

# ANIMAL INTELLIGENCE.

---

*A LECTURE delivered in the Hulme Town Hall, Manchester, March 12, 1879.*

BY GEORGE J. ROMANES, Esq., M.A., F.L.S.

---



THE great interest which in these days attaches to the study of animal intelligence arises from the importance which the subject has acquired in relation to the theory of descent; for when once this theory is accepted—as it now is by all competent persons—the science of comparative psychology, like the science of comparative anatomy, is placed on a completely new foundation. Groups of facts which previously seemed to be separated are now seen to be bound together in a most intimate manner, while the first principles of the science which have hitherto been unsuspected, are now for the first time brought to light. No longer is it enough to say that such and such an action on the part of an animal is determined by instinct, and as such is beyond the reach of further explanation. Now the very thing to be explained is the character and origin of the instinct—the causes which led to its development, its continuance, its precision, and its use. No longer is it enough to consider the instincts manifested by one animal as an isolated body of phenomena, devoid of any scientific meaning because thus standing out of relation to any known or scientific causes. The whole scientific import of instincts as manifested by one animal now depends on the degree in which they are connected by general principles with the instincts which are manifested by other animals. So that just as in the science of comparative anatomy the scientific interest which attaches to the study of an animal body depends on the relations which the anatomy of the body presents to that of other animals, so in the now embryonic science of comparative psychology all the phenomena of mind as they occur in one animal would be almost destitute of scientific interest unless they admitted of being com-

pared with the phenomena of mind as presented by other animals. And in the one science as in the other, the principle which infuses philosophical life into all these comparisons is that which is furnished by the doctrine of evolution.

But the bearing of this doctrine on the science of psychology does not end here. For it is notorious that from the hour when Mr. Darwin and Mr. Wallace simultaneously propounded the theory which has exerted so great an influence on the thought of the present century, the difference between the views of these two joint-originators of the theory has since been shared by the ever increasing host of their disciples. You all know what that difference is. You all know that while Mr. Darwin believes the facts of human psychology to admit of being explained by the general laws of evolution, Mr. Wallace does not believe these facts to admit of being thus explained. Therefore, while the followers of Mr. Darwin maintain that all organisms whatsoever are alike products of a natural genesis, the followers of Mr. Wallace maintain that a distinct exception must be made to this general statement in the case of the human organism—or, at all events, in the case of the human mind. Thus it is that the great school of evolutionists is now divided into two sects, according to one of which the mind of man has been slowly evolved from lower types of mental life, and according to the other of which the mind of man, not having been thus evolved, stands apart from all other types of mental life.

Such, then, being the immense importance of the theory of descent on the science of psychology, I shall not apologise for restricting the subject of this lecture to a consideration of animal intelligence in its relation to that theory. I shall endeavour to show that, if this theory is accepted, it is competent to explain all the facts of animal intelligence, with the exception of a very small percentage which we may reasonably hope will also before long fall into their proper places; and I shall also endeavour to show that we have no sufficient ground for separating the mind of man from that of the lower animals in this respect, but that to obtain a consistent and satisfactory body of scientific theory we must consent to allow that the mind of man differs from that of the lower animals only in the degree to which it is developed.

Such being the theme on which I desire to speak, I think you will allow that I shall do so most fairly by restricting myself to a consideration of the objections and difficulties which have been urged by the opponents of evolution in its application to psychology. These opponents, driven from the field of natural history, have

taken a temporary refuge in the intrenchments of mental science, and I do not deny that here for a while they may still maintain a rational standing-ground. Many of the facts of mental science are still difficult to explain by the theory of descent; and so long as they are not fully explained, the opponents of that theory have a full right to intrench themselves behind the residual mystery. But considering the obscure and complicated character of the facts in question, it is not to be wondered at that hitherto the theory of descent has not been so successful in subduing this province as it has been in subduing the province of natural history. Speaking for myself, however, I have no doubt that sooner or later all the science of life and of mind will owe allegiance to this theory, and while the advance forces of the latter are steadily continuing their march, I may to-night point out the roads by which it is probable that they will have to proceed.

