NEW PUBLICATIONS.

DARWIN ON THE ORIGIN OF SPECIES.

ON THE ORIGIN OF SPECIES BY MEANS OF NATURAL SELECTION. By CHARLES DARWIN, M. D. 12mo. pp. 432. D. Appleton & Co.

The reputation of Mr. Darwin as a scientific naturalist will challenge attention to this volume, no less than the novelty and boldness of the views which it announces. His name is familiar to the students of physical science, by his admirable narrative of the researches which he conducted while attached to the exploring expedition in the Beagle under Capt. Fitzroy, from 1832 to 1836, and other writings in which a fine vein of philosophy is blended with accurate and vigorous description.

On his return from that voyage, nearly twenty-five years ago, he became convinced that certain facts, which he had observed, in the distribution of the inhabitants of South America, and in the geological relations of the present to the past inhabitants of that continent, might throw not a little light on the mysterious question of the origin of species. After the lapse of five years, which appear to have been mainly devoted to other labors, though in a similar field, he took the subject in hand, and for the last sixteen years has devoted to its investigation the most diligent inquiry, spread over a vast range of facts, and no common power of minute analysis and logical deduction. Nor does he regard his work as yet in a state of completion, although sufficiently advanced to satisfy his mind of the correctness of his theory. The advice of such eminent scientific men as Sir Charles Lyell and Dr. Hooker has induced him to publish this volume, in its present form, although it claims only to be an imperfect abstract of his researches and speculations.

The cardinal doctrine of the work, as set forth b Mr. Darwin, is that the various species, into which the animal and vegetable kingdoms have been divided by naturalists, are not immutable; that th idea of the separate and independent creation o each species is an error; and that those belongin to the same genera are lineal descendants of some other extinct species, in the same manner as th acknowledged varieties of any one species are the descendants of that species.

In order to verify his conclusions by the study of a special group, Mr. Darwin selected that of the domestic pigeon, as affording the most convenient test and illustration of his theory. His observations on this class of birds, were profound and curious. Every breed which he could purchase or obtain was brought into his dovecots. He procured an assortment of skins from several quarters of the world. He studied treatises on pigeons in various languages, became a member of London pigeon clubs, and the associate of eminent pigeon fanciers. The astonishing diversity of breeds is well known. Even the names of the varieties demand a special dictionary. Look at the wonderful difference in the beaks of the English carrier and the short-faced tumbler, and see the corresponding differences entailed upon the skull. The barb is allied to the carrier, but instead of a very long beak, has one very short and very broad. The pouter has a body, wings, and legs of amazing length, and its ludicrously inflated crop is a matter of amusement. The turbit has a very short and conical beak with a line of reversed feathers down the breast; the jacobin has feathers so much reversed along the back of the neck that they form a hood; the trumpeter and laugher have a peculiar coo; the fantail has thirty or even forty tail feathers, instead of twelve or fourteen, like the rest of the pigeon family; several other less distinct breeds might be specified. The differences in the skeleton are no less strongly marked than in the external organization. The period at which the perfect plumage is acquired varies. So does the down with which the nestlings are clothed when hatched. The shape and size of the eggs vary. The manner of flight is peculiar in the different breeds; and so in many of them, are the voices and disposition. Every ornithologist would regard these breeds as distinct, well-defined species, if not indeed, as belonging to different genera. Now, maintains Mr. Darwin, great as are the differences between the breeds of pigeons, they have all descended, as most naturalists, in fact, admit, from a single stock, that of the rock pigeon. We need not here go into the arguments by which he supports his position. The case is mentioned as an illustration of the manner in which he traces existing diversity to original unity.

Starting, then, from a common point, how are the innumerable varieties to be accounted for? Some effect may be due to the external conditions of life; some, perhaps, to habit; but such agencies are certainly not sufficient to explain the differences of a race-horse and a cart-horse, a greyhound and a bloodhound, a carrier and a tumbler pigeon. The power of adaptation in our domesticated races to the use or fancy of man is no doubt wonderful. Some variations of this kind may have arisen suddenly, and by a single step, as in the turnspit dog or the ancon sheep; but this does not tell the whole story. All the breeds were not at once produced in their present improved forms; the secret is to be found in man's power of accumulative selection. Nature gives successive variations; man integrates them in certain directions, for convenience and utility; and in this sense he may be said to make for himself useful breeds. The same principles are followed by horticulturists; but the variations are here often more abrupt. No one supposes that our choicest productions have been established by a single variation from the original stock. The steadily increasing size of the common gooseberry, for instance, has been the result of successive experiments. The continued selection of slight variations, either in the leaves, the flowers, or the fruit, will produce races different from each other chiefly in these characters. But the effect of what may be called unconscious selection is still more important. This arises from every one trying to possess the best individual animal without reference to the improvement of the stock. Thus a man who intends to keep pointers, naturally tries to procure the best dogs, and afterward breeds from the best in his pack, but without the slightest idea of permanently altering the breed. Still this process, continued during centuries, could not fail to produce remarkable and permanent effects. Thus there is reason to believe that King Charles's spaniel has been unconsciously modified to a great extent since the time of that monarch. Many excellent authorities are of opinion that the setter is directly derived from the spaniel, and has probably been slowly altered from it. It is certain that the English pointer has been greatly changed within the last century, chiefly by crosses with the fox hound; but in so gradual and unconscious a manner that though the old English pointer certainly came from Spain, at present, if we may believe Mr. Borrow, there is no native dog which resembles him in that country. In like manner, by a careful process of selection and training, the English race-horse has come to surpass in fleetness and size the original Arab stock. The cattle of England have also increased in weight and in early maturity, compared with the stock formerly kept. If we thus compare the accounts given in old pigeon treatises of carriers and tumblers, with those breeds as now existing in Britain, India, and Persia, we can readily trace the stages through which they have insensibly passed, and come to differ so greatly from the rock pigeon.

In plants the same gradual process of improvement through the occasional preservation of the best individuals may be recognized in the increased size and beauty now to be seen in the varieties of the heartsease, rose, pelargonium, dahlia, and other plants, when compared with the older varieties or with their parent stocks. No one expects to obtain a first-rate heartsease or dahlia from the seed of a wild plant, or a first-rate melting pear from the seed of the wild pear. This fruit, though cultivated in classical times, appears to have been of very inferior quality. Great surprise is often expressed at the skill of gardeners in having produced such splendid results from such poor materials. But the art has been simple, and, as far as the final result is concerned, has been followed almost unconsciously. It has consisted in always cultivating the best known variety, sowing its seeds, and when a slightly better variety has chanced to appear, selecting it, and so onward. The gardeners of the classical period, who cultivated the best pear they could procure, never thought what splendid fruit would be enjoyed at this remote day, though it is due, in some degree at least, to their having naturally chosen and preserved the best varieties they could find.

The application of these principles to organic beings in a state of nature is not difficult. No one supposes that all the individuals of the same species are cast in the very same mold. But the individual differences, such as are known frequently to appear in the offspring from the same parents, afford materials for natural selection to accumulate, in the same manner as man can artificially accumulate individual differences in his domesticated productions. It is a mistake of naturalists to suppose that important organs never vary. The varieties, in fact, are so great, that in the floras of special countries drawn up by different botanists, a surprising number of forms have been ranked by one botanist as genuine species, and by another as mere varieties. The same is true of the animals in different areas. Many of the birds and insects in North America and in Europe which differ very slightly from each other, have been ranked by one eminent naturalist as undoubted species, and by another as varieties, or, as they are often called, as geographical races. The term species, accordingly, is regarded by Mr. Darwin as one arbitrarily given for the sake of convenience to a set of individuals closely resembling each other, and not essentially differing from the term variety, which is given to less distinct and more fluctuating forms. The term variety, again, in comparison with mere individual differences, is also applied arbitrarily, and for the sake of convenience.

We are now prepared to advance another step, and to approach the question as to the origin of species in nature. How have the exquisite adaptations of one part of the organization to another part, and to the conditions of life, and of one distinct organic being to another being, been perfected? These beautiful adaptations are in every part of the organic world. We see them in the relations of the woodpecker and mistletoe; in the humblest parasite which clings to the hairs of a quadruped or the feathers of a bird; in the plumed seed which is wafted by the gentlest breeze. How is it, again, that minute varieties become ultimately converted into distinct species, which in most cases obviously differ from each other far more than do the varieties of the same species? All these results—and here is a cardinal point in Mr. Darwin's theory—follow inevitably from the struggle for life. Owing to this struggle, any variation, however slight, if it be in any degree profitable to an individual of any species, in its infinitely complex relations to other organic beings and to external nature, will tend to the preservation of that individual, and will generally be inherited by its offspring. The offspring, also, will thus have a better chance of surviving, for of the many individuals of any species which are periodically born, but a small number can survive. This principle, by which each slight variation, if useful, is preserved, is called by the author, natural selection, in order to mark its relation to man's power of selection. Man by selection can certainly produce great results, and can adapt organic beings to his own uses, through the accumulation of slight but useful variations, given to him by the hand of nature. But natural selection is a power incessantly ready for action, and is as far superior to man's feeble efforts, as the works of nature are superior to those of art.

The struggle for existence, which is at the foundation of the principle of natural selection, includes not only the life of the individual, but success in leaving progeny. Two canine animals in a time of dearth may be truly said to struggle with each other which shall get food and live. But the term is used in a larger sense. A plant on the edge of a desert is said to struggle for life against the drouth; but a plant which annually produces a thousand seeds, of which on an average only one comes to maturity, may more truly be said to struggle with the plants of the same and other kinds which already clothe the ground. A struggle for existence inevitably follows from the high rate at which all organic beings tend to increase. Every being, which during its natural lifetime produces several seeds or eggs, must suffer destruction during some period of its life, and during some season or occasional year, otherwise, on the principle of geometrical increase, its numbers would soon become so inordinately great that no country could support the product. Hence as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life. This is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of food, and no prudential restraints from marriage.

Throughout the whole realm of nature, it may be said that every single organic being is striving to the utmost to increase in numbers; that each lives by a struggle at some period of its life; and that heavy destruction inevitably falls either on the young or old, during each generation, or at recurrent intervals. Lighten any check, mitigate the destruction ever so little, and the number of the species will almost instantaneously increase to any amount.

But how does this struggle for existence bear upon the principle of natural selection, in relation to the production of varieties? Here is the answer. As variations useful to man have undoubtedly occurred, so we must expect that other variations useful in some way to each being in the great and complex battle of life, should also occur in the course of thousands of generations. If such do occur, it can scarcely be doubted that individuals possessing any advantages, however slight, over others, would have the best chance of surviving and perpetuating their kind. On the other hand, it is evident that any variation in the least degree injurious would be rigidly destroyed. The preservation of favorable variations, and the rejection of injurious variations, is then what is meant by Mr. Darwin as natural selection. To understand the probable course of this principle, take the case of a country undergoing some physical change, for instance, of climate. The proportional numbers of its inhabitants would almost instantly undergo a change, and some species might become extinct. Any change in the numerical proportions of some of the inhabitants, independently of the change of climate itself, would most seriously affect many of the others. If the country were open on its borders, new forms would certainly immigrate, and this also would seriously disturb the relations of some of the former inhabitants. Thus every slight modification which might chance to arise in the course of ages, and which in any way favored the individuals of any of the species, by better adapting them to their altered condition, would tend to be preserved; and natural selection would thus have free scope for the work of improvement.

