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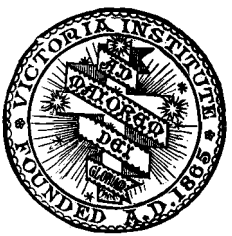

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502ND ORDINARY GENERAL MEETING.

MONDAY, FEBRUARY 7TH, 1910.

D. HOWARD, ESQ., D.L., F.C.S., F.I.C. (VICE-PRESIDENT), IN THE CHAIR.

The Minutes of the previous Meeting were read and confirmed.

The following paper was then read by the author :—

SPECIES AND THEIR ORIGIN.

By the REV. JOHN GERARD, F.L.S.

TO those who give attention to the discussion concerning the origin of species, which since the time of Mr. Darwin has so greatly exercised the scientific mind, it must frequently have occurred not only that there seems no great prospect of a conclusion being reached which shall secure universal, or even general, acceptance, but that it is by no means clear what the question itself is. Yet it is evident that, unless this be first made perfectly clear, the discussion is not likely to have any very profitable issue. Before we can arrive at any result worth having touching the origin of species, or the manner in which they have come to be what we actually find them, we must begin by determining what we signify by the term, that is to say, what species *are*. But to determine this will certainly not be easy, for although everybody freely uses the word, and has a general idea of its meaning sufficient for practical purposes, very little investigation is required to show that the differences masked by its employment are both wide and vital.

Despite the title of his famous work, with which the question we speak of must always be connected, Darwin himself seems never formally to have stated what, in his view, "species" should

be taken to mean. Undoubtedly, however, he clearly showed that he supposed each species to be descended from a single ancestor, or rather, it should seem, pair of ancestors. To this extent, therefore, he was in agreement with Linnæus and the older naturalists, who, as is well known, defined species as the descendants of a brace of parents originally created in the exact form which their offspring still perpetuate; but with this notable difference, that Darwin's whole point is that the ancestors to whom common descent is thus to be traced, were themselves sprung from progenitors so different from them that they would needs be regarded as constituting *another* species. The question does not now concern us as to *how* the transformation of the older form to the newer may be supposed to have come about, whether by the action of natural selection or otherwise. What we have to examine is simply, What is it that is said to have been transformed; or, in other words, *What* is a species? To this various high authorities give various answers.

Mr. Wallace* quotes one definition from a distinguished botanist, De Candolle, another from a zoologist, Swainson, of whom the former says:—

"A species is a collection of all the individuals which resemble each other more than they resemble anything else, which can by mutual fecundation produce fertile individuals and which reproduce themselves by generation in such a manner that we may from analogy suppose them to have all sprung from one single individual."

Swainson writes to somewhat similar effect:—

"A species, in the usual acceptation of the term, is an animal which, in a state of nature, is distinguished by certain peculiarities of form, size, colour, or other circumstances from another animal. It propagates after its kind individuals perfectly resembling the parent; its peculiarities, therefore, are permanent."

On the other hand, Mr. Mivart tells us†:—

"The word 'species' denotes a peculiar congeries of characters, innate powers and qualities, and a certain nature realised indeed in individuals, but having no separate existence, except ideally, as a thought in some mind."

These definitions are evidently quite different, and the difference is of no slight importance. It is very frequently laid down as undeniable that "species" themselves have no

* *Darwinism.*

† *Genesis of Species*, p. 2.

real existence, but are mere abstractions, found not in nature, but only in the mind which creates them, and here we are often bidden to discern the true key to the question of their origin. Thus Mr. G. H. Lewes writes*:—

"The *thing* species does not exist: the term expresses an *abstraction*, like Virtue and Whiteness: not a definite concrete reality, which can be separated from other things and always found the same. Nature produces individuals; these individuals resemble each other in varying degrees; according to their resemblances we group them together as classes, orders, genera, and species; but these terms only express the *relations of resemblance*, they do not indicate the existence of such *things* as classes, orders, genera, or species. There is a reality indicated by each term—that is to say, a real relation; but there is no objective existence of which we could say, 'This is variable; this is immutable.'"

This Mr. Lewes proceeds to apply to the matter now in hand†:—

"No sooner [he says] do we understand that 'Species' means a relation of resemblance between animals, than the question of the fixity or variability of species resolves itself into this: Can there be any variations in the resemblance of closely allied animals? A question which would never be asked."

On the same subject Professor Bowne declares‡:—

"In any case, a species is nothing but a group of similar individuals. These individuals and the power or powers which produce them are the only realities in the case. The important problem is not what is a species, but what is the individual and what the power that produces individuals. Thus it is clear that the transformation of species means simply the production of individuals along lines of descent in such a way that, if we should take individuals from points mutually distant in such a line, they would be so unlike that we should not think of classing them together."