Apart from the facts of human psychology the great stronghold of the enemy now consists in this position, "How do you explain the origin of animal instincts? Hitherto we have believed with the belief of centuries, that all the varied and astounding instincts which animals exhibit have been directly communicated to them by the wisdom of their Maker—that the bee constructs its cell, the beaver its dam, and the bird its nest, as each has been severally taught by the Supreme Intelligence. But now you tell us that science is penetrating the region of psychology, and hopes to show that all the facts of animal intelligence admit of being explained on natural principles. Tell us, then, the proposed explanation of animal instincts."

Well, in answer to this challenge, I have first to say that it does not follow because we are not ready with a scientific explanation of every animal instinct that therefore animal instincts can have no such explanation. On the contrary, I should maintain that if we have satisfactory reason for concluding that most animal instincts have had a natural growth, the few outstanding cases which we cannot as yet explain in this way ought to be considered as objects for further scientific inquiry, and not to be set down at once as supernatural, and therefore beyond the range of such inquiry. Yet this is now what is in effect being constantly done by all those writers who point to certain obscure instincts as not explicable by any known principles, and therefore as evidence of supernatural endowment. These instincts are luckily few in number—so few that I think I can name them all. First, we have the migratory instinct, which is exhibited for the most part by birds. No theorist

has as yet been framed to explain the manner in which migratory birds find their way over enormous tracts of country. They fly for the most part by night, and ornithologists affirm that in some species the young broods do not accompany the older birds, and must therefore perform their first journey without guidance. Next we have the so-called *homing* instinct. I have evidence of a cat finding its way home from London to Huddersfield, a distance of 200 miles; of a dog returning to its home in Sutherlandshire from Berwick-on-Tweed, having been taken to Berwick by sea and returning by land; and of horses, donkeys, cattle, &c., returning over enormous distances. In such cases short cuts are often made over third sides of triangles; but it is interesting that in one of my cases, communicated to me by an intelligent correspondent, some horses, in taking a short cut for home, were brought up, after a journey of several hundred miles, on the end of a peninsular, where they do not seem to have had sense enough to double back.

Again, we have a somewhat mysterious instinct manifested by several species of wasp-like insect. These insects lay up a store of spiders to serve as food for their larvæ when the latter leave the egg. To do this they sting the spiders in a certain spot of the body where there is a large nerve-centre—the effect being that the spider is not killed outright but merely paralysed, and so does not decompose during its imprisonment, and while the eggs of the wasp are in process of hatching. Now the question has been put by Mr. Mivart—How did the wasps first find out the precise spot in the spider's body where their stings would have this peculiar effect? My answer in this, as in the other cases, is, We do not know; but we feel that our ignorance is no warrant for concluding that there has been any supernatural intuition in the matter; rather do we feel that our ignorance impels us to seek for some more natural and probable explanation. Thus, for instance, in this particular case it is, I think, possible that if the facts were carefully observed it would be seen that the form of the wasp happens to be so adapted to the form of the spider that the sting naturally strikes the nerve-centre of the latter. And, if this were the case, the origin of the instinct would be explained by the mere coincidence in the form of the two animals.

There are several other animal instincts the origins of which are of a more or less mysterious character—such, for instance, as those presented by neuter insects, where it is difficult to understand how the principles of heredity can apply. But I think I have now named all the cases in which it seems to me we need

to allow our incompetence to explain the origin of animal instincts; and I have thus taken the trouble to specify these cases explicitly, because some of the criticisms on my former lecture on this subject, (delivered before the British Association at Dublin), seemed to think that the simple origin which I then assigned to animal instincts was far too simple to be true, and that as such it could not meet all the cases. Now I believe that the only cases which it does not meet are those which I have specified. All the other countless cases of animal instinct may, I believe, be reasonably explained by the hypothesis which my previous lecture embodied. That hypothesis is, that animal instincts may arise in either of two ways.

