

THE DUKE OF ARGYLL ON MR DARWIN'S THEORY OF DEVELOPMENT.

LAST night, the Duke of Argyll delivered the opening address of the session of the Royal Society of Edinburgh, in presence of a large audience of members and visitors. The principal subjects of His Grace's address were the idea of "creation by law," and the bearing which existing theories on the origin of species had upon our knowledge and conception. We give the portion of the address of greatest interest to the general reader, referring to recent theories of development, and especially to that of Mr Darwin.

The Duke of ARGYLL, after noticing the various senses in which the word law might be used in connection with creation, said:—It is certain that nothing is known or has been even guessed at, in respect of the history or origin of life, which corresponds with law in its strictest and most definite sense. There is no knowledge of any or more forces—such as the force of gravitation, or of magnetic attraction, or repulsion—to which any one of the phenomena of life could be traced. Far less have we any knowledge of any such laws which could be connected with the successive creation or development of new organisms. There is one idea which has been common to all theories of development, and that is the idea that ordinary generation has some how been producing from time to time extraordinary effects, and that a new species is in fact simply an unusual birth. It is worthy of observation that the earliest forms, in which the theory of development appeared, did suggest something more nearly approaching a law of creation than is contained in the later form to a law of creation than is contained in the later form, which that theory has assumed—the hands of Mr Darwin. He looked upon the adaptation and arrangement of natural forms, which could express these modifications of natural structure in exact proportion to the need of them, as an adaptation and arrangement which was in the nature of creation. It has not, I think, been sufficiently observed that the theory of Mr Darwin does not address itself to the same question, and does not even pretend to trace the origin of new forms to any definite process. His theory gives an explanation, not of the process by which new forms first appeared, but only of the process by which, when they have appeared, they acquire a permanent existence, and thus become established in the world. A new species is, indeed, according to his theory, as well as with the older theories of development, simply a natural birth. The bond of connection between allied, specific, and generic forms is, in his view, simply the law of inheritance. But Mr Darwin does not pretend to have discovered any law or rule according to which new forms have been born from old forms. He does not hold that outward conditions, however changed, are sufficient to account for them. Still less does he connect them with the effort or aspirations of any organisation after new faculties and powers. He frankly confesses that "our ignorance of the laws of variation is profound," and says, that in speaking of them as due to chance, he means only "to acknowledge plainly our ignorance of the cause of each particular variation." Again he says, "I believe in no law of necessary development." This distinction between Mr Darwin's theory and other theories has not, I think, been sufficiently observed. His theory seems to be far better than a mere theory—to be an established scientific truth—in so far as it accounts, in part, at least, for the success, and establishment, and spread of new forms when they have arisen. But it does not even suggest the law by which, or according to which, such new forms are introduced. Natural selection can do nothing except with the materials presented to its hands. It cannot select except among the things open to selection. Natural selection can originate nothing; it can only pick out and choose among the things which are originated by some other law. Strictly speaking, therefore, Mr Darwin's theory is not a theory on the origin of species at all, but only a theory on the causes which lead to the relative success or failure of such new forms as may be born into the world. It is the mere important to remember this distinction, because it seems to me that Mr Darwin himself frequently forgets it. Not only does he speak of natural selection performing this and that modification of structure, but he undertakes to affirm of one class of changes that they can be produced, and of another that they cannot be produced by this process. Now, what are the changes for the preservation of which his theory does in some sense account? They are such changes, and these only, as are of some direct use to the organism in the struggle for existence. Any change which has not this direct value is not provided for in the theory. All structures, therefore, are unaccounted for—not only as respects their origin, but even as respects their preservation—in which the variations have no other value than more beauty or variety. In illustration of this remark, His Grace proceeded to notice some differences in the numerous species of humming birds. What explanation, he asked, did the law of natural selection give—he did not say of the origin, but even of the continuance and pre-valuation—of such specific varieties as these? None whatever. It was impossible to bring such varieties into relation with any physical law known to us. It had relation, however, to a purpose which stood in close analogy with our own knowledge of purpose in the works of man. These beauty and mere variety for their own sake were objects which we ourselves sought when we could make the forces of nature subordinate to the attainment of them. There seemed to be no conceivable reason why we should doubt or question that these were ends and aims also in the forms given to living organisations when the facts corresponded with this view, and no other. In this sense, we could trace a creative law—that is, we could see that these forms of life fulfilled a purpose and intention which we could appreciate and understand. But then, it might be asked, had this purpose and intention been attained without the use of means? had no physical laws been used whereby new forms of beauty had been evolved the one from the other in a series so wonderful for its variety in unity, and