All this, no doubt, is true enough so far as it goes; but it does not take us very far. Of course, if we define species with Mivart as a congeries of characters, innate powers, qualities, and the rest, it must clearly be acknowledged that the basis of our classification is no more than an abstraction, having no existence

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* *Studies in Animal Life*, p. 169.
† P. 130.
‡ *Hibbert Journal*, Oct., 1909, p. 133.

outside our own mind. But obviously it is not the same when we define it as a collection or group of individuals bound together by certain characteristics. A group, though it is not a substance, as is an individual, has, nevertheless, a real existence of its own, and possesses attributes which do not belong to the several individuals of which it is composed. Such a body is now the British Parliament, such are likewise our Royal Society, the Jockey Club, and the French Academy, each with definite functions and powers, and its own distinctive history. From these and similar instances it is not difficult to see that, by analogy, "the transformation of species" may be understood in a sense differing considerably from what we have heard.

An example which may be worked out in considerable detail is furnished by our army. This, as we all know, falls naturally into certain broad divisions or classes—horse, foot, and artillery. These, again, are further divided into what may be styled genera—as the Cavalry, into Dragoons, Hussars, and Cuirassiers, the Infantry into Grenadiers, Rifles, and Highlanders. Finally, there are regiments which may well represent species, every member of each being modelled on exactly the same pattern as to uniform, accoutrements, and functions, so that from an inspection of one it would be possible to arrive at a correct description of all, none, however, being the exact facsimile of any other. That there is a very real sense in which the continued existence of such bodies can be traced as a concrete reality, and not in any mere abstract or figurative sense, our many regimental histories bear witness, nor can there be any doubt that in very many instances, if not in all, transformations have to be recorded which furnish some analogy with those of which evolutionists tell us. Not a few regiments have served in turn under Marlborough, Wolfe, and Wellington, in the Crimea, the Indian Mutiny, and South Africa. He who knew each of them first at one of these epochs could hardly believe that it was identical with its own previous self, though the unbroken continuity of its life cannot reasonably be questioned. Sometimes we still find in the present actual traces of adaptation to a state of things that has passed away, as our "Grenadiers" record the days when hand-grenades were used in battle, and our "Fusiliers" recall those when soldiers armed with guns had to be distinguished from pikemen and archers. Occasionally we are introduced to historical origins still more remote and fundamental, as in the case of the well-known "Buffs," a regiment which, as claiming descent from one of the

ancient civic train-bands, still enjoys the privilege of marching through the City of London with bayonets fixed, band playing, and colours flying. Notable relics of the past are likewise furnished by inter-regimental feuds, sometimes bearing witness to very long memories. It is said, for instance, that one of these dates from the massacre of Glencoe, in 1692, the corps, representing respectively its victims and its actual perpetrators, being still ready to come to blows, more than two centuries later.

It is unnecessary to indicate in how many points analogy may be discovered between those bodies which are styled regiments, and those termed "species" of plants or animals. The latter, like the former, are distinguished each by its own garb or uniform, and never did the most exacting of martinets insist so rigorously upon the right number of buttons or cut and tint of facings on a soldier's coat as does Nature in every minutest particular whereby her several cohorts may be distinguished, and manifold are the features which seem unmistakably to argue a real continuity of life persisting through changes which might appear altogether to separate newer forms from old.

It is of course proverbial that comparisons are always defective, and that which we have used is no exception to the rule; but one truth at least it serves to illustrate, that a number of individuals being stamped with a common characteristic linking them together as a distinctive group, this may have a definite history including modifications and transformations which might appear altogether to alter its character. The question to be asked is therefore not quite so idle as that which we have heard as to whether there can or cannot be variations in the resemblance of closely allied animals, the relations of those which we term members of a species being clearly subject to a law imposed upon them all.

The real problem, therefore, is to determine, What is the power, influence or law, which makes such original groups what they are, and invests each of their members with those common characters which our mind naturally recognizes, and so proceeds to classify individuals as included in one species, or species in one genus.

This is, in fact, the root of the matter. Far more vital than the question whether species can be transformed is the previous question, How came they to be constituted? To what do they owe their genesis? As we have been told by Mr. Lewes, the relations of resemblance linking together the individuals of a species are real relations—there is a reality indicated by each term. What, then, is the cause of this reality, that to which

we may trace its origin? Until we can satisfy ourselves upon this point, it seems vain to seek any answer to the further question regarding transformation; but if we can arrive at a conclusion satisfactory to reason concerning the basis upon which our classification must ultimately rest, we shall at any rate have a tolerably clear understanding of the problems which lie beyond.

It is clear, to begin with, that in such an enquiry we must needs introduce the idea of Mind. Mr. Mivart, as we have heard, after defining species as a congeries of characters having no separate existence, adds the important qualification, "except ideally as a thought in some mind." Similarly, Professor Bowne declares, "Intelligence is the only source of any objective classification." Nor can this be understood as meaning no more than that were there no intelligence capable of making abstractions, and grouping individuals according to their common characteristics, there could be no possibility of classification, as in like manner there could be no colour were there no eyes in the world capable of sight?

