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WEEKLY EVENING MEETING,

Friday, February 10, 1860.

SIR HENRY HOLLAND, BART. M.D. F.R.S. Vice-President,  
in the Chair.

PROFESSOR T. H. HUXLEY, F.R.S.

*On Species and Races, and their Origin.*

THE speaker opened his discourse by stating that its object was to place the fundamental propositions of Mr. Darwin's work "On the Origin of Species by Natural Selection," in a clear light, and to consider whether, as the question at present stands, the evidence adduced in their favour is, or is not, conclusive.

After some preliminary remarks, in the course of which the speaker expressed his obligations for the liberality with which Mr. Darwin had allowed him to have access to a large portion of the MSS. of his forthcoming work, the phenomena of species in general were considered—the Horse being taken as a familiar example. The distinctions between this and other closely allied species, such as the Asses and Zebras, were considered, and they were shown to be of two kinds, structural or morphological, and functional or physiological. Under the former head were ranged the callosities on the inner side of the fore and hind limbs of the Horse—its bushy tail, its peculiar

larynx, its short ears, and broad hoofs: under the latter head, the fact, that the offspring of the horse with any of the allied species is a hybrid, incapable of propagation with another mule, was particularly mentioned.

Leaving open the question whether the physiological distinction just mentioned is, or is not, a universal character of species, it is indubitable that it obtains between many species, and therefore has to be accounted for by any theory of their origin.

The species *Equus caballus*, thus separated from all others, is the centre round which a number of other remarkable phenomena are grouped. It is intimately allied in structure with three other members of the existing creation, the Hyrax, the Tapir, and the Rhinoceros; and less strait, though still definite bonds of union connect it with every living thing. Going back in time, the Horse can be traced into the Pliocene formation, and perhaps it existed earlier still; but in the newer Miocene of Germany it is replaced by the *Hippotherium*, an animal very like a true *Equus*, but having the two rudimental toes in each foot developed, though small. Further back in time, in the Eocene rocks, neither *Equus* nor *Hippotherium* have been met with, nor *Rhinoceros*, *Tapirus*, or *Hyrax*; but instead of them, a singular animal, the *Palaeotherium*, which exhibits certain points of resemblance with each of the four existing genera, is found. The speaker pointed out that these resemblances did not justify us in considering the *Palaeotherium* as a more generalized type, any more than the resemblance of a father to his four sons justifies us in considering him as of a more generalized type than theirs.

The geographical distribution of the *Equidae* was next considered; and the anomalies and difficulties it offers were pointed out; and lastly the variations which horses offer in their feral and their domesticated condition, were discussed.

The questions thus shown to be connected with the species Horse, are offered by all species whatever; and the next point of the discourse was the consideration of the general character of the problem of the origin of species of which they form a part, and the necessary conditions of its solution.

So far as the logic of the matter goes, it was proved that this problem is of exactly the same character as multitudes of other physical problems, such as the origin of glaciers, or the origin of strata of marble; and a complete solution of it involves—1. The experimental determination of the conditions under which bodies having the characters of species are producible; 2. The proof that such conditions are actually operative in nature.

Any doctrine of the origin of species which satisfies these requirements must be regarded as a true theory of species; while any which does not, is, so far, defective, and must be regarded only as a hypothesis whose value is greater or less, according to its approximation to this standard.

It is Mr. Darwin's peculiar merit to have apprehended these logical

necessities, and to have endeavoured to comply with them. The Pigeons called Pouters, Tumblers, Fantails, &c., which the audience had an opportunity of examining, are in his view, the result of so many long-continued experiments on the manufacture of species; and he considers that causes essentially similar to those which have given rise to these birds are operative in nature now, and have in past times been the agents in producing all the species we know. If neither of these positions can be upset, Mr. Darwin's must be regarded as a true theory of species, as well based as any other physical theory: they require, therefore, the most careful and searching criticism.

After pointing out the remarkable differences in structure and habits between the Carrier, Pouter, Fantail, Tumbler, and the wild *Columba livia*, the speaker expressed his entire agreement with Mr. Darwin's conclusion, that all the former domesticated breeds had arisen from the last-named wild stock; and on the following grounds—1. That all interbreed freely with one another. 2. That none of the domesticated breeds presents the slightest approximation to any wild species but *C. livia*, whose characteristic markings are at times exhibited by all. 3. That the known habits of the Indian variety of the Rock Pigeon (*C. intermedia*) render its domestication easily intelligible. 4. That existing varieties connect the extremest modifications of the domestic breeds by insensible links with *C. livia*. 5. That there is historical evidence of the divergence of existing breeds, e.g. the Tumbler, from forms less unlike *C. livia*.

The speaker then analyzed the process of selection by which the domesticated breeds had been produced from the Wild Rock Pigeon; and he showed its possibility to depend upon two laws which hold good for all species, viz., 1. That every species tends to vary. 2. That variations are capable of hereditary transmission. The second law is well understood; but the speaker adverted to the misconception which appears to prevail regarding the first, and showed that the variation of a species is by no means an adaptation to conditions in the sense in which that phrase is commonly used. Pigeon-fanciers, in fact, subject their pigeons to a complete uniformity of conditions; but while the similarly used feet, legs, skull, sacral vertebræ, tail feathers, oil gland and crop undergo the most extraordinary modifications; on the other hand, the wings, whose use is hardly ever permitted to the choice breeds, have hitherto shown no sign of diminution. Man has not as yet been able to determine a variation; he only favours those which arise spontaneously, i.e. are determined by unknown conditions.

It must be admitted that, by selection, a species may be made to give rise experimentally to excessively different modifications; and the next question is, Do causes adequate to exert selection exist in nature? On this point, the speaker referred his audience to Mr. Darwin's chapter on the struggle for existence, as affording ample satisfactory proof that such adequate natural causes do exist.

There can be no question that just as man cherishes the varieties he wishes to preserve, and destroys those he does not care about; so

nature (even if we consider the physical world as a mere mechanism) must tend to cherish those varieties which are better fitted to work harmoniously with the conditions she offers, and to destroy the rest.

There seems to be no doubt then, that modifications equivalent in extent to the four breeds of pigeons, might be developed from a species by natural causes; and therefore, if it can be shown that these breeds have all the characters which are ever found in species, Mr. Darwin's case would be complete. However, there is as yet no *proof* that, by selection, modifications having the physiological character of species (*i.e.* whose offspring are incapable of propagation, *inter se*) have ever been produced from a common stock.

No doubt the numerous indirect arguments brought forward by Mr. Darwin to weaken the force of this objection are of great weight; no doubt it cannot be proved that all species give rise to hybrids infertile, *inter se*; no doubt (so far as the speaker's private conviction went), a well conducted series of experiments very probably would yield us derivatives from a common stock, whose offspring should be infertile, *inter se*: but we must deal with facts as they stand; and at present it must be admitted that Mr. Darwin's theory does not account for all the phenomena exhibited by species; and so far, falls short of being a satisfactory theory.

Nevertheless the speaker expressed his sense of the extremely high value to be attached to Mr. Darwin's hypothesis; and, avowing his own conviction that the following it out must ultimately lead us to the detection of the laws which have governed the origin of species, he concluded his discourse in the following words, which he wishes to be added in full to the very brief preceding account of his view of Mr. Darwin's argument:—

“I have endeavoured to lay before you what, as I fancy, are the turning points of a great controversy; to render obvious the mode in which the vast problem of the origin of species must be dealt with; and so far as purely scientific considerations go, I have nothing more to say. But let me beg you still to listen to a last word respecting the unscientific objections which I constantly hear brought forward, on the part of the general public, against such doctrines as those we have been discussing. For this is a matter upon which it is of the utmost importance that men of science and the public should come to an understanding. I have heard it said, that it is presumptuous for us to attempt to inquire into such matters as these; that they are problems beyond the reach of the human understanding. Do you remember what was the reply of the old philosopher to those who demonstrated to him so clearly the impossibility of motion? ‘*Solvitur ambulando,*’ said he, and got up and walked. And so I doubt not that one of these days either Mr. Darwin's hypothesis, or some other, will get up and walk, and that vigorously; and so save us the trouble of any further discussion of this objection.

“Another, and unfortunately a large class of persons take fright at the logical consequences of such a doctrine as that put forth by

Mr. Darwin. If all species have arisen in this way, say they — Man himself must have done so; and he and all the animated world must have had a common origin. Most assuredly. No question of it.

“But I would ask, does this logical necessity add one single difficulty of importance to those which already confront us on all sides whenever we contemplate our relations to the surrounding universe? I think not. Let man's mistaken vanity, his foolish contempt for the material world, impel him to struggle as he will, he strives in vain to break through the ties which hold him to matter and the lower forms of life.

“In the face of the demonstrable facts, that the anatomical difference between man and the highest of the *Quadrumana* is less than the difference between the extreme types of the Quadrumanous order; that, in the course of his development, man passes through stages which correspond to, though they are not identical with, those of all the lower animals; that each of us was once a minute and unintelligent particle of yolk-like substance; that our highest faculties are dependent for their exercise upon the presence of a few cubic inches more or less of a certain gas in one's blood; in the face of these tremendous and mysterious facts, I say, what matters it whether a new link is or is not added to the mighty chain which indissolubly binds us to the rest of the universe? Of what part of the glorious fabric of the world has man a right to be ashamed—that he is so desirous to disconnect himself from it? But I would rather reply to this strange objection by suggesting another line of thought. I would rather point out that perhaps the very noblest use of science as a discipline is, that now and then she brings us face to face with difficulties like these. Laden with our idols, we follow her blithely—till a parting in the roads appears, and she turns, and with a stern face asks us whether we are men enough to cast them aside, and follow her up the steep? Men of science are such by virtue of having answered her with a hearty and unreserved, Yea; by virtue of having made their election to follow science whithersoever she leads, and whatsoever lions be in the path. Their duty is clear enough.

“And, in my apprehension, that of the public is not doubtful. I have said that the man of science is the sworn interpreter of nature in the high court of reason. But of what avail is his honest speech, if ignorance is the assessor of the judge, and prejudice forman of the jury? I hardly know of a great physical truth, whose universal reception has not been preceded by an epoch in which most estimable persons have maintained that the phenomena investigated were directly dependent on the Divine Will, and that the attempt to investigate them was not only futile, but blasphemous. And there is a wonderful tenacity of life about this sort of opposition to physical science. Crushed and maimed in every battle, it yet seems never to be slain; and after a hundred defeats it is at this day as rampant, though happily not so mischievous, as in the time of Galileo.

“But to those whose life is spent, to use Newton's noble words, in picking up here a pebble and there a pebble on the shores of the great

ocean of truth—who watch, day by day, the slow but sure advance of that mighty tide, bearing on its bosom the thousand treasures wherewith man ennobles and beautifies his life—it would be laughable, if it were not so sad, to see the little Canutes of the hour enthroned in solemn state, bidding that great wave to stay, and threatening to check its beneficent progress. The wave rises and they fly; but unlike the brave old Dane, they learn no lesson of humility: the throne is pitched at what seems a safe distance, and the folly is repeated.

“Surely, it is the duty of the public to discourage everything of this kind, to discredit these foolish meddlers who think they do the Almighty a service by preventing a thorough study of his works.

“The Origin of Species is not the first, and it will not be the last, of the great questions born of science, which will demand settlement from this generation. The general mind is seething strangely, and to those who watch the signs of the times, it seems plain that this nineteenth century will see revolutions of thought and practice as great as those which the sixteenth witnessed. Through what trials and sore contests the civilized world will have to pass in the course of this new reformation, who can tell?

“But I verily believe that come what will, the part which England may play in the battle is a grand and a noble one. She may prove to the world, that for one people, at any rate, despotism and demagoguery are not the necessary alternatives of government; that freedom and order are not incompatible; that reverence is the handmaid of knowledge; that free discussion is the life of truth, and of true unity in a nation.

“Will England play this part? That depends upon how you, the public, deal with science. Cherish her, venerate her, follow her methods faithfully and implicitly in their application to all branches of human thought; and the future of this people will be greater than the past.

“Listen to those who would silence and crush her, and I fear our children will see the glory of England vanishing like Arthur in the mist; they will cry too late the woful cry of Guinever:

‘It was my duty to have loved the highest;  
It surely was my profit, had I known;  
It would have been my pleasure had I seen.’”