First: By the effects of habit in successive generations, actions which were originally intelligent may become, as it were, stereotyped into permanent instincts. Thus, for instance, there are several kinds of birds, such as partridges and plovers, which have the wonderful instinct of pretending to be wounded when frightened off their nest by an enemy, the effect being to induce the enemy to pursue the apparently wounded bird, and so to be led away from the nest. Now this, I think, must originally have been an intelligent action on the part of those birds—the maternal feelings being so strong that when an enemy appeared there was an irresistible desire on the part of the mother to sacrifice herself rather than her brood, and so, instead of flying off, inducing the enemy to follow her away from the brood by pretending inability to fly. Those parents which had sense enough to adopt this device would no doubt be able to rear a greater number of broods than could the more stupid parents; and the young broods of such intelligent parents would inherit a tendency to adopt this device when they themselves became mothers. Thus the originally intelligent device would slowly become organised into an instinct, and so is now performed with mechanical promptitude by every individual partridge or plover.

I may give one other case, illustrative of the same principle. Having had occasion to keep a number of guinea-pigs and Himalayan rabbits in the same outhouse, I one day presented them both simultaneously with a bundle of freshly-pulled stinging-nettles. The rabbits and the guinea-pigs all crowded round the green bundle, but not one of the rabbits ventured to touch it. On the other hand, all the guinea-pigs set to devouring the nettles with avidity, the result being that they all had their noses severely stung. Every half minute or so they had to stop eating, sit down,

and violently scratch their noses, so that at any one time a number of guinea-pigs were so engaged. Moreover, every now and then a philosopher guinea-pig seemed to reflect that there must be some cause for the very painful irritation of his nose, and not feeling it reasonable to blame the vegetables, he very naturally concluded that in some unaccountable way his neighbour guinea-pig must have been to blame ; he therefore set upon his neighbour with a squeal, and in this way a great many guinea-pig misunderstandings arose.

Now the lesson to be learnt from this observation is as follows : The Himalayan rabbit is a kind of fancy rabbit, which has been domesticated for an untold number of generations ; yet this observation shows that these fancy rabbits still retain an instinctive fear of nettles—a fear which must originally have been due to the intelligent observation by a wild ancestry that stinging nettles are things which had better be left alone by rabbits. On the other hand, guinea-pigs come from a country where, as I am informed by the best authority, stinging-nettles are not endemic, and therefore my guinea-pigs can have had no hereditary experience to warn them against the treachery of nettle-nature. Thus, one way in which instincts may arise is by intelligent observation and adjustment, gradually growing by repetition into a non-intelligent or intuitive adjustment.

Secondly : The other way in which I suppose animal instincts to arise is still more simple, viz., by survival of the fittest preserving actions which, although never intelligent, yet happen to have been of benefit to the animals which first chanced to perform them. Thus, for instance, take the instinct of incubation. It is quite inconceivable that any animal can ever have kept its eggs warm with the intelligent purpose of developing their contents ; so we can only suppose that the incubating instinct began in some such form as we now see it in the spider, where the object of the process is protection, as distinguished from the imparting of heat. But incidental to such protection is the imparting of heat, and as animals gradually became warm-blooded no doubt this latter function became of more and more importance to incubation. Consequently, those individuals which most constantly cuddled their eggs would develop most progeny, and so the incubating instinct would be developed by natural selection without there ever having been any intelligence in the matter.

That some instincts must have been developed in this way is further evident, if we reflect that instinctive actions are performed

by animals at an age before intelligence has begun to assert itself. Thus, for instance, the sucking instinct can never have depended on intelligence for its beginnings. It must have been as exclusively due to survival of the fittest, as is a very similar and remarkable action which is described by M'Crady as occurring in a species of jelly-fish. This jelly-fish carries its larvæ on the inner sides of its bell-like body. The mouth and stomach of the jelly-fish hang down like the tongue of a bell, and contain the nutrient fluids. Now M'Crady observed this depending organ to be moved first to one side and then to the other side of the bell, in order to give suck to the larvæ on the sides of the bell—the larvæ dipping their long noses into the nutrient fluids which that organ of the parent's body contained. I cite this case, because if it occurred in one of the higher animals it would properly be called a case of instinct; but as it occurs in so low an animal as a jelly-fish, it is quite impossible that intelligence can ever have played any part in originating the action. Therefore we may set it down as the uncompounded result of natural selection.