We must, in fact, ascribe to Mind a far higher function, and recognize in it the only power capable of establishing those real relations upon the recognition of which any true principle of classification must be based. And here we may apply what Newman says in general concerning order*:—

"As a cause implies a will, so order implies a purpose. Did we see flint celts in their various receptacles all over Europe, scored always with certain special and characteristic marks, even though those marks had no assignable meaning or final cause whatever, we should take that very repetition, which, indeed, is the principle of order, to be a proof of intelligence. The agency, then, which has kept up and keeps up the general laws of nature, energizing at once in Sirius and on the earth, and on the earth in its primary period as well as in the nineteenth century, must be Mind, and nothing else, and Mind at least as wide and as enduring in its living action, as the immeasurable ages and spaces of the universe on which that agency has left its traces."

Sir John Herschel likewise saw in such a manifestation of order as is afforded by the repetition of similar features, clear evidence of the influence of purpose. As he observes,† a line of spinning jennies of the same pattern, or a regiment of

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* *Grammar of Assent*, p. 70.

† *Preliminary Discourse on the Study of Natural Philosophy*, p. 38.

soldiers clad in the same uniform and going through the same evolutions, necessarily implies a controlling force directing things according to a definite system. So true is this that if along a road we travelled we should find at every twenty yards, or other regular interval, merely a couple of stones laid one upon the other, or three arranged as an equilateral triangle, we should unhesitatingly conclude that an intelligent being had been before us and left this mark, nor would any argument to the contrary—if one could be found, or even imagined—avail to shake our belief.

The admission of such a force being, however, what many evolutionists are most unwilling to admit, they commonly seek for the needful foundation on which to base the objective reality of their classification in community of descent, so that a species consists of individuals which have at some period, comparatively recent, descended from a common ancestor—or pair; and a genus consists of species which have similarly originated at a period more remote, in the course of which the power to which transformation is due, whether natural selection or another, has operated to produce alterations now recognized as specific.

Something of a digression here suggests itself, which appears to be by no means unimportant.

It is not easy to ascertain on unimpeachable authority what the course of evolution must be supposed to have been. In the conclusion of the *Origin*, Mr. Darwin speaks of life having been originally breathed "into several forms, or into one." Mr. Wallace intimates* that not only distinct forms, such as crows and thrushes, may have descended "from each other," but that all birds, including such widely different types as wrens, eagles, ostriches, and ducks, are possibly, or probably, modified descendants of a common ancestor; further still, that even mammals, birds, reptiles, and fishes may have a common origin.

On the other hand, Mr. Darwin emphatically warns us against the notion that we shall ever find, either living or fossil, the direct progenitor of any species, existent or extinct.† All that we have a right to expect is a form intermediate between each species and a common but unknown progenitor not, however, as it would seem *directly*, intermediate between them. But he tells us, moreover,‡ that the same identical species cannot be produced twice over, "even if the very same condition, of life,

* *Darwinism*, p. 6.
† *Origin*, 6th Edition, p. 264.
‡ *Op. cit.*, p. 292.

organic and inorganic, should recur." From this it must follow that every species now existing is made up of descendants of one single ancestral pair, other descendants from the more distant common ancestor having disappeared. But, to take the simplest of Mr. Wallace's examples, the forms intervening between thrushes and crows and their original common ancestor must have been immensely numerous along each line of descent, and of these intervening forms each must have belonged to *some* species, which for the time being had succeeded in establishing or continuing itself, though it had finally to yield its place in favour of other representatives of the same kindred, which had better adapted themselves to the conditions of life. According to this, each evolutionary stage which was marked by the appearance of a group so distinctive as to be styled a new species, must have witnessed the extinction of a multitude of near relatives which had not sufficiently accommodated themselves to actual conditions, an extinction which took the form, not, as was once supposed, of a catastrophe or general massacre, like that of royal princes on the accession of a new sultan, but of a gradual dropping off of those less fitted to survive. But, at any rate, this seems to be clear, from what Mr. Darwin tells us, that in every instance a species has started from progenitors which had developed characters distinguishing them specifically from others descended from the same ancestry, and which, because of such distinguishing characters, became the sole survivors of their race.

Many points are here suggested which seem worthy of more attention than they have usually received, but at present we may concern ourselves with one only, which brings us back to that from which we may seem to have digressed. Can community of descent furnish a satisfactory basis for the classification of species, if it constantly happens, and as it were inevitably, that amongst the descendants of the same progenitors specific differences are produced? As Professor Bowne says:—

"Descent, as such, carries nothing with it in the intellectual system. It is merely the actual method by which the organic system has been realised, but it becomes such a method only because it is so adjusted as to produce the result. The systematic relations of things in a graduated and ordinated scale of existence were insisted upon long before the doctrine of descent was thought of, and this doctrine adds nothing to that earlier view, except a conception of the way in which that intellectual order was realised. But, as just said, descent alone explains nothing unless its inner order presupposes just this

result. Animal homologies, we are told, presuppose blood relationship; but this is not so unless blood relationship implies animal homologies."

