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I. THE HISTORY OF EVOLUTIONISM.*

EVOLUTIONISM, in the broad plain sense of the term, as opposed to the doctrine of mechanical-individual creation, may now be hailed as victorious along the whole line. In proof, we need only listen to the voices which are raising the well-known chorus:—"All this we knew long ago! Was there any need of a Darwin or a Wallace to tell us truths which are to be found embodied in classical myths, hinted at by early Christian fathers, and even shadowed forth in Holy Writ?" We might, indeed, ask the utterers of such voices how it comes that none of them was able to detect the great truth in these old sagas and writings till modern biologists found it in the Book of Nature? But it is not always good policy to tear away the veil under which neophytes hide the fact of their conversion.

Turning, then, from the initial controversy, we have to organise the territory which we have won. Accepting Evolution as God's way of Creation, we have before us the almost infinite task of tracing out how or by what agencies it is effected? why the organic world is as we find it, and not other? In connection with this undertaking we shall find it highly important to explore all the earlier suggestions and hypotheses which have been put forward as to Descent, its efficient causes, and its laws of operation. Not long ago we had the pleasure of reviewing a thoughtful and suggestive work,† in which the author seeks to prove that

* Erasmus Darwin. By ERNST KRAUSE. With a Preliminary Notice by CHARLES DARWIN. London: John Murray.

† Evolution, Old and New. By S. BUTLER.

Mr. C. Darwin,—and we presume Mr. Wallace,—instead of developing, have rather obscured the doctrines advanced by Erasmus Darwin, Buffon, and Lamarck. The volume now before us is therefore the more opportune. In it Dr. Krause gives a full, an able, and impartial survey of the genius and the researches of the elder Darwin, and assigns him a high place in the history of biological science.

It must not be imagined that prior to the appearance of the "Vestiges" the hypothesis of special creation had remained uncontroverted. Linnæus and Buffon were men of too philosophical intellects to accept as a matter of course the notion of a world mechanically made and peopled with plants and animals by a certain date, as if under contract. But their opinions wavered, perhaps according as evidence on the one or the other side suggested itself to their minds, —perhaps, also, as they were alternately swayed by private conviction or by prudential considerations. These fluctuations are most strikingly shown in the writings of Buffon. Mr. S. Butler solves the difficulty by interpreting all such passages favourable to the Old School as ironical—a somewhat hazardous expedient. But in the works of Erasmus Darwin—who, it must be remembered, is prior in point of time to Lamarck—we find no such wavering. He first established, as Dr. Krause insists, "a complete system of the theory of Evolution." At first sight, indeed, he might seem to have anticipated his illustrious grandson to a very serious extent. He discusses in his works the questions of heredity of adaptation, of the protective arrangements of animals and plants, and of sexual selection. He describes insectivorous plants. He analyses the emotions and social impulses, and seeks to trace out their origin. He suggests that all the limestone rocks in the world "were formed originally by animal and vegetable bodies from the mass of waters." He refers the Fungi to a third kingdom which, like a "narrow isthmus," unites plants and animals. He asks, "Do some genera of animals perish by the increasing power of their enemies? or do they still reside at the bottom of the sea? Or do some animals change their forms gradually, and become new genera?" It is only quite of late that we may venture to reply to the second of these questions in the negative. In tacit but yet unmistakable opposition to the shallow and mawkish teleology of his time, which viewed all nature in relation to man, and affected to know the hidden purposes of God, he asks—"Why has this plant poisonous juices? Why has that one spines? Why have birds and fishes light-coloured breasts and dark

backs?" He treats of the arrangements by which plants defend themselves from unbidden insect guests, thus, in part at least, anticipating a recent and most interesting work by Prof. Kerner. He points out that, in barren moorland districts, horses have learnt how to eat furze—a very nutritious plant—without wounding their mouths. He notices that flower-haunting birds and insects are gaily and vividly coloured, whilst larks, partridges, and hares resemble in their hues the dry vegetation or the earth upon which they rest. He observes that the snake and wild cat and leopard are so coloured as to imitate dark leaves and their lighter interstices. He pronounces the eggs of birds to be so coloured as to resemble adjacent objects. "The eggs of hedge-birds are greenish, with dark spots; those of crows and magpies, which are seen from below through wicker nests, are white, with dark spots; and those of larks and partridges are russet or brown, like their nests or situations." He suggests that, "like the fable of the chameleon, all animals may possess a tendency to be coloured somewhat like the colours they most frequently inspect, and, finally, that colours may thus be given to the egg-shell by the imagination of the female parent." These suppositions, as Dr. Krause reminds his readers, have lately been proved to be, in many cases, perfectly correct. He recognises the existence and the universality of the struggle for existence —a phenomenon overlooked to this day by a large portion of the intelligent and respectable classes, and sometimes denied even by compilers of books and writers of review-articles. How this contest rages in the apparently peaceful vegetable world Erasmus Darwin has well expressed in the following lines:—

> "Yes! smiling Flora drives her armed car
> Through the thick ranks of vegetable war;
> Herb, shrub, and tree with strong emotions rise
> For light and air, and battle in the skies;
> Whose roots diverging with opposing toil
> Contend below for moisture and for soil."

From such a recognition of the contest waged among all organisms it may seem no very wide step to the hypothesis of Natural Selection as *the* cause—according to the younger Darwin, or, we should rather submit, as *a* cause—of the variation of species. But it was never taken by Erasmus. He further expressed the idea which lies at the foundation of Mr. S. Butler's recent work, "Life and Habit," and which will doubtless effect the solution of all the remaining mysteries of instinct. He regarded the young animal as a

continuation, or, as he expresses it, as an "elongation of its parents," and as retaining in consequence the habits of the latter. He believed that the human race was at one time four-footed, and that hermaphroditism was the general condition even of the higher animals.

We might, indeed, fill much more space than stands at our disposal in showing to what an extent Erasmus Darwin anticipated the most recent biological researches and the most advanced speculations of our own day.

But we have now to meet the two main questions:—Why did he so completely fail to command the assent of the public? and wherein does his system differ from that of his illustrious grandson? That he did not carry conviction to the minds of even a minority of thinkers is undeniable. Even until quite recently the idea of a transformation of species, or of their origin in any other mode than that embodied in Milton's poetical gloss on the Mosaic cosmogony, was, in England at least, branded as philosophically false and theologically impious, and the very name of Darwin had become a bye-word and a reproach.

This failure was due to the combined action of a number of circumstances. Erasmus Darwin was too far in advance of his own contemporaries to meet with a fair appreciation. As Dr. Krause remarks:—"It is only now, after the lapse of a hundred years, that, by the labours of one of his descendants, we are in a position to estimate at its true value the wonderful perceptivity, amounting almost to divination, that he displayed in the domain of Biology."

Again, very much of the evidence that was needed to convince those capable of judging of the truth of Evolution could not be said to exist. The disciplines of animal and vegetable geography, which have supplied such a mass of proof in favour of "Transformism," had not been elaborated. Palæontology was also a thing of the future, and no investigator could point to the gradual mutation, *e.g.*, of *Castanea atava* into *Castanea vesca*, or demonstrate the successive stages through which the horse has passed in reaching his present structure.

Embryology, also, was not in a position to speak as she has since spoken. The collateral evidence in favour of development as the general law of Creation, now furnished by Astronomy in the shape of the nebular theory, was also wanting. What wonder, then, that the system of the elder Darwin, even had it been much more complete than was actually the case, should be rejected?

The time, too, was especially unfavourable. The tele-

ologists were everywhere expounding their favourite dogma of "Man, the measure and the purpose of all things." Foremost among them stood Paley, utterly incapable of rising to any true biological conception, but bold, plausible, and popular, on account of his *à posteriori* demonstration of the existence of God. No small part of his works may be said to have been written at Erasmus Darwin, though the latter is never mentioned by name. Still more unfortunate, in the state of public opinion then prevalent in England, was the fact that Darwin's predecessor, Buffon, and his immediate successor, Lamarck, were both Frenchmen. As such they were at once set down as atheists and "jacobins," and an unmerited and groundless stigma was thus attached to the very idea of Evolution. Dr. Darwin's "Loves of the Plants" was burlesqued by the *Anti-Jacobin* in a humorous effusion entitled the "Loves of the Triangles," and he himself was very openly accused of atheism. The wanton malice or the gross ignorance displayed in this charge must be apparent to all who have taken the trouble to read his works. It would be easy to quote, from the writings of this so-called "atheist," ascriptions of praise and glory to God which almost rise to the fervour and dignity of psalms. But even in our own—as we would fain hope—more candid times we see but too clearly on what slender evidence such accusations are made. Has not the younger Darwin himself been denounced, by some who certainly know better, as the conscious and intentional apostle of infidelity?

A little later on in the century the influence of Cuvier and his school was no less hostile to a candid consideration of the arguments in favour of Evolution. Acute, laborious, and, in some departments at least, a keen and indefatigable collector of facts, the great French professor was wanting in the true philosophic spirit, and tainted to the core with that "aletheophobia" which is the bane of official science. Of him it has been well said that his influence threw back scientific biology for at least one generation.

In England we suffered, in addition, from the predominance of the Quinarian school, as represented by Swainson. Until the atmosphere was cleared of all these mists and clouds no true progress could be effected, and it is therefore no wonder if the clue given by the elder Darwin was neglected and his methods of investigation not followed up.

But we may go further: another cause remains why Erasmus Darwin failed to convince his contemporaries and his more immediate successors, and upon this we cannot

touch without showing wherein he differs from his illustrious grandson.