To illustrate the action of this principle more particularly, take the case of a wolf, which preys on various animals—securing some by craft, some by strength, and some by fleetness. Suppose that the fleetest prey, a deer, for instance, had, from any change in the country, increased in numbers, or that any other prey had decreased in numbers during that season of the year when the wolf is hardest pressed for food. Can it be doubted that the swiftest and slimmest wolves would have the best chance of surviving, and so be preserved or selected, provided that they retained sufficient strength to master their prey, when they might be compelled to depend on some other animals. Even without any change in the proportional number of animals on which the wolf preyed, a cub might be born with an innate tendency to pursue certain kinds of prey. This cannot be deemed improbable, when we observe such great differences in the natural tendencies of our domestic animals; one cat, for instance, taking to catch rats; another, mice; one bringing home winged game; another, hares or rabbits; and another hunting on marshy ground, and almost nightly catching woodcocks or snipe. Now, if any slight innate change of habit, or of structure, benefited an individual wolf, it would have the best chance of surviving, and of leaving offspring. Some of its young would probably inherit the same habits or structure, and, by the repetition of this process, a new variety might be formed, which would either supplant or coexist with the parent form of wolf.

We need not follow the author in his various applications of this principle, as we have aimed to give a general idea of his method, rather than to elucidate it in its complicated and intricate details. His reasonings are almost always ingenious and striking, and are presented with fairness and an evident love of truth. Though the conclusions at which Mr. Darwin has arrived are widely different from received opinions, he never betrays a love of paradox, or a desire to startle or surprise his reader by extraordinary statements. He possesses the modesty of true science, and though he often deals in conjectures, he never fails to bring a plausible array of facts in their support. It is not easy to see how far he pushes the application of his theory. On this point, his language is ambiguous, and as it appears to us, often inconsistent. Sometimes, he would seem to shrink from conclusions, toward which he is impelled by the force of logic. His mind, we imagine, is still in a state of suspense, deeply impressed by the result of observations which present the kingdoms of nature in a new light, but scarcely prepared to accept their legitimate consequences. Under such circumstances, he can hardly look for an intelligent assent on the part of his readers. Thus he asserts that animals have descended from at most only four or five progenitors, and plants from an equal or smaller number. At the same time, he argues, that analogy would lead still further, and suggest the belief that all animals and plants have descended from some one prototype. All living things have much in common, in their chemical composition, their germinal vesicles, their cellular structure, and their laws of growth and reproduction. This is seen even in so trifling a circumstance as that the same poison often similarly affects plants and animals. The poison secreted by the gall-fly produces monstrous growths on the wild rose or oak-tree. Hence, concludes Mr. Darwin, we may infer from analogy that probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed. The whole history of the world, as at present known, although of a length quite incomprehensible by us, will hereafter be recognized as a mere fragment of time, compared with the ages which have elapsed since the first creature, the progenitor of innumerable extinct and living descendants, was created. This statement, in apparent contradiction with the general bearing of the volume, is sufficiently revolutionary in its character, in spite of the ineffable quietness with which it is announced. It fully throws down the gauntlet to the whole scientific world, and will doubtless call forth an intellectual conflict of no little interest.

THE FATE OF SIR JOHN FRANKLIN.

A NARRATIVE OF THE DISCOVERY OF THE FATE OF SIR JOHN FRANKLIN AND HIS COMPANIONS. By Captain M'CLINTOCK, R. N., LL.D. pp. 375. Ticknor & Fields.

Immediately after the return of Dr. Rae, in 1854, with some relics of Sir John Franklin's expedition, Lady Franklin determined to appropriate the remainder of her fortune (already much exhausted by previous searches) to an exploration of the localities in which the last traces of her husband had been discovered. The Government had declined taking any part in further enterprises for that purpose, from a conviction that, as there was no prospect of saving life, it would be wrong to expose the officers and men to the perils inseparable from such an undertaking. Lady Franklin, accordingly, at once commenced preparing to send out an expedition, equipped and stored at her own expense. Several friends of the cause, including some of the most distinguished scientific men in England, volunteered their aid, and thus a considerable additional sum was raised in furtherance of the effort.

On the 18th of April, 1857, Lady Franklin offered the command of the proposed expedition to Capt. M'Clintock, by whom it was most cheerfully accepted. A better choice could hardly have been made. Capt. M'Clintock had already served in three consecutive expeditions from 1848 to 1854; was conversant with all the details of the service; was deeply interested in the cause; and had eminently distinguished himself in the voyages of Sir John Ross and Capt. Austin, and especially in his extensive journeys on the ice, when associated with Capt. Kellett.