But, no doubt, in the case of most animal instincts intelligence and natural selection have gone hand-in-hand, or co-operated, in producing the observed results—natural selection always securing and rendering permanent any advances which intelligence may have made. Thus, to take one case as an illustration. Dr. Rae tells me that the grouse of North America have the curious instinct of burrowing a tunnel just below the surface of the snow. In the end of this tunnel they sleep securely, for when any four-footed enemy approaches the mouth of the tunnel, the bird, in order to escape, has only to fly up through the thin covering of snow. Now in this case the grouse probably began to burrow in the snow for the sake of warmth, or concealment, or both; and, if so, thus far the burrowing was an act of intelligence. But the longer the tunnel the better would it serve in the above-described means of escape; therefore natural selection would tend to preserve the birds which made the longest tunnels, until the utmost benefit that length of tunnel could give had been attained.

And similarly, I believe, all the host of animal instincts may be fully explained by the joint operation of these two causes—intelligent adjustment and survival of the fittest. For now, in concluding this part of my subject, I may draw your attention to another fact which is of great importance, viz., that instincts admit of being modified as modifying circumstances may require. In other words, instincts are not rigidly fixed, but are plastic, and

their plasticity renders them capable of improvement or of alteration. To demonstrate this fact, I shall detail one experiment.

I removed a "clutch" of eggs from a hen which had been sitting on them long enough to have hatched them had they been capable of hatching, and in their place I substituted a brood of new-born ferrets. The hen appeared to be genuinely surprised at the extraordinary product of her hatching, but in a truly philosophical spirit made the best of an unexpected result, and nursed the ferrets with all the fondness of maternal care. Day and night she brooded over them to keep them warm, and although she often looked at them with a long and wondering gaze, she nobly did her duty in rearing her peculiar brood. Now in order to perform this duty she had profoundly to modify the dictates of hereditary instinct; for it is needless to say that the requirements of a young ferret are widely different from those of a young chicken. In the first place, a chicken is able to run about very soon after it quits the egg, while it is days and weeks after its birth before a ferret is able to do so. The poor hen-mother was therefore sorely puzzled in the first instance by the astounding laziness which was displayed by her brood. In vain did she leave the nest every few minutes and cluck and cluck to coax her chicks to follow; the only response from the nest was a chorus of grunts and growls and squeals, which became more and more horribly un-chicken-like the longer they were continued, so that at last the mother in despair had again to go and keep her young ones warm. Nor was this all. These, her young ones, showed a great contempt for the time-honoured staff of poultry-life—grain; while, on the other hand, they displayed an unaccountable partiality to an unheard-of and altogether monstrous kind of food—milk. Oh horrible sight it was for a mother's eyes to see, these her hairy chickens all cuddled together in their nest, greedily lapping their liquid nourishment supplied by the hands of strangers! Yet, after a few days the poor puzzled hen learned to understand the needs of her curious offspring; complacently she left the nest when the saucer of milk was brought, and tenderly she regarded the evident enjoyment which that same saucer afforded to her eccentric children. But there was one peculiarity on the part of these children to which the unfortunate mother never became accustomed. This was their attempts at sucking. Often when all was quiet, and the hen-mother rested with outspread wings upon her sleeping brood, suddenly a great change would come over the spirit of her dream, as with a loud yell of mingled pain and

horror she used to fly from her nest, and show by many an indignant cackle how shamefully her ungrateful chickens had bitten her most tender breast.

Now this whole experiment proves how considerably even the most strongly-inherited of instincts admits of being modified in adaptation to novel circumstances arising in the experience of the individual. I several times removed one of the young ferrets from the rest and concealed it at a distance from the nest behind some boxes. The cold soon made the young animal cry for attention, and although no two sounds could be conceived as more unlike than the shrill peeping of a young chicken and the hoarse growling of a young ferret, the hen always recognised the latter as the voice of one of her family in distress, and used to go with all the solicitude of maternal love to where it was concealed.

Instincts, then, are plastic in adapting themselves to changed conditions in the life of the individual, and there can thus be no doubt that they must also be plastic in adapting themselves to changed conditions in the life of the species, whenever these changes are of sufficient duration to call into play the principles of heredity. And, if this is so, we can well understand with what abundant facilities the principle of natural selection is supplied when developing animal instincts into harmony with animal surroundings.