As Dr. Krause very aptly remarks, "It is one thing to establish hypotheses and theories out of the fulness of one's fancy, even when supported by a very considerable knowledge of Nature, and another to demonstrate them by an enormous number of facts, and carry them to such a degree of probability as to satisfy those most capable of judging." Erasmus Darwin, along with a number of most valuable observations and suggestions, lays before us—as was in his day inevitable—not a few puerile and unfounded hypotheses. Thus he puts in the mouth of a philosophic friend the conjecture that the first insects had proceeded from a metamorphosis of the honey-loving stamens and pistils of the flowers by their separation from the parent plant, after the fashion of the male flowers of *Vallisneria*. He believed that, as far as possible, flowers are adapted for self-fertilisation, and even stigmatises cross-fertilisation as "adulterous." Probably, however, his greatest weakness lies in the agency to which he ascribes the gradual transformation of organisms. Like his successor, Lamarck, he depends here on the conscious and intentional attempts of each being to adapt itself to changing circumstances. He declares that all warm-blooded animals have arisen from one living filament which THE GREAT FIRST CAUSE endued with animality, with the power of acquiring new parts, attended with new propensities, directed by irritations, sensations, volitions, and associations; and thus possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity, world without end." This idea is by no means unsuitable as far as animals are concerned; but with strict logical consistency its author applied it also to the development of plants, and thus became, as Dr. Krause maintains, the most formidable critic of his own system. If we are to suppose plants consciously attempting to adapt themselves to changing conditions, we are ultimately driven to assign them a sensorium, and, as the composite vegetable body is not unlike a coral-stock, this sensorium must be ascribed to every bud. These difficulties, it is scarcely needful to say, the younger Darwin evades by his hypothesis of Natural Selection. The individual which—without any intention or consciousness on its own part, and by a mere accidental variation—is in better accord with external circumstances than are its neighbours, has the better chance of surviving them, and of leaving a progeny. Doubting, as we do, the

all-sufficiency of this hypothesis, we must yet admit that it marks out distinctly the interval between Erasmus Darwin and his grandson, and constitutes a most important step in the history of Evolution.

As an introduction to the English version of Dr. Krause's work, Mr. Charles Darwin has contributed a biographical notice of his grandfather, from which we gather interesting facts not a few. He was, for instance, one of the forerunners both of Sanitary Reform and the Temperance Movement, though free from the savour of quackery and the ultraism by which his successors in both make themselves too often unpleasantly notorious. He was a mechanical inventor, no less than a biologist, and his prophecy as to the future career of steam has been too often quoted to need repetition. He refers in his writings to the value of bones as a manure. He expressed the confidence that microscopic research would lead substantially to the discovery of a new world. Two of his sayings here given are worth quoting :— he delared that " the world was not governed by the clever men, but by the active and energetic," and that " the fool is he who never experiments."

But the most interesting feature of this biographical notice is the light which it throws on the interesting question of heredity. For several generations the Darwin family has been distinguished for an intelligence far above the average, which in two cases at least has risen to the rank of genius. Almost all its members have possessed scientific tastes, and have followed the learned professions, generally with success. We read that Robert Darwin, the father of Erasmus, was a man given to scientific pursuits : he left two sons, Robert Waring, a poet and a botanist, and Erasmus, the subject of this memoir. Of the children of the latter five reached maturity :—Charles, who had already become distinguished as an anatomist, when he died from the effects of a wound received whilst dissecting; Erasmus, a statistician and genealogist; Robert Waring, a skilful and eminent physician, father of him whom we must designate as *the* Darwin of our own days; Francis, a naturalist of merit; and Violetta, who became the mother of Mr. Galton, the author of the well-known treatise on the " Heredity of Genius." A son of Francis, Captain Darwin, in his " Gamekeeper's Manual " shows " keen observation and knowledge of the habits of various animals." The two sons of Mr. Charles Darwin, George and Francis, have not merely taken part in their father's researches, but have entered into independent scientific investigations.

By way of contrast to the work with which we have been engaged, we cannot help referring to a review article which has recently appeared on the other side of the Atlantic. We have already glanced, in passing, at the attempts made to find the germs of modern discoveries and speculations in very unlikely regions. At one time it was the fashion to declare that the philosophers and the poets of classical antiquity had anticipated all our most valuable ideas. Next came a rage for extracting systems of science from Hebrew roots by dint of high pressure philology, somewhat as soups of doubtful value may be obtained from old bones by the aid of Papin's digester. The latest mania is for seeking out chemical, physical, or biological truths in the writings of *Albertus Magnus*, St. Thomas Aquinas, or St. Augustine. Indeed St. Augustine is declared to have been an Evolutionist.

The article professes to deal with "Malthusianism and Darwinism." In opposition to the former we are told that the lower races of man die out in contact with civilisation, and thus make room for their superiors. But as against the Darwinians we learn, on the contrary, that it is not the higher, but the lower forms that survive. This, we think, is very like self-refutation.

II. SCIENTIFIC PROGRESS OF THE PAST YEAR.

By William Spottiswoode, D.C.L., LL.D.

(*Being a Condensed Report of the Presidential Address delivered at the Anniversary Meeting of the Royal Society, on Monday, December* 1, 1879.)

In the spring it is our duty to elect into the Royal Society our annual complement of new Fellows, and at our early summer meetings we admit to our ranks the young and vigorous in the career of Science. But in the autumn, or fall, as on the other side of the Atlantic it is so aptly termed, it is our custom to recount the names of those who have dropped from our list. Some of these have fallen in a plenitude of years, and in maturity of mind; others in