which no other situation could offer. Neither instinct nor any conceivable modification of instinct could have taught the ants to avail themselves of a good fortune which, but for the invention of glass hives, would never have offered itself to these insects. The conclusion seems irresistible that reason must have been their guide, inducing a departure from their ordinary habits." We may here ask—If observation and subsequent reflection can induce an animal to depart from its ordinary habits, are not those habits themselves under the direction of reason?

One case more, typical of a very important class, must be brought forward. Number, it will be conceded, is an abstract idea. A work was written but a little while ago‡ to prove the inability of animals to comprehend even the simplest numerical relations. There is, however, an instance on record of a Scotch collie, who, when assisting at the operation of sheep-washing, showed himself equal to count quite as well as many savages. There was close to the stream a small pen, capable of holding, if we remember rightly, eleven sheep at a time. The dog, without any assistance, always started off to the flock and drove up the

* R. MOFFAT, *Missionary Labours and Scenes in Southern Africa*.

† KIRBY and SPENCE, *Entomology*, ii., p. 416.

‡ See *Quarterly Journal of Science*, v., 361.

sheep in successive lots of eleven, without ever committing an error. We are unable to see how even the most adroit sophist can explain away this case. Man, however, is very loth to yield his fancied superiority. If the actions of animals can no longer be all explained by "instinct," surely some new name can be invented! Words are very cheap, and if they signify nothing where is the harm? Accordingly we have a new set of faculties, to which the actions of brutes may be ascribed. We hear of "*quasi-intelligence*," "*quasi-mind*," and even of "*quasi-memory*." Perhaps we shall in due time be informed that when an animal is in need of food it feels "*quasi-hunger*," and that when over-driven it suffers from "*quasi-fatigue*." Is it not gratuitous and unphilosophical in the extreme thus to multiply imaginary faculties? If it can be positively proved, from facts, that a dog remembers persons, places, or events by a totally different process and on totally different principles from what we ourselves do, then it will be time to talk of "*quasi-memory*." Until such proof is furnished it is a mere insult to our common sense. More than that, it is the *reductio ad absurdum* of all systems and first principles from which such a conclusion can be drawn. We trust that our physicists and chemists may not catch this infection, and treat us to *quasi-magnetism*, *quasi-light*, and *quasi-gravitation*.

It is suggested that a book should be written on the stupidity of animals. Such a work might then be very appropriately followed up by a companion volume on the stupidity of mankind. We fear that the latter, if fairly compiled, would prove the bulkier of the two. We are told that an elephant at the Zoological Gardens, finding the end of its trunk entangled in a ring, pulled till it tore off the extremity of its own member; but we know of a man who, in pruning his orchard, deliberately and neatly sawed away the branch against which his ladder was leaning, and fell to the ground with great violence. His name was Ferdinand Hilthel, and he lived not fifteen miles from Goerlitz. Yet on the strength of such negative cases we should not be justified in pronouncing man irrational. Why then should such an inference be drawn from the occasional, or even frequent, stupidity of the lower animals?

As a proof of animal irrationality it is said that a dog has been known, in a sudden broil, to fly *at* his master. We do not in the least dispute it, for we have seen very similar blunders committed by man! We witnessed an instance where a gentleman, in the confusion consequent upon a railway-train arriving much behind its time at a crowded

station, actually sought to prevent his wife from getting into the same compartment as himself, whilst all the time he was most anxious to secure a seat for her. Are we to pronounce him endowed merely with "*quasi-intelligence*"?

We may surely decide that the attempt to erect "reason" into an absolute criterion for distinguishing between man and beast is an utter failure, and that its hopelessness will be more and more recognised the more profound and the more accurate our knowledge of the animal world becomes. Vast as is the superiority of our own species over even the highest brute, the difference is not of kind, but of degree.

We cannot help pointing out as significant the assertion that if the ants could be proved to be rational they would be insects merely in form!