So much, then, for the probable modes of origin of animal instincts, or the first difficulty which the theory of descent has to encounter in the domain of psychology. The second and only other great difficulty which that theory has to encounter in this domain arises from the enormous difference between animal intelligence and human intelligence—a difference so enormous that any man may well hesitate to believe that the latter can have been developed from the former. Indeed, I may say that it is not until we have become convinced, through the facts of structural organisation, that the body of man is a product of natural evolution, that we are prepared to suspect the possibility of his mind being the same. But wide as is the difference between the mind of a man and the mind of a brute, we must remember that the question is one, not of degree, but of kind, and therefore that our task is calmly and honestly to estimate the character of the difference which is presented, in order to decide whether it is really beyond the bounds of credibility that this great difference can ever have been bridged over by numberless intermediate links during the course of geological time.

First, I shall briefly consider the points in which animal intelligence resembles human intelligence, and in this connection, the primary place must be assigned to the emotions. Beginning then with these, in my former lecture I stated in general terms that, "as regards the particular emotions which occur among the higher animals, I can affirm, from my own observations, that all the following give unmistakable tokens of their presence—fear, affection, passionateness, pugnacity, jealousy, sympathy, pride, reverence, emulation, shame, hate, curiosity, revenge, cruelty, emotion of the ludicrous, and emotion of the beautiful. Now this list includes nearly all the human emotions except those which refer to religion and to the perception of the sublime." It has been objected to this statement by my critics that I ought to have given instances of the display of these various emotions. I will therefore now supply some of the evidence which in my previous lecture I was compelled, from want of time, to omit. The first five emotions which I have named are of such constant occurrence among animals that any proof of their occurrence would here be superfluous. As a beautiful instance of the display of sympathy, I may narrate an occurrence which was witnessed by my friend Sir James Malcolm—a gentleman on the accuracy of whose observation I can rely. He was on board a steamer where there were two common East India monkeys, one of which was older and larger than the other, though they were not mother and child. The smaller monkey one day fell overboard amidships. The larger one became frantically excited, and running over the bulwarks down to a part of the ship which is called "the bend," it held on to the side of the vessel with one hand, while with the other it extended to her drowning companion a cord with which she had been tied up, and one end of which was fastened round her waist. The incident astonished everyone on board, but unfortunately for the romance of the story the little monkey was not near enough to grasp the floating end of the cord. The animal, however, was eventually saved by a sailor throwing out a longer rope to the little swimmer, who had sense enough to grasp it, and so to be hauled on board.

As a good example of emulation, I may quote the case of a terrier I had which taught a puppy of his own to hunt rabbits. For a long time he viewed the progress which the youngster made with the legitimate satisfaction of parental pride. But as the puppy grew up, the vigour of youth enabled the son to outrun his father in the chase. It was then amusing to see the desperate

efforts which the old dog used to make to keep pace with the young one, and when all these efforts failed he used suddenly to exercise his paternal authority and grasp his presumptuous offspring by the tail, whereby at the same time he avoided the disgrace of being beaten in a fair run, and also inflicted due punishment on filial irreverence.

Passing over shame, hate, and curiosity, as emotions which are of such frequent occurrence among animals as not to require illustrative proof, we come next to revenge, one of the best instances of which has been communicated to me by the historian, Mr. Morrison. Some members of his family kept a parrot and a monkey as pets. One day these pets had a quarrel, which terminated in the parrot severely biting the fingers of the monkey. At the time the monkey was not able to retaliate, owing to the presence of his enemy's allies. But his wrath was warmed by nursing, and several hours afterwards the parrot was found to have mysteriously disappeared. High and low the house was searched without avail, and it was not until all search had proved fruitless that a very dreadful discovery was made; for in the evening, when the cook poured out the soup all boiling hot for dinner, a hideous medley of bones and feathers revealed too well the awful punishment of Poll. In some way or another the monkey had succeeded in cramming the bird into the soup-pot, so affording a display of revenge which I should not have believed on the testimony of any less trustworthy a person than Mr. Morrison.