its unity in variety? He was not so willing to answer this question in the negative; all he said was that the physical laws which were made subservient to this purpose were entirely unknown to us. On the other hand, if he were asked whether he believed that every separate species had been a separate creation—not born but separately made—he must answer that he did not believe it. He thought the facts did suggest to the mind the working of some creative law almost as certainly as they convinced us that we knew nothing of its nature, or of the conditions under which it did its glorious work. The only sense, his Grace proceeded to say, in which we get any glimpse of creation by law, are these—1st, That the close physical connection between different specific forms is probably due to the operation of some force or forces common to them all; 2d, that these forces have been employed and worked with others equally unknown for the attainment of each end as the multiplication of life in forms fitted for new spheres of employment, and for the display of new kinds of beauty. Is there anything in this conclusion to conflict with such knowledge as we have from other sources of the nature and working of creative power? I do not know on what authority it is that we so often speak as if creation were not creation, unless it works from nothing as its material, and by nothing as its means. We know that out of the "dust of the ground"—that is out of the ordinary elements of nature—are our own bodies formed, and the bodies of all living things. Nor is there anything which should shock us in the idea that the creation of new forms any more than their propagation has been brought about by the use and instrumentality of means. In a theological point of view, it matters not what these means have been. I agree with M. Guizot when he says—"Those only would be serious adversaries of the doctrine of creation who affirm that the universe—the earth and man upon it—have been from all eternity and in all respects just what they are now." But this cannot be affirmed in the teeth of facts which science has clearly ascertained. There has been a continual coming-to-be of new forms of life; there is creation, no matter what have been the laws of forces employed by creative power. The truth is that the theory which fixes upon inheritance as the cause of organic likeness startles us only when it is applied to forms in which unlikeness is more prominent than resemblance. The idea, for example, that the different kinds of pigeons, or of humming birds, have all descended through successive variation from some one ancestral pair, whether it be true or not, would not startle any one. Yet if this be true, we must be prepared for the same unlikeliness extending farther. The advocates of development urge that time is a powerful factor. They say that if small changes, but constant enough and definite enough to constitute new species, can and do arise out of lower varieties, it is impossible to fix the limits of divergence which may be reached in the course of ages. Yet it surely does not follow that there is no such limit because we cannot fix it. It does not necessarily follow that because we admit the idea of the rock dove, and the turtle dove, and the ring dove, being all descended from an ancestral pigeon, we are bound to accept the idea of the whale the porpoise, and the monkey being all descended from one primate mammal. Mr Darwin says truly enough that "inheritance" is that cause which alone, as far as we positively know, produces organisms quite like, or nearly like, each other." But this is no reason why we should conclude that inheritance is the only cause which can produce organisms quite unlike, or only very partially like, each other. We are surely not entitled to assume that all degrees and kinds of likeness can only arise from this single cause. Yet until this extreme proposition be proved, or rendered probable, we have a sound scientific basis for doubting the application of the theory precisely in proportion to the unlikeness of the animals to which it is applied. And this is the ground of reasoning, besides the ground of feeling, on which we revolt from the doctrine as applied to man. We do so because we are conscious of an amount and of a kind of difference between ourselves and the lower animals, which is, in sober truth, unmeasurable in spite of the close affinities of bodily structure. But the closeness of these affinities is a fact. Man, as Archbishop Whately has said, besides being man, is also an animal. Science will ask, even if she neglects an answer: What is the common cause of this common structure? The fact which it has always appeared to me most difficult to disprove from the theory of development is the existence of rudimentary or aborted organs—the existence of teeth, for example, in the jaws of the whale, teeth which never cut the gum, and which are entirely useless to the animal. We have an inherent conviction that this must have some use in the future, or it must have had in the past. Whether we look at it in the light of history, or prefer to regard it in the light of prophecy, it points to the existence of some derivative form in which these teeth have been, or are to be, turned to use. Still, there is no proof that inheritance is the only cause from which such structures can arise. In the inorganic world we know that not more similarity but actual identity of form, as in crystals, is the result of laws which have nothing to do with inheritance, but the forces whose nature it is to aggregate the particles of matter in identical shapes. It is impossible to say how far a similar identity of effect may have been impressed on the forces through which vital organisations are first started on their way. There are some essential resemblances between all forms of life, which it is impossible even in imagination to connect with community of blood or descent. For example, the bilateral arrangement is common to all organisms down at least to the radiata. Again, the general mechanism by which food is in part assimilated and part rejected, is also common through a range of equal extent. There are fundamental similarities of plan, depending probably on the very nature of forces of which we know nothing, but which we have not the slightest reason to suppose are due to inheritance

on the same laws, equally unconnected with inheritance by descent. Indeed, inheritance has been suggested as the cause, mainly because there is a difficulty in conceiving any other. But there is an equal difficulty in conceiving the applicability of this cause to man. Mons. Guizot, in his work entitled "Méditations sur l'Essence de la Religion Chrétienne," p. 27, lays it down as a physical impossibility that man—the human pair—can have been introduced into the world except in complete stature—in the full possession of all his faculties and powers. He holds it as certain that on no other condition could man on his first appearance have been able to survive and to found the human family. Even those who distrust this argument are entitled to the rank of a self-evident physical truth, must admit that it is at least quite as good as the opposite assertion that any origin except the origin of natural birth is inconceivable. Where our ignorance is so profound, no reasoning of this kind is of much value; but there is much to be said in support of Mons. Guizot's position. Certainly, man as a mere animal is the most helpless of all animals. His whole frame has relation to his mind, and apart from that relation it is feebler than the frame of any of the brutes. Yet in its plan and structure it is homologically, that is ideally, the same as theirs—organ answering to organ, and bone to bone. "Adherence to type" are words expressive of an idea, of a purpose which we see fulfilled in organic forms. But this purpose must have sought its own accomplishment by the use of means; and the question of science always is, what were these? Love of beauty is equally a purpose which we see fulfilled in nature; but in the case of the humming-birds this has been accomplished by giving to their plumage the structure of "thin plates," which decomposes light, and flings back its prismatic colours to the eye. Fitness and special adaptation is another of the purposes of creation; but this also is attained through the careful arrangement, and adaptability to use, of physical laws. In like manner, "adherence to type" is the expression of a fact, or the statement of a purpose which, like all the other purposes fulfilled in nature, invites to an investigation of the instrumentality employed. We see the purpose, but we do not see the method. We see the purpose, for example, in the wonderful adaptability of the vertebrate type to the infinite varieties of life to which it serves as an organ and a home. There is at least one conclusion which I hold to be certain, namely this—that no theory in respect to the means and method employed in the work of creation can have the slightest effect in removing that work from the relation in which it stands to the attributes of creative Will. We cannot too completely shake off the notion that things which happen by way of "natural consequence" are thereby removed from being the effect of purpose and the work of will. We forget that all our own works are works done through the use and instrumentality of natural forces, which knowledge and intelligence alone enable us to combine for the accomplishment of our designs. All that we do, or can effect, is brought about by way of natural consequence. The steam-engine works by way of natural consequence; so does Mr Babbage's calculating-machine; so does the electric telegraph; so does the solar system. Everything that is done in nature, as well as everything that is done in art, seems to be done, as it were, by knowing how to do it. Whatever may be the ultimate seat of the elementary forces of nature, they can only produce the effects which we desire to obtain by being combined under the control of mind. They appear to be used in the works of nature precisely on the same principle on which they are used by man. The fewer those elementary forces, the greater must be the mental power, and skill, and knowledge, under which they are yoked to such various use. And it is apparently out of a small number of elementary forces, having fixed rules, limiting their combination, that all the infinite varieties of organised inorganic matter are built up by means of nice adjustment. As all the faculties of a powerful mind can utter their voice in language whose elements are reducible to twenty-four letters, so all the forms of nature, with all the ideas they express, are worked out from a few simple forces, having a few simple properties. (Applause.) And here I cannot help saying that I do not share in the impression which is felt by many that the progress of modern investigation is in a direction tending to materialism. Of course, I am not speaking of what may be the bias of individual minds. But I do speak, and with strong convictions, of the general bearing of scientific truth. I not only do not share in that impression, but I entertain an exactly opposite belief. Nothing is more remarkable in the present state of physical research than what may be called the transcendental character of its results. And what is transcendentalism but the tendency to trace up all things to the relation in which they stand to abstract ideas? And what is this but to bring all physical phenomena nearer and nearer into relation with the phenomena of mind? Is this materialism? Some of the ablest writers, who are at this moment under most suspicion in this respect, give their witness most emphatically to what I would call the purely mental quality of the ultimate results of physical inquiry. Mr Lewis says, in his work on Aristotle, "the fundamental ideas of modern science are as transcendental as any of the axioms in ancient philosophy." Let us look for a moment on the light, small as it may be, which physiology has cast on the great mystery of life. We never see life separate from some material organisation. Yet what is the doctrine proclaimed? I believe—first by the great John Hunter, and now emphatically repeated by men like Professor Huxley and Dr Carpenter—it is that organisation is not the cause of life, but life is the cause of organisation. Material organs are merely the special forms built up and fashioned by the vital forces—whatever these may be—for the discharge of special functions. And it is well worthy of remark that some of the most clear and striking illustrations of this truth are to be found in some of the lowest forms of life, revealed to us only by the microscope. Professor Huxley and Dr Carpenter both refer to the Foraminifera, in which the most beautiful and complicated forms of shell are evolved by the vital force working in creatures composed of simple jelly, without parts, without structure, without organs of any kind. Thus, the deeper we go in science the more certain it becomes that all the realities of nature are in the region of the invisible; so that the saying is literally true, that the things which are seen are temporal, and it is only the things which are not seen that are eternal. Surely, if this is materialism, it is materialism spiritualised. These doctrines seem to me rather to bring into the strict domain of science ideas which, in the earlier stages of human knowledge, lay wholly within the region of faith or of belief. For example, the writer of the Epistle to the Hebrews specially declares that it is only by faith that we understand that "the things which are seen were not made of the things which do appear." Yet this is now one of the most sacred doctrines of science, that invisible forces are above and behind all visible phenomena, moulding them in forms of infinite variety, of all which forms the only real knowledge we possess lies in our perception of their beauty and their fitness—in short, of their being all the work of "a toil co-operant in an end." Creation by law means nothing but creative force directed by creative knowledge worked under the control of creative power, and in fulfilment of creative purpose.

His Grace, at the close of his address, resumed his seat amid loud applause.

The Duke of ARGYLL said he had not had time to prepare the usual obituary notices of the Fellows of the Society who had died during the past year, which he regretted the more so they had lost, among others, Mr Leonard Horner, Professor Pillans, Professor Miller, and some others, whom he should gladly have noticed more at length. Professor Balfour, however, had kindly prepared notices, which perhaps might now be read.

Lord NEAVE then read the notices of the Fellows who had died during the year. One foreign honorary member the Society had lost one—Baron Piazzi, of Turin. On their home list they had to lament the loss of ten of their ordinary Fellows, namely—Leonard Horner, Professor Miller, Robert Morrison, Dr Newbiggin, Professor Pillans, Dr Archibald Robertson, Dr Smythian, Lieutenant-General Swinburne, Dr R. D. Thomson, and Lord Wood. The whole number of Fellows of the Society at the commencement of this session was 270, a larger number than had been on their list for many years.

The Council of the Society reported that the Macdougall Bursars Prize for the biennial period 1863-64 had been awarded to Mr John Denis Macdonald, R.N., F.R.S., surgeon to H.M.S. Leona, for his zoological papers published in the Transactions of the Society during that period.

On the motion of Principal FORBES, of St Andrews, a vote of thanks was given to the Duke of Argyll for his interesting and able address, which was briefly acknowledged by his Grace.

Ten was then served to visitors and members in the new South Room.

Letter to the Editor.

SIR JAMES MATTHEW STONGE died at his residence, Tynan Abbey, county of Armagh, on Thursday.