Our enquiry therefore comes in the end to this: are the resemblances between individuals, plants and animals, according to which we classify them in the same species, regulated by some dominating cause, or are they merely fortuitous? As Professor Bowne puts it:—

"The only further question that can arise concerning species is whether the power which produces individuals does so at random or according to rule. In the latter case species exist in the only sense in which species can exist; that is, natural groups exist whose members are bound together by their likeness, and the likeness of the members is due to the fact that they have been produced according to a common rule."

It would, in fact, appear that mere points of resemblance between individual objects do not suffice for the establishment of a species, or, which is the same thing, that such points of resemblance, if sufficiently numerous and characteristic to afford a basis for such establishment, necessarily convey the idea of a rule to which such resemblance is due. The resemblances to a camel, a weasel, and a whale, which Hamlet indicated to Polonius in the shapes of clouds, would never suggest the idea of species, simply because they were obviously quite casual, being due to the random operations of the wind. On the other hand, were the sky to be filled with cloud pictures accurately representing droves of camels or schools of whales, we should inevitably conclude that this was undoubtedly owing to *some* sort of rule or cause, even though we could form no notion as to what might be its character. So, when we find in organic nature groups of plants or animals unmistakably stamped with the same image or likeness, we cannot but explain their mutual relationship as being the result of some common influence—just as in the case of coins or books issued from the same mint or printing press. In the case of organic species the influence thus manifested is, we are told, that of common descent; but, whereas that of the coiner or printer is one the nature of which we thoroughly understand, of descent we can only say that we know nothing whatever as to its mode of operation, nor, indeed, anything except the phenomena exhibited by its results—the very thing that has to be accounted for; so that in reality, to explain what we would understand, we are bidden to fall back on our lack of knowledge.

That species have no real existence naturalists who study living nature must, it would seem, find it exceedingly difficult to persuade themselves, so many and so far reaching are the points of resemblance which they must continually discover; and which imperatively suggest the idea of a rule imposing them. If there be such a rule, then assuredly in a very true sense species are a reality, and the question of their fixity or transformation has a very definite meaning. If on the other hand, there be no such rule in existence, and the various characteristics in which classification of species is founded are due to fortuitous circumstances alone, then species owe their origin only to the men who invented them. And doubtless many species, especially amongst the smaller organisms, whether plant or animal, seem to be based on a foundation no more substantial. Professor Asa Gray, for instance, was known to say that he did not believe in the fixity of species, for he had made and unmade too many of them. But this means no more than that some which once he had called species were not in reality species at all; it nowise affects the case of "natural species," if such there be, based upon characteristics common to individuals, and due not to fortuity but to law.

There remains of course the perplexing question of the distinction between species and varieties and the test, or tests, by which species may practically be distinguished one from another—that most usually adopted being the impotence of creatures belonging to different groups to produce hybrids regularly fertile *inter se*. That this *is* a real test Professor Huxley at one time strenuously denied,* though at another† he appeared to take it as the basis of his own conclusion on the subject. In any case it seems clear that groups which are recognised as true species do in certain circumstances interbreed; for example, the black carrion crow (*Corvus corone*) and the grey hooded crow (*Corvus cornix*) undoubtedly do so on the borders of the districts which they respectively inhabit, and there can be no question that the offspring resulting from such unions are intermediate in plumage between the parents, and though it is not very easy in the case of such birds to obtain precise information, it would appear that the hybrid race perpetuates itself. The same is the case with two species of goldfinch—*Carduelis*

* *The Darwinian Hypothesis*, 1859. (*Darwiniana*, p. 3.)
† *The Origin of Species*, 1860. (*Ibid.*, p. 74.)

elegans and *caniceps*. On the other hand, although the common primrose (*Primula vulgaris*) and the cowslip (*P. veris*) are acknowledged to be but varieties of one species, it has proved so difficult as to be well-nigh impossible to obtain crosses between them.*

So, again, there are genera which Mr. Darwin styles "protean or polymorphic," in which the species present an inordinate amount of variation, with the result, as he adds, that hardly two naturalists agree whether to rank them as species or as varieties, examples being, amongst plants, the genera Rubus, Rosa, and Hieracium; amongst animals several kinds of insects and Brachiopod Shells.† Some authorities in consequence multiply the number of species prodigiously, whilst others reduce this to a minimum. It is not an unusual experience to find that as a man grows older he becomes less inclined to favour the larger figures.

The whole question appears to be, Are there or are there not "natural species," species which have for their basis something in nature which impresses upon the individuals of which they are constituted the common characteristics according to which we classify them? Among the higher and more developed classes, both of the vegetable and animal kingdoms, there seem certainly to be groups thus stamped with characters marking them as connected by a bond which man does not make but recognise; and, if such groups there are, it seems impossible to avoid the conclusion that there are in nature really existent species.

If so, we are of necessity driven back on the enquiry, what cause can possibly be supposed capable of producing such uniformity? And it is not easy to understand how any answer to the question can be found which is even plausible, except that the orderly disposition of nature which mind alone can discern, mind alone can have instituted. Very specially, we may add, should this be the lesson which we learn from science, for if there be one conviction more than another which is borne in upon us by every fresh investigation in all her fields it is that all things have been ordered "in measure, and number, and weight." So it is that, in every nook and cranny of her domain, we are able to discover laws which human wit is only now beginning after all these ages dimly and partially to descry, but which have been in operation from

* *Darwiniana*, p. 4.
† *Origin*, p. 35.

the beginning. Such we find to be the case in those wonderful researches as to the constitution of matter which are so marked an achievement of our own day, but which, beyond the fact that they reveal the existence of laws whereof we previously had no inkling, do but enhance the bewildering mystery of the universe in which we dwell. Of this only may we feel assured that we shall never arrive at any region which does not furnish matter for science, in which we do not find order and not chaos —a universe rationally explicable, bearing the stamp of mind whereof we see a reflection in our own.

As Sir John Herschel declared*: "The presence of mind in the universe is what can alone supply such explanation of her constitution and operations as shall harmonise with our own experience."

So it is with inorganic nature; so in an even more marvellous degree with the hosts of organic life. Many a species of both plants and animals wears the family livery, including seemingly trivial and insignificant details, in regions the most diverse and under every variety of condition. There must, it seems obvious, be some controlling power which sets and keeps the pattern, so that from a woodcock, for example, bought in a London poulterer's, we can furnish a description which is sure to agree in every particular with the plumage of birds found in Lapland or in Japan; while in any of the multitude of dandelions which April scatters through the land will be found an exact counterpart, though not a facsimile, of its brethren in Greenland, Italy, or Patagonia. If such agreement is without a cause, does it not seem there must be an end of science? If, on the other hand, a cause there be, must it not resemble, at least analogically, that intelligence which of all powers known to us in the world can alone discern in the visible universe more than can be perceived by corporeal eyes, recognising as its ultimate explanation an infinite cause, for which, to us, the word Mind is the least inadequate and misleading of symbols? †

Discussion.

On the conclusion of the paper, the Chairman thanked the author, in the name of the meeting, for his interesting and all too brief lecture. It must be considered as a tremendous shock to the strict Linnæan to find that there were people who believed in species

* *Familiar Lectures*, "On Atoms."

† Mivart, *Lessons from Nature*, p. 301.

as unstable and even as non-existent. The question—or rather the different questions—was as old as the controversy between the nominalists and the realists; but there was a real practical value in this question of species. If there was an answer to be found they would at the same time have found a conclusive answer to the query whether there was anything but mere accident in it all.

It was generally agreed that the species had a real existence apart from the individual, but much confusion was introduced by the existence of the protean genera.

Was man more ignorant than the dog? Dogs at any rate were all realists. For them there was no confusion introduced by the extraordinary forms at which the breeder had arrived. Great Dane or dachshund, it made no difference. The dog was always recognisable and treated as such.

It was to the speaker one of the most remarkable things to consider the extraordinary results arrived at by an old gentleman walking in his garden. The Abbé Mendel, a gardener and a most patient observer of nature, had been able to demonstrate the rules that governed the reversion to the original type, and only now was the significance of Mendel's discovery being made evident to them by the work of those who had rediscovered him. Reversion to type was for them the real test of species. Asa Gray wrote of making and unmaking species—but did he ever unmake any of these realities?

The speaker himself had only studied one genus—*cinchona*—a protean genus, but giving real species, each reversionary to its type. He could wish to have his whole life before him to study this genus in the light of Mendelism.

But without a mind behind them all the differences of which they spoke could have no real existence: this perpetual flux, if it were true, was a greater evidence of mind than anything else in Science; and men, generally, were coming more and more to favour a broad and general evolution under and controlled by a mind.

Professor HULL congratulated the author on the able manner in which he had handled an abstruse subject. There was a double difficulty to be met; first, to define a "species," and secondly, to account on natural grounds for its development. Through his forty years on the Geological Survey, the question of what was a species was constantly cropping up, and was especially conflicting—because

authorities themselves were often not agreed—regarding special organisms. His experience was, that whoever discovered a fossil specimen, had a claim to give it a name as a species, and it became a type. He, the speaker, recognised that there was a wide range of variation admissible as regards species and even genera, but his difficulty arose when they came to types of organic structure. A type was the appearance of a new fundamental idea, such as the vertebrate type in animals, and the dicotyledonous type in plants commencing in the upper cretaceous stage of the geological series. The explanations of the life history as given by the Darwinian hypothesis was, in the speaker's opinion, inconclusive, and insufficient to account for the phenomena they were dealing with, which can only be explained on the view of Sir John Herschel, quoted by the author of the paper that "the presence of mind in the universe is what can alone supply such explanation of her constitution and operations as shall harmonise with our own experience,"—a Mind all wise, beneficent and all pervading.