We pass on to the last remaining point, the moral life, and ask if here can be found the absolute distinction which, mirage-like, has fled as we have followed? One of the charges brought against the so-called "Agnostics" is that they confound virtue with pleasure. This accusation is urged in a chapter in which he seeks to show that "perceptions of right and wrong, and of our power of choice and consequent responsibility, are universally diffused amongst mankind, and constitute an absolute character separating man from all other animals." Here, as usual, dissidents are criticised sometimes singly and sometimes collectively, all being, by implication at least, held answerable for any error or oversight, real or imaginary, detected in the writings of any one, and for its assumed consequences. Now, that some modern writers may have forgotten that an action highly pleasurable to the doer is not necessarily virtuous, we shall not seek to deny. In so doing they have been probably influenced by a more or less conscious reaction against the opposite error so dominant in the Dark Ages, and at all other times of rampant ecclesiasticism—that an action was to be regarded as vicious in the exact proportion of its pleasurable nature, even though no person were injured, whilst sufferings and privations by which no one was benefited were deemed virtuous and meritorious. Of these two opposite errors the modern one is assuredly the less dangerous. But it is very curious that Mr. Mivart, well acquainted as he must be with the writings of Mr. Herbert Spencer, has not thought proper to allude to his criterion for distinguishing evil from good. To this we are therefore obliged to call attention:—"From whatever assumptions they start, all theories of morality agree that conduct whose total results, immediate and remote, are beneficial, is good

conduct ; whilst conduct whose total results, immediate and remote, are injurious. is bad conduct." * This passage, we submit, completely refutes the charge brought against modern philosophy—that it teaches man to indulge any desire, no matter at what cost to others, or with what future consequences to himself. Ultimate as well as immediate results are considered, and the effects—not upon the actor alone, but upon all persons whom the action can possibly influence—are fully weighed.

To Mr. Spencer's criterion it has been objected that it leaves motives out of the question. But we are not sure that the consideration of motives can be, generally speaking, anything but delusive. What may be the motives which have led to any particular line of conduct we may guess with more or less of correctness, but we can never know with certainty. Nor in many cases can motives, however accurately known, be allowed to weigh in the same scale as results, or in any manner to affect our judgment. We should surely not show any more mercy to a Thug, or to a judge of the "Holy Office," who murders men "for their soul's health" or for the pretended honour of his God, than we would to a Greek brigand or a Chinese pirate. If anything, the latter are the less dangerous criminals. Mr. Mivart dispenses with every criterion, holding man's notions of right and wrong to be intuitive : his manner of dealing with the innumerable facts that prove, on the contrary, that man has no such innate standard, is saddening. The strangest scepticism, on the one hand, is blended with a credulity no less strange on the other. The fact that no authenticated instance of remorse on the part of a savage can be adduced is left in the background. The outrages of wild men are sought to be explained away with a wonderful amount of misplaced ingenuity. We quote the following passage :—"Thus the most revolting act that can well be cited, that of the deliberate murder of aged parents, monstrous as the act in itself is, may really be one of filial piety, if, as is asserted, the savage perpetrators do it at the wish of such parents themselves, and from a conviction that thereby they not only save them from suffering in this world, but also confer upon them prolonged happiness in the next." It is a known fact that the murder of aged relatives is often effected in such a way that the victims would never solicit it as a favour. Sometimes they are disposed of not by being promptly slain, but by being simply abandoned to die of

* Essay on Education, p. 114.

hunger and thirst, or to be devoured by wild beasts, as the chance may be. Can we believe that any person would wish to be thus "saved from suffering in this world"? But we need not confine our attention to the lowest savages. The ancient Danes, as is very well known, had a custom of tossing young children upon the points of their spears. Was this act, also, a species of disguised kindness, intended merely for the good of the victims? Surely an innate moral sense which can allow such actions as we have here mentioned, not to speak of what might further be brought forward, must be of no practical value. It is idle to say that savages do not approve of murder, robbery, and outrage, because they become angry if themselves or their tribe are the sufferers. The lower animals do just the same: rob a wild beast of his prey, or of his young, and your life is in peril. Shoot a peccary, and the whole tribe rushes upon you.