As regards cruelty, the proverbial behaviour of a cat with a mouse may, I think, properly be taken as evidence of delight in torture for torture's sake; and in the case of monkeys we find this evidence so indisputable that I do not suppose I need wait to give illustrations. It is of more importance that I should state some evidence as to the occurrence of the next emotion on the list, that, viz., of the ludicrous. My assertion that some animals possess a sense of humour has seemed to several of my critics the most difficult of all my assertions to accept. Yet, antecedently, I see no more reason to doubt that animals should possess a sense of the comical, than that they should possess a sense of the beautiful, and the question whether or not they do, becomes one merely of observation. Well, viewed in this way, I do not think that any careful observer of animals, and especially of monkeys, can doubt that they often perform actions with the evident purpose of exciting laughter. How far they themselves enjoy the joke it is not so easy to tell, though I have seen an

orang outang appear to enjoy her own jokes amazingly. Without having been taught, she used to put her feeding-tin upon her head—where it somewhat resembled a bonnet—and then smile at the spectators, as much as to say, “Now then, don’t I look queer?” But perhaps the strongest evidence that one can give of the sense of the ludicrous in animals consists in the evident dislike which some animals show of being laughed at when they do not intend to appear ridiculous. I once had a terrier which was very fond of being laughed at when he wished to appear comical, but became thoroughly miserable if ridiculed when he did not wish to appear so. For instance, this terrier used to be very fond of catching flies upon the window-panes, and if ridiculed when unsuccessful was evidently much annoyed. On one occasion, in order to see what he would do, I purposely laughed immoderately every time he failed. It so happened that he did so several times in succession—partly, I believe, in consequence of my laughing—and eventually he became so distressed that he positively *pretended* to catch the fly, going through all the appropriate actions with his lips and tongue, and afterwards rubbing the ground with his neck, as if to kill the victim; he then looked up at me with a triumphant air of success. So well was the whole process simulated, that I should have been quite deceived had I not seen that the fly was still upon the window. Accordingly I drew his attention to this fact, as well as to the absence of anything upon the floor; and when he saw that his hypocrisy had been detected, he slunk away under some furniture, evidently very much ashamed of himself.

So much, then, for the sense of the ludicrous in animals, to which I cannot now devote more time. As regards the sense of the beautiful, or the last of the emotions which I have named, it is enough to say that the presence of such an emotion in animals must be conceded by all who accept the evidence which Mr. Darwin has adduced of the facts of sexual selection.

So far then as the emotional life of brutes is concerned, it cannot be said that the facts of psychology raise any difficulties in the theory of descent; on the contrary, the emotional life of animals is so strikingly similar in its general principles to the emotional life of man, that the similarity might be taken as independent proof of a genetic relation between them. It is not until we come to the faculties which are called intellectual that any apparent difference of kind asserts itself, and that the mind of the brute becomes marked off as seeming to belong to an altogether distinct

category from that of the man. Let us then examine the precise nature of this difference.

In popular phraseology, descended from the Middle Ages, all the mental faculties of the animal are termed instinctive, in contradistinction to those of man, which are termed rational. But unless we commit ourselves to an obvious reasoning in a circle, we must avoid assuming that all actions of animals are instinctive, and then arguing that because they are instinctive, therefore they differ from the rational actions of man. The question really lies in what is here assumed, and we can only answer it by examining in what essential respect instinct differs from reason. Now it seems to me that the only essential respect in which instinct differs from reason consists in the amount of conscious deliberation which the two processes respectively involve. Instinctive actions are actions which, owing to their frequent repetition, become so habitual in the course of generations that all the individuals of the same species automatically perform the same actions under the stimulus supplied by the same appropriate circumstances. Rational actions, on the other hand, are actions which are required to meet circumstances of comparatively rare occurrence in the life-history of the species, and which therefore can only be performed by a conscious effort of thought. The effects of frequent repetition in making actions instinctive or automatic may be seen even in the course of an individual life-time. Thus, for instance, Mr. Herbert Spencer tells of an old soldier who was one day carefully carrying a choice pie home to his dinner. Some cruelