LITERATURE, SCIENCE, AND LIGHT READING.

DARWIN'S ORIGIN OF SPECIES.*

[No modern work has excited more intense interest, not even the *Vestiges of Creation*, than this remarkable volume, which is avowedly the forerunner of others on the same subject. During the last few days it has been reviewed in most of the leading publications of the metropolis, by none, however, more succinctly, philosophically, and impartially than by an accomplished critic in the *Saturday Review*, whose notice we extract, entire.]

Not many years have passed since the reading part of the British public was profoundly disturbed by the appearance of an anonymous work called *Vestiges of Creation*. Few books have at the outset produced more effect. Many readers were fascinated by the boldness, and, as they supposed, the novelty of the author's views. Others, of more serious disposition, were alarmed at the tendency of his theory, which seemed to dispense with the agency of an intelligent Creator in the work of creation. The alarm of the latter class was the greater that, until men of eminence in science buckled on their armour to confront the unknown author of all this confusion, they were sorely in doubt whether any effectual resistance could be offered to the attack that had been made upon established opinions.

To some lookers-on, the most surprising part of the affair was the proof that it gave of the existence of a great unsuspected deposit of ignorance in the very midst of the upper stratum of English society. Except some skill in the exposition of his opinions, and a moderate acquaintance with the results of recent inquiry, the author of the *Vestiges* added nothing to the "development theory" of Lamarck that could weigh with a mind trained to scientic investigation. Two arbitrary hypotheses, sustained by nothing that deserved the name of argument, furnished the basis of his theory. "The creation of life, wherever it takes place, is a chemico-electric operation, by which simple germinal vesicles are produced." All animated beings, "from the simplest and oldest up to the highest and most recent, are the results, *first*, of an inherent impulse in the forms of life to advance, in definite times, through grades of organization terminating in the highest dicotyledons and mammalia; *secondly*, of external physical circumstances, operating reactively upon the central impulse to produce the requisite peculiarities of exterior organization." When it was seen that such flimsy speculations as these were able to unsettle the innermost regions of English thought, it became quite clear that it was time to think of including natural science within the range of our educational systems. After causing an amount of disturbance quite disproportioned to its real importance, the *Vestiges of Creation* are now nearly forgotten and the book rests in our libraries on the same shelf with many another clever defence of a shallow theory. It has probably done no permanent harm, and if it has contributed to the spread of a sounder and less empirical mode of teaching natural science than has hitherto been common in this country, the author may be allowed to plead so much in extenuation of the censure which he incurred.

During the entire discussion we had amongst us one who took no part in the strife—a silent labourer, who, for many years before and since the rise and fall of the *Vestiges of Creation*, had been engaged in observations and experiments upon the precise question at issue, the Origin of Species. Mr. Darwin is known to the scientific public by more than one work of unquestionable value, but his attainments and ability were believed to be superior to any evidence of them he had previously given, and the interest felt in the work upon which he was known to have been long engaged, was increased by a communication made last year to the Linnean Society, which, to the initiated, showed pretty clearly the direction towards which his opinions tended. The great undertaking upon which the labour of nearly a quarter of a century has been expended is still unfinished; but, for reasons explained in the introduction, Mr. Darwin has been led to publish the present volume, which he terms an abstract of his future work. As far as we can pretend to judge, it contains a full statement of the writer's theoretical views, and of the arguments by which he proposes to sustain them. The detail of evidence is, of course, reserved for the complete work; but a sufficient summary is now given to enable the reader to anticipate its character, though not fully to test its value.

When we say that the conclusions announced by Mr. Darwin are such as, if established, would cause a complete revolution in the fundamental doctrines of natural history—and further, that although his theory is essentially distinct from the development theory of the *Vestiges of Creation*, it tends so far in the same direction as to trench upon the territory of established religious belief—we imply that his work is one of the most important that for a long time past have been given to the public. We have not been amongst the foremost to pass our judgment upon it, for it is a book—we say it deliberately—that will not bear to be dealt with lightly. It is the result of long-continued thought and labour, directed by a man of remarkable ability and wide attainments to construct and to consolidate a theory which has for its basis some undeniable facts. There is scarcely an objection that can be urged that Mr. Darwin has not already anticipated, and to which he has not replied, as far as it admits of reply—and that with a degree of moderation and candour that would be evidence of excellent judgment, if they were not, as we fully believe them to be, entirely unaffected.

Although it is certain that Mr. Darwin's views will cause painful anxiety to many who will regard them as hostile to the truths of Revelation, we cannot share in that anxiety, and are therefore not disposed to discuss the new theory on any other than strictly scientific grounds. Except in a single brief and somewhat obscure paragraph, Mr. Darwin has avoided all reference to the origin of the human race; but in his future work he can scarcely fail to be explicit upon that point. To him, or to any other man of science who should attempt to prove to us that the moral and spiritual faculties of man have been gradually developed by the working of matter upon matter, we should reply by demurring *in toto* to the applicability of his reasoning. No conceivable amount of evidence derived from the growth and structure of animals and plants would have the slightest bearing upon our convictions in regard to the origin of conscience, or man's belief in a Supreme Being and the immortality of his own soul. Within the proper domain of natural science, which includes the entire visible creation, animate and inanimate, we desire to place no barrier before the spirit of inquiry. We know that there are limits which human reason is unable to overpass, but we believe that those limits will be more surely ascertained and fixed by the right use of reason itself than by the edict of an eternal authority.

Mr. Darwin's theory may be stated in a few words. All organic beings are liable to vary in some degree, and tend to transmit such variations to their offspring. All at the same time tend to increase at a very rapid rate, and their increase is kept in check by the incessant competition of other individuals of the same species, or that of individuals of other species, or by physical conditions injurious to each organism or to its power of leaving healthy offspring. Whatever variation occurring among the individuals of any species of animals or plants is in any way advantageous in the struggle for existence will give to those individuals an advantage over their fellows, which will be inherited by their offspring until the modified variety supplants the parent species. This process, which is termed natural selection, is incessantly at work, and all organized beings are undergoing its operation. By the steady accumulation, during long ages of time, of slight differences, each in some way beneficial to the individual, arise the various modifications of structure by which the countless forms of animal and vegetable life are distinguished from each other. All existing animals have descended from at most only four or five progenitors, and plants from an equal or lesser number. Analogy (which Mr. Darwin admits to be a deceitful guide) would even lead him to infer that "all the organic beings which have ever lived on this earth have descended from some one primordial form into which life was at first breathed."

Easy enough to state, it is impossible to give within much less space than the author has himself employed any idea of the mass of argument by which this startling theory is sustained and defended. With admirable skill and ability, Mr. Darwin has in succession encountered the various and formidable difficulties which the bare announcement of his theory must suggest to the minds of most naturalists. The chapters devoted to Instinct, Hybridism, Geographical, Distribution, and to Embryology—though from the nature of the present work necessarily incomplete—are especially remarkable for the amount of learning and research that are brought to bear upon the argument.

So much we have said in bare justice to the author of this new theory; but it may relieve the anxiety of some of our readers if we at once declare that, after the most deliberate consideration of his arguments, we remain unconvinced. To discuss the subject with any approach to completeness would be impossible within ten times the space that can be given to this article. We shall merely point out in a very general way a few of the difficulties encountered by Mr. Darwin in attempting to answer objections which we feel justified in calling insurmountable; for if he has failed to overcome them, it is scarcely likely that any abler advocate of his theory will be found to replace him.

To the present, as well as every other hypothesis which assumes as a fact of organized life the gradual and continued transition from one species through another, to some form widely different in structure, geology opposes the records preserved in the organic remains found in each successive formation. To remove the difficulty which lies in the perfectly definite character of past species even in the earliest geological periods, Mr. Darwin spares no amount of skill and labour to establish, first, the extremely imperfect character of the geological record; secondly, the enormous lapse of time that must be allowed for the deposition of each formation, and for the intervals between them. It is only a proof that it is impossible for any man to apply to his own arguments that constant and accurate process of testing which is afforded by independent criticism, and no imputation against the candour of the writer, to say that in this delicate part of his case he has committed some manifest errors, and allowed himself assumptions to which he would scarcely have resorted had his need been less urgent.

Mr. Darwin commences by summing up the maximum thickness of all the sedimentary formations hitherto detected in Great Britain, points out the extreme slowness with which they have been deposited, and the still longer periods intervening during which the area of Great Britain was either at rest or exposed to denudating action, and by way of furnishing a scale by which to estimate the whole, he calculates the time necessary for the denudation of the Weald of Sussex alone at about three hundred millions of years. No wonder that behind such a formidable outwork Mr. Darwin thinks himself free to deal, according to his pleasure, with past ages of time, and that, if a million of centuries, more or less, is needed for any part of his argument, he feels no scruple in taking them to suit his purpose. Let us, however, examine the process by which he has attained to these results. When Professor Ramsay estimates the aggregate thickness of British deposits at 72,584 feet, it is not intended that either in Britain or elsewhere we have reason to believe that such a thickness of sedimentary matter has ever been deposited on any part of the earth's surface. This large figure is obtained by adding together the utmost thickness which each deposit is anywhere known to acquire. But to obtain a probable measure of the time requisite for any deposit to attain its maximum thickness we should compare the maximum rate of deposit now known to occur. We know, indeed, very little of the action of the greatest rivers in this respect; but, if Everest's observations are to be relied upon, the Ganges annually pours into the Bay of Bengal, a mass of sediment which would cover more than 5000 square miles to the depth of half an inch; or, in other words, enough to form a stratum 1000 feet in thickness in 24,000 years. This fact alone, and a moment's thought of the enormous mass of mineral matter which is constantly transported by other great rivers, either to form deltas, or—as with the Amazon—to be swept into the depths of the ocean, far from land, goes some way to modify Mr. Darwin's assumption that formations of considerable thickness can be formed only during periods of subsidence; while, at the same time, it helps to moderate the huge demand that he wishes to establish against the great reserve of geological time. This brings us to his estimate of the period consumed in the denudation of the Weald Valley. As most of our readers know, this is the tract between the North and South Downs, that is crossed in going from London to the Sussex coast. There is sufficient reason to believe that, since the deposition of the chalk, the sea has flowed in the valley between the two ranges of the Downs for a sufficient time to remove not only the chalk, but also a large amount of the underlying strata. In the first instance, though this is but a trifle, Mr. Darwin has forgotten to allow for the fact that the sea would act against both sides of the valley at once, and thus we should begin by reducing his enormous estimate by one-half. The difference between us is, however, more important. He assumes that the sea-action would begin at the upper surface of the chalk, and gradually eat into it, backwards and downwards, at the rate of a yard in twenty-two years: and further than this, he seems to assume that the underlying formations—upper and lower greensand and wealden—would offer the same resistance as the chalk. But surely Mr. Darwin must know what reason there is to believe, or rather to be certain, that the chalk that once covered the Weald Valley was penetrated by faults, and probably by fissures, of considerable depth and breadth. The sea in many places would have worked against the bottom of perpendicular faces of chalk: and, as any one may see at Beachy Head, it will eat away a cliff six hundred feet high nearly as fast as one of sixty feet. But further than this, it is more than probable that during the denudation of the Weald the action of the sea was directed against the soft green-sand underlying the chalk, and as this was rapidly eaten away, vast masses of chalk would fall away to seaward. Our conclusion, therefore, is, that in this instance Mr. Darwin has enormously overrated the amount of time which can legitimately be demanded to account for the geological phenomena.

His next step in the career of hypothesis is still more startling. Even the vast roll of ages that he would place between us and the commencement of organic life in the palæozoic rocks does but carry us back to an epoch when there lived in the waters a large number of animals as distinct from each other in their structure as those that the dredger may now take off our western coasts; and, strange to say, at least two genera of molluska of which the representatives still exist. To obtain the space which he requires in order to account for the existence of this varied fauna, Mr. Darwin does not hesitate to plunge backward in the æons of past time, and to point to a period as far removed from the earliest known palæozoic rocks as these are from our era. Not knowing where to find a shred of evidence for the existence of this enormous mass of pre-Silurian formations, a new hypothesis is produced, certainly ingenious, but to our minds, in the very highest degree improbable. Mr. Darwin fairly admits that his case is difficult but tries to satisfy the inquirer by the assurance that his witnesses are all drowned. The present continents and oceans, as he tells us, have existed pretty much where they now do ever since the deposition of the oldest fossiliferous beds; but before that epoch other continents existed in the area now filled by oceans; from their waste, formations were formed in the adjoining seas, and in those formations one after another, throughout millions of ages, the successive forms of the primitive fauna and flora were silently entombed; but no elevatory forces—no volcano, terrestrial or submarine, throughout the countless ages that have since elapsed—have ever brought a single fragment of these buried continents to the light of day.

We leave professed geologists to deal with these and other portions of Mr. Darwin's speculations. Enough has been said to show what a pile of unsupported conjecture has been required to sustain this last and ablest attempt to penetrate the mystery of the origin of species, or, in other words, the Origin of Life. Apart from the innate curiosity that urges all reflecting men at some time to consider this great problem, students of natural history are continually driven to seek some solution of it, in order that they may find some secure basis on which to raise the superstructure of their science. Discussing the subject with men of the most various opinions, we have found them nearly unanimous upon one point—that there must be somewhere discoverable a true criterion of species, and that, although the *modus operandi* of Creative Power might remain concealed, the general plan of creation would, sooner or later, be made known to us. Upon this ground we venture to dissent as well from those eminent naturalists who, like the late Edward Forbes, endeavour to raise what we may call the orthodox doctrine of the separate creation of species to the rank of a demonstrated scientific truth, as from all those who, under one form or another, cling to the doctrine of development. We simply diabelive that—at least in its present condition—natural science is entitled to treat any doctrine whatever as either proved or provable.

In regard to that which is peculiar to Mr. Darwin's theory, we are far from thinking that the fruits of his labour and research will be useless to natural science. On the contrary, we are persuaded that natural selection must henceforward be admitted as the chief mode by which the structure of organized beings is modified in the state of nature. We think it very possible that through this agency considerable groups of nearly allied species may have been derived from a single progenitor, but we are convinced that the modifying power rests within defined limits, though those limits may not be discoverable by man. Far as explorers may travel along the shores of the Ocean of Truth, the horizon does but stretch the farther before them, illimitable in its vastness.

* *On the Origin of Species by means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life.* By Charles Darwin, M.A., &c., &c. London: Murray. 1859.

SCIENCE AND ART.

A REMARKABLE ASTRONOMICAL FACT.

Professor Mitchell, in his lectures on astronomy, related a very remarkable fact. He said that he had not long since met, in the city of St. Louis, Missouri, a man of great scientific attainments, who for forty years had been engaged in Egypt in deciphering the hieroglyphics of the ancients. This gentleman had stated to him that he had lately unravelled the inscriptions upon the coffin of a mummy, now in the London Museum, and that by the aid of previous observations he had discovered the key to all the astronomical knowledge of the Egyptians. The zodiac, with the exact positions of the planets, was delineated on the coffin, and the date to which they pointed was the autumnal equinox in the year 1722, before Christ, or nearly thirty-six hundred years ago. Professor Mitchell employed his assistants to ascertain the exact position of the heavenly bodies belonging to our solar system on the equinox of that year (1722 B.C.), and sent him a correct diagram of them, without having communicated his object in doing so. In compliance with this the calculations were made, and to his astonishment, on comparing the result with the statements of his scientific friend already referred to, it was found that, on the 7th of October, 1722, B.A., the moon and planets had occupied the exact position in the heavens marked upon the coffin in the London Museum.

BUDS FROM THE CHRISTMAS BOUGHS.

AN "O'ER TRUE TALE" OF THRILLING INTEREST.

CHAPTER I.

"Oh, Fred, the Christmas boughs are come! the Christmas boughs are come!" cried the loud, eager voice of Eva Aldrich, and she bounded to the sitting-room window, and pressed down her face against the pane, while the man in the cart gathered up the long graceful boughs of holly, the wreaths, and yards of woven vine and ivy. "Dear me!" continued the little girl, in those eager, impatient tones that betrayed at once she was a petted, half-spoiled child, "I do wish that man would not be so slow; I could work faster than that myself. Won't we have a nice time though, Fred? We'll have a serpent round the chandelier, and double festoons from the ceiling to the floor, and a star over the mantel, and in great green letters on either side, 'Merry Christmas!' Won't it be glorious for my party, Fred?"

Now Frederic Aldrich was two years older than his sister, and had just passed his twelfth birthday, and fancied it better became the dignity of his age to manifest a slight degree of indifference to all his sister's demonstrations, so he answered, quite coolly, as he curled the black ear of the great Newfoundland that had laid its head on his knee—

"Well, I don't know; I s'pose 'twill all look well enough."

Eva turned sharply on him. "Now, Frederic Aldrich, you needn't pretend to me you don't care anything about Christmas or my party, because I just know better. You think as much of the new blue coat, with gold buttons, papa ordered for you to wear to-morrow night as I do of my white dress, if you are a boy, and ashamed to own it."

"I'm not ashamed to own it," retorted Frederic; "but girls always go into ecstasies over everything. Uncle Robert says they do."

"I never do, any way, Fred, and—oh, see, there it's beginning to snow! What if it shouldn't be pleasant to-morrow night!" and the little girl turned up her anxious face to the few snow flakes that were lazily sifting down to the ground.

Just at that moment Mrs. Aldrich's voice called from the dining-room, "Come, children, come, and see the evergreens," and Eva's feet glanced out of the door, and down the stairs, while Fred followed slowly, patting Carlo's head, and whistling a tune, as though Christmas festivals were quite a secondary consideration.

The little girl had been born and reared in all the tenderness and luxury with which love and wealth could surround her. She was a bright, impulsive, warm-hearted child, but she was habitually, though unconsciously, selfish, expecting others would yield to her wishes or her whims, and, though very generous in the way of making gifts, hardly knowing what it was to sacrifice her own desires for those of another. Still, perhaps, this was more the fault of her parents than of herself, for everybody loved and petted her. She was a very pretty child, too; with thick, long curls of yellow-brown hair, for ever dancing about her cheeks; with laughing hazel eyes, and lips that were like a newly-opened honey-suckle when you have seen some bee dive deep into its crimson cell.

Her face, it is true, had a little too fair and delicate a look to suit my fancy—it lacked some of that warm, living hue which you can only find out among the green fields, and in the shady woods, and which tells its own story of health—that gift above all earthly blessings.

"Mother, Uncle Robert said this morning he would order a temple for the centre of the table, made of iced oranges, and all sorts of confectionary. You don't think he'll forget the cakes and creams, do you?"

"No, no, my child. What a little chatterbox you are, Eva. I never shall get this work done, with your hindering me after this fashion, and I'm so nervous over it, for I want it finished before dinner. Do run up-stairs, there's a good girl."

"Oh, please, let me stay, mamma. You know you'll want me to hand you the hammer and tacks in a few moments, for you said you shouldn't trust one of the girls to put up the holly."

Before Mrs. Aldrich could answer, a domestic put her head inside the door. "Please, ma'am, the woman's brought home Miss Eva's skirt, and she says it's just ten shillings."

"Oh, dear me; I forgot to ask Mr. Aldrich to leave me any money this morning, and I forget, too, where I laid my purse; it'll take so long to hunt up the money just now. Tell the woman I'm very sorry, and ask her to come round to-night, and she shall certainly have it."

Now Mrs. Aldrich was naturally a kind-hearted woman, and if she had stopped to think twice, she would not have allowed the