Mr. Mivart quotes as an example of "Savage refinement" the following passage from Sir John Lubbock:—

"Among the Greenlanders, should a seal escape with a hunter's javelin in it, and be killed by another man afterwards, it belongs to the former. But if the seal is struck with the harpoon and bladder and the string breaks, the hunter loses his right. If a man finds a seal dead with a harpoon in it, he keeps the seal but returns the harpoon. Any man who finds a piece of drift-wood can appropriate it by placing a stone on it as a sign that some one has taken possession of it. No other Greenlander will then touch it."*

This is very interesting; but we can give from our own observation a case somewhat similar amongst animals certainly not ranking high in the scale of intelligence. We kept formerly a number of vipers and other snakes in a pit something like a melon frame. If a live mouse was dropped into the pit there was a general scramble, and all the venomous inmates were seen snapping at the warm-blooded intruder. But as soon as one had planted a fatal bite all the others withdrew into their crevices, or coiled themselves up to sleep, leaving the conqueror to the quiet enjoyment of his meal. This we witnessed repeatedly, and can bear witness that it was not the largest or strongest snakes alone whose rights to their prey were thus left undisputed.

But even if it were shown that all existing tribes on the earth had some notions of morality the question is still open. Mr. Mivart assumes that no tribes ruder and lower than any now dwelling upon our globe have flourished in primeval

* *Origin of Civilisation*, p. 305.

days, and have been swept away. Yet that such must have once existed will appear highly probable if we reflect on the process of extermination still going on. Is it not likely that in more barbarous days before modern philanthropy had arisen, and before the Aborigines Protection Society had been organised, wars of extirpation, always directed against the races least raised above the brute level, would be more frequent and more destructive? The legends of all ancient nations point in the same direction, telling us of half-human monsters whom their forefathers extirpated or drove out.

But this is not all; before the presence of a moral sense, of a feeling of right and wrong, whether innate or acquired, can be brought forward as "an absolute characteristic separating man from all other animals," it must be shown that no other animal possesses such moral sense. And here Mr. Mivart has nothing save baseless, wanton assumption to array against solid facts. He may, if it so please him, *assert* that brutes are void of all traces of conscience, but unless he could enter into their minds and be aware of their feelings, such assertion is unwarrantable. Suppose a mineralogist were to hold up before us two minerals, A and B, very similar in all their outward properties, and should inform us that the distinction between them consisted in the fact that cobalt was always present in A, and was as uniformly absent in B. We should naturally ask if he had analysed both and could give a full account of all their constituents? What should we think were he to reply:—"I certainly have analysed A, and have found the presence of cobalt. B I have not been able to analyse, but on *a priori* grounds I am satisfied that no cobalt can there be present." Should we not feel inclined to send him back to take some quite other "lessons from nature?"

As an instance of the very different conclusions which other minds have drawn from a close and prolonged observation of animal life, we may take the following passage from the writings of the late Agassiz. Pronouncing the range of passion in animals as extensive as in man, he continues:—"I am at a loss to trace a difference of kind between them. The gradation of moral faculties between the higher animals and man is so imperceptible that to deny to the first a certain sense of consciousness and responsibility would be an exaggeration." These are the words, it must be remembered, of an original observer of unquestioned ability and untiring industry, who, moreover, devoted his attention far more closely and exclusively to biology than Mr. Mivart has

apparently done. Agassiz, further, was no "Agnostic," no Darwinist, no believer in Evolution, but a champion of the doctrine of individual creation. No one can accuse him of seeking to under-estimate the difference between man and other animals from any sinister motive.

The Rev. J. G. Wood, in his recent interesting work "Man and Beast,"—without, as far as we can perceive, accepting Darwinism, or even Evolution, and certainly without seeking to demonstrate our kinship with apes,—arrives at conclusions closely resembling those of Professor Agassiz, and even produces no contemptible evidence in favour of animal immortality. The like has been done by Bishop Butler. Nor can it be denied that some at least of the strongest arguments advanced in favour of man's immortality tell in favour of a hereafter in store for lower animals. If the life of man is a drama, of which the fifth act, with its compensations and retributions, is reserved for another stage, surely the same should hold good with brutes, among whom also there prevail those differences of destiny which have perplexed man.

There are on record fully authenticated instances of animals feeling ashamed of actions they have committed. We may refer to the case observed and described by Mr. G. J. Romanes.* This case, which we think no one will attempt to ignore as the exaggeration or the mistake of an incompetent observer, is very significant. To escape ridicule X is tempted to tell (or not) a falsehood. Detected in this the said X feels much more distressed and ashamed than when merely ridiculed for his blundering. Now if for X we read John Nupkins, all will admit that John Nupkins knew that falsehood was wrong, and will call his subsequent distress the action of a guilty conscience. But if, instead of John Nupkins, X happens—as in this case—to stand for a terrier, where is our right to put any different interpretation on the same set of facts?

Among certain birds—*e.g.*, rooks—careful observers have detected distinct traces of criminal law. Thievish birds, who persevere in stealing sticks from the nests of their fellow-citizens, have been seen banished from the community, severely chastised, and even killed, by a general assemblage. "But law necessarily pre-supposes the notions of right and wrong, and could never, therefore, have arisen among beings incapable of drawing this distinction."

We shall add one more case to prove in the lower animals

* See Quarterly Journal of Science, v., 425., and p. 153 of present number.

the existence of free will, the power of overcoming natural instincts and temptations, in order to secure a supposed benefit in the sequel ;—" A fine terrier, in the possession of a surgeon at Whitehaven, about three weeks ago exhibited its sagacity in a rather amusing manner, It came into the kitchen and began plucking the servant by the gown, and, in spite of repeated rebuffs, it perseveringly continued in its purpose. The mistress of the house, hearing the noise, came down to enquire the cause, when the animal treated her in a similar manner. Being struck with the concern evinced by the creature, she quietly followed it upstairs into a bed-room, whither it led her ; there it commenced barking, looking under the bed, and then up in her face. Upon examination, a cat was discovered there quietly demolishing a beef-steak, which it had feloniously obtained. The most singular feature in the whole case is that the cat had been introduced into the house only a short time before, and that bitter enmity prevailed between her and her canine companion."* This is a capital case. "Instinct" would undeniably have led the terrier to attack the cat and attempt to deprive her of her booty, the rather as the two animals were on unfriendly terms. But we find this natural impulse here completely restrained for the attainment of a certain definite end. The terrier lays an information against his enemy. Why should he, unless he entertained the notion that theft was wrong ? He evidently concluded that his enemy, if detected in such an act, would probably suffer severe punishment. The incident is of the greater value as it prove that brutes are capable not merely of planning means to effect an object quite unconnected with the preservation of the individual or of the species, but of exercising self-control ; that, in short, they do not always blindly and necessarily follow their physical appetites, but can, like man, forego present indulgence for what appears to them a greater good hereafter.

A strange attempt is made to show that animals are altogether unconscious ; that though they feel pain, they are not aware of so doing. They are represented as being, therefore, naturally and permanently in the state into which man may be artificially and temporarily thrown by means of anæsthetics. If this be, then cruelty to animals is an impossibility, and the stipulation that in vivisection anæsthetics are to be employed is farcical in the extreme. But what of the evidence for this assumption ? We know that man can

* *Zoologist*," p. 2131.

be conscious of suffering, and also, under certain circumstances, unconscious. We are not without grounds for supposing that the lower animals feel less acutely than he does.* But how are we to be certain that as a class they are always unconscious of pain? Who has looked into the mind of a tortured horse or dog, and satisfied himself that it was unconscious of its misery, and therefore not miserable? And how is the favoured sage who has done this wondrous thing to satisfy us that he has observed and interpreted aright? Mr. Mivart tells us that a wasp deftly snipped in two with a pair of scissors, whilst sipping honey or syrup, will continue its banquet. We have seen an impaled dragon-fly greedily devour a blue-bottle presented to his jaws. The absence of struggle and disturbance is here taken as a proof that the animal does not feel. But if so, when we find a wounded animal writhing and screaming, may we not infer that it both feels and knows that it feels?

What of mental distress, sorrow, as distinct from bodily pain? We know that this condition produces in brutes the very same results as in man. Dogs have been known to pine away and die for the loss of their masters. Female apes sometimes, "sensational" as it may seem, do not always recover from the effects of losing their infants. Birds have often drooped and died on losing their mates. A horse sometimes falls out of condition on parting with its yoke-fellow. Yet we are to believe that they are all the while unconscious of the distress they suffer! In short, for the notion of the total unconsciousness of animals, we can find no valid evidence, but much against it, and must therefore dismiss it to limbo as one of the many far-fetched and hopeless attempts to defend the "great gulf."

We do not consider it legitimate to denounce any scientific hypothesis because some persons may find in it countenance for moral or social errors. But we cannot help pointing out that, had this unconsciousness of animals been advanced as a cardinal point of Darwinism, great would have been the outcry raised against the demoralising tendencies of modern science. Here, however, science pleads on the side of mercy, whilst Mediævalism replies to every attempt to lighten the sufferings of domestic animals: "No es Cristiano!"

The whole work, despite the unquestionable ability which it evinces, must be pronounced disappointing—worthy, perhaps, of a Joseph de Maistre, but utterly unworthy of a

* It is probable also that the lower races, or species—if we may venture to use the word—of mankind have less feeling than the higher.

Mivart. If such are genuine "Lessons from Nature" the venerable dame keeps a most inefficient school, and the sooner it is closed the better. But in this case the pure white light has passed through such a powerfully distorting medium that its true nature can scarcely be recognised. Metaphysics may be regarded as a disease which thinkers are liable to contract at some part of their career, just as children take the measles, or rather the scarlet fever. Mr. Mivart's is a very bad case; but for his own sake, and still more for that of Science, we wish him a full and a speedy recovery. An intellect like his is too valuable to be lost.

V. THE MECHANICAL ACTION OF LIGHT.*

By W. CROOKES, F.R.S.

TO generate motion has been found a characteristic common, with one exception, to all the phases of Physical Force. We hold the bulb of a thermometer in our hands, and the mercury expands in bulk, and, rising along the scale, indicates the increase of heat it has received. We heat water, and it is converted into steam, and moves our machinery, our carriages, and our ironclads. We bring a loadstone near a number of iron filings, and they move towards it, arranging themselves in peculiar and intricate lines; or we bring a piece of iron near a magnetic needle, and we find it turned away from its ordinary position. We rub a piece of glass with silk, thus throwing it into a state of electrical excitement, and we find that bits of paper or thread fly towards it, and are, in a few moments, repelled again. If we remove the supports from a mass of matter it falls, the influence of gravitation being here most plainly expressed in motion, as shown in clocks and water-mills. If we fix pieces of paper upon a stretched string, and then sound a musical note near it, we find certain of the papers projected from their places. Latterly the so-called "sensitive flames," which are violently agitated by certain musical notes, have become well known as instances of the conversion of sound into motion. How readily chemical force undergoes the same transformation is manifested in such catastrophes as those of Bremerhaven, in the

* A Lecture delivered at the Royal Institution, on Friday evening, February 11th, 1876.