Professor H. LANGHORNE ORCHARD.—I am sure we all join in the thanks which have been expressed to the author for his able paper. The paper suffers, however, from the lack of a good definition of "Species." None of the definitions quoted seems adequate. Better than any of them is that given by Buffon, namely, "A constant succession of individuals, similar to and capable of reproducing each other." This distinguishes at once between species and *varieties*. If varieties (within a species) pair together, the result is mongrels, which are perfectly fertile. If species are made to pair together, what are obtained are hybrids—creatures of very limited fertility. It was this physiological fact which (as he himself points out) kept Huxley, who had plenty of good-will toward Darwinism, from accepting that theory.

The so-called "species," mentioned on p. 132, are not species at all. They are varieties—two varieties of the species "crow," two varieties of the species "goldfinch." On the other hand, primrose and cowslip are probably different species. Professor Asa Gray's "species"—which he could make and unmake—were varieties.

Darwin's theory of descent, brought before us on p. 124, convicts him of either inconsistency or confusion of thought.

Darwin supposes that if we trace the descent of all dogs back through thousands of years, we shall at last arrive at a single pair

of dogs, from which all the others have sprung. He supposes that for this ancestral pair and all the multitude of their descendants throughout the ages, the law of descent is that "Like produces Like" and they are all of one and *the same species*. Darwin does not, however, regard this ancestral pair as the final ancestor—he imagines that it had itself an ancestor. And he arbitrarily and inconsistently affirms that the law of descent undergoes a remarkable change, so that descendant and ancestor are of *different* species. To assume, without evidence, that the law of descent changes in this strange manner, is a procedure born not of science but of imagination, and it may safely be said that a supposition so violent would never have been made but for the exigencies of a theory.

I would congratulate the able author of this paper upon the felicity of his comparison—of course only analogical—between a species and a regiment.

We entirely concur with him as to "the controlling power which sets and keeps" the species pattern, recognising that the pattern finds its sole explanation in "an infinite cause for which, to us, the word mind is the least inadequate and misleading of symbols."

JOHN SCHWARTZ, Esq.—I would suggest that the definition of species quoted from Mr. Wallace as limited to those which can by mutual fecundation produce fertile individuals, is now held by practically all the younger generation of biologists; and that the views quoted from Mr. Mivart and Mr. G. H. Lewis are dealing with the matter from a metaphysical or philosophical rather than from a strictly natural science standpoint. As our lecturer states, the vital question is: How can species be constituted? He appears to suggest, on p. 129, that the unwillingness to accept mind as over-ruling all, has been the reason for adopting the evolutionary theory of the origin of species; this, I think, is incorrect. Biologists have frankly adopted the empirical view of natural science, and have practically unanimously accepted the evolutionary theory as established by historical facts; quite independently of any further philosophical or metaphysical views which they may individually hold, as to whether an over-ruling mind has planned it all, or whether it is the result of a fortuitous concourse of forces or atoms; and those definitely holding the latter views are, I think, a minority. Darwin was in no way dogmatic about variation and the precise

methods of natural selection, and I believe that the views that have long been held respecting "the extinction of vast multitudes of nearer relatives," referred to on p. 130, have recently been considerably modified, and that it is now largely held that sports or sudden abrupt large variations are the real causes of permanent variations. Modern Mendelism has made a further analysis, the varying components account for variations in the germ cell, just as electrons have modified our ideas about molecules.

All members of this Institute must, as Christians, thoroughly endorse the conclusions so ably driven home by the lecturer, that the word mind is the least inadequate word that we can apply to the Infinite Cause of the Universe and its operations, and dim as is our comprehension, yet the fortuitous concourse of atoms theory is quite irrational.

Mr. ARTHUR W. SUTTON, F.L.S., expressed the very great pleasure with which he had listened to the lecturer's able and suggestive paper, and alluded to the fact that those whose lives were spent in the more practical branches of horticulture were impressed with two outstanding facts:—On the one hand the wonderful possibilities, by means of selection and cross-fertilisation, of the improvement of the plants of the garden and farm, and on the other hand, the limitations imposed by nature which raised barriers beyond which it was impossible to go.

Mr. Sutton mentioned that, from his experience, he supposed that there was no body of men who, taken as a class, were more profoundly conscious of a supreme or supernatural Power or Being who controlled the course of nature than gardeners. Extraordinary as the results obtained by gardeners undoubtedly were, they were constantly reminded that their success would be impossible were it not for the inherent potentialities with which their plants, trees, etc., were endowed, and although nature allowed her servants to extend the usefulness or increase the beauty of a plant, it was only on lines and in directions peculiar to the individuals under treatment, and that by no possible means could a gardener induce one plant to assume the specific characteristics of another.

Mr. Sutton remarked that it was contended by some that different species could not interbreed and produce fertile offspring, while others contended that certain species did so; this difference of opinion Mr. Sutton attributed to the fact that some included as

species individuals which really ought more properly to be termed varieties, while others limited species to those individuals which were essentially distinct from all others, the whole question hingeing upon what is the true definition of a species.

One speaker had alluded to the theory of "mutations," or sudden modifications in plants or animals, as the starting point for further evolution, or for the origin of new species, but Mr. Sutton contended that there was no instance on record of any such "mutation" having produced a new species, and that the "mutations" of which so much had been heard, were really nothing more than variations which are so common and which occur so constantly when different varieties of any one species are cross-fertilized.

Dr. SCHOFIELD.—I have listened with great interest to the paper just read and it seems to me that the very existence of Science postulates mind, for it is all a quest for laws or orderly and rational sequences which require mind to produce them. The most remarkable thing is the facility with which some scientists can turn the blind eye when they wish. For instance, they wander along an old river bed and pick up a flint evidently chipped purposely to sharpen it, and they called it an arrow-head and see in that flint the unmistakable impress of mind beneath. They are quite clear that it must require mind to make the chips on a flint that have an obvious purpose in view. The funny thing is that when they leave the flint and consider the philosopher who discovered it, the blind eye is turned and they see no necessity for the intervention of mind.

He forsooth is a somewhat fortuitous concourse of atoms, the product of a mysterious and wholly imaginary force called evolution that by "sexual selection" and the "survival of the fittest" has succeeded in forming him. In short it took a great mind to design St. Paul's Cathedral—no one doubts this—but Sir Christopher Wren himself was a chance product of a blind evolution. To make these chips on an arrow-head requires mind, but no mind is needed to make a philosopher. How Wisdom rises above folly in the words, "Every house is builded by some man; but He that built *all things* is God!"

The SECRETARY desired, as one of the least of the followers of Darwin, to be allowed to protest against the manner in which the opinions of evolutionists were so often travestied. He trusted that none of them would ever meet in the flesh the sort of evolutionist

whom their friend, Professor Orchard, was in the habit of exhibiting to them and then successfully demolishing. He believed that no such person existed.

No one could afford to neglect the vast changes which had been introduced into almost every branch of science, since and as a direct result of the propounding of the theory of evolution. The principle of evolution was held to a greater or less degree by almost all men of science. It was true that not all believed now in the Darwinian theory of selection. They differed greatly as to the means, some were selectionist and some mutationists, but on the main principles most agreed, and they were hoping, not without reason, that the study of the "laws" of Mendel would throw new light on the great problem of the means by which evolution was effected.

There were some who conceived of evolution as contrary to Christian belief. Yet it seemed to him that it was the study of this very problem of species or evolutionary lines that led men of science more and more to demand, to postulate, the existence of a first cause, a mind controlling and ruling all the processes of nature.

Surely there was something infinitely grand in the conception of a universe brought slowly into being, from the beginning the germs of progress in it, gradually developing on the lines laid down by the Creator towards a future at which they could scarcely guess; and this was more in accordance with their conception of the Divine power than that ideas of separate creations or a world knowing no change where all things were made for man and man lived beneath the jealous sovereignty of the Jehovah of the Hebrews.

NOTE BY REV. A. IRVING, D.SC., B.A.

I have read the Rev. John Gerard's paper on "Species and their Origin" with considerable interest, and beg to be allowed to make a few remarks upon it. The paper is a careful piece of consecutive reasoning from the selected data, and one has no reason to find fault with the general conclusion, though the author's phraseology is scarcely satisfactory when he speaks of mind as a "force" (p. 129).

There seems to be very little of the inductive method in the paper; and by omitting practically all consideration of the influence of *environment* he has given us only one side of the question under

consideration. Of course the distinction to be drawn between "species" and "varieties" constitutes a very great *crux*, and we must on this matter defer in each case to the specialists. It is that to which Asa Gray referred when he said that he had had to do with the making and unmaking of so many species, that he had not much faith in the hard and fast definitions by which species were distinguished in handbooks of Botany; like the man who "did not believe in ghosts, because he had seen too many of them." (*Natural Science and Religion:* Scribner, New York.) That is an important confession.

Each species is known by characters, which are established in each case by generalisations from those actually found in the individuals which compose the group; and in every instance the generalisation is arrived at, as Mill would say, "by enumeration of instances." There they are, however, transmissible in each species through many generations. Each individual is itself a "summation of powers," including those which characterise the *species* and those which it shares in common with other species of the *genus* to which the species belongs; so that we are thrown back upon the well-known necessity of proceeding in the definition of a species *per genus et differentias* (see Mill, *Logic*, B. i).

The genus *Equus*, for example, contains not only the three modern species—*caballus*, *asinus*, and *zebra*—but others, as *E. stenonis* of the Italian region and *E. sivalensis* of the Indian region; both extinct since the Pliocene, yet with parts of skull, teeth, and limb-bones sufficiently preserved to warrant the assignment of them to the genus *Equus* and at the same time the differentiation of them structurally from the three modern species, with their manifold varieties. The descent of all these from the Miocene *Anchitherium* is pretty well established; but many modifications are marked in the lines of descent, in which the influence of environment has played an important part. Judgments vary as to what constitute generic or specific differences. Thus the form of "Horse" now seen in the British Museum and labelled *Hippidium neogæum* was first described as a species of *Equus*; and the *Equus caballus pregivalskii*, now accepted as the type of the original wild horse of Mongolia, was even thought by a very eminent naturalist to be a hybrid between the Tarpan and the Kiang. That however has been disproved since more individuals have been brought to England, and foals bred

from them. Sterility or fertility in breeding would seem to be after all the true criterion for distinguishing between "species" and "varieties"; but this requires the patient following of the experimental method to check opinions formed from mere observation. Mr. Gerard quotes Huxley "junior" and Huxley "senior," as inconsistent. Obviously the latter must correct the former.

As research advances, the Darwinian creed is apt to receive some rude shocks. Thus Mr. Gerard (pp. 129, 130) quotes Darwin himself as saying that the same identical species cannot be produced twice over, "even if the very same conditions of life, organic and inorganic, should recur." That dogmatic utterance seems to have been rudely traversed of late by the reproduction of the Pleistocene species of small slender-limbed species of horse, which Professor Cossar Ewart, F.R.S., of Edinburgh, but named *Equus agilis*, but which Owen had described from a few fragments from the Oreston cavern as *Asinus fossilis*. Professor Ewart, it would seem, has, in his experimental farm at Penicuik, reproduced, by the cross-breeding of some seven breeds of small horses, the identical *species* of horse which ranged in Pleistocene times from Algiers to the South of England; and he seems satisfied that it represents more than a mere "variety," but rather the "small slender-limbed *species* hunted and sketched or sculptured by our Palæolithic ancestors." (See *Nature*, Jan. 20th, 1910.)

Ewart enumerates as specific characters—"a fine head, slender limbs and small hoofs, a mane which, instead of clinging to the neck, arches to one side, a well set-on tail, and only two out of the eight callosities usually found in horses; *i.e.*, the four ergots and the hind chestnuts are absent." Here again it remains for the naturalists to decide how far these amount to specific, as distinguished from varietal *differentiae*. Whatever uncertainty may beset this question, we may with a fair degree of certainty maintain, I think, that Professor Ewart's results have given a practical demonstration to the important principle of "directivity," as a necessary supplement to the crude Darwinian dogma of "natural selection by the survival merely of the fittest." And in further illustration of this in the plant-world, we hear of a new "species" (? variety) of wheat obtained from cross-fertilisation of species or varieties of *Triticum*, and remarkable for its disease-resisting powers.

Reply by the Rev. J. GERARD, F.L.S.—I find the result of this

interesting discussion to be almost entirely confirmatory of the main contention to the support of which my paper was directed: viz., that while on the one hand we cannot but recognize something objectively real at the back of "species," we have not yet succeeded and probably never shall succeed, in determining the precise character of that reality, and are therefore obliged to base our definitions, not as strict logic would require, upon *genus* and *differentia*, but upon differences which appear on the surface in phenomena which lie within the range of ordinary observation—such, for example, as the oft-quoted sterility of hybrids *inter se*. Here, however, it must be observed there is undoubtedly a danger of arguing in a circle, if we think to explain the fact of sterility by difference of species and then to form this difference by the fact of sterility.

But, as I have said, the net result of the views now expressed appears to be, firstly, that species have a real actual existence in the nature of things, and secondly, that no satisfactory explanation of specific distinctions is possible apart from a Mind ordaining them.

I may be allowed to remark on one or two particular points.

Dr. Irving considers it unsatisfactory in regard of phraseology to speak of mind as a force (p. 140). I would, however, point out that in so speaking I refer to mind *in action*, using the term in its widest sense—*i.e.*, to will, and this, as I hold, is not merely *a* force, but the only causative force of which we have practical experience.

Professor Langhorne Orchard (p. 136) takes exception to the classification which makes two species of *Corvus corone* and *C. cornix*, or of *Carduelis elegans* and *C. caniceps*, which he declares to be only varieties. As to this, it seems enough to say that, in spite of the great authority of the late Professor Newton, the majority of ornithologists consider the difference in each case to be specific, as may be seen in the case exhibited, in illustration of this very point, in the entrance hall of our Natural History Museum. With regard to the distinction between primrose and cowslip (*Primula vulgaris* and *veris*) although Professor Huxley, whom I cited in his essay on the Darwinian Hypothesis, declares it with considerable emphasis to be a well-established fact that these are only varieties and not species, it must be acknowledged that the great majority of botanists are of a contrary opinion.

Two observations in particular made in the course of the discussion appear to me both interesting and suggestive.

The first is that of the Chairman (p. 135) as to the unfailing recognition by dogs of specific identity in their own kind, in spite of all the bewildering varieties which have been produced—a mastiff and a toy terrier equally accepting each other as indubitable dogs. This is certainly a very powerful argument for the reality of species.

Still more important in the observation contributed by Mr. Sutton, that within his own experience no class of men are more fully impressed with the conviction that nature bears witness to the controlling influence of a supreme Power, to which like all else the distinctions of species must be referred—than are practical gardeners. Such an observation I take to be of great importance, as the evidence of those who habitually come into contact with living nature must always, I think, be entitled to much greater weight than that of those who know her chiefly through the observations of others, or as studied in museums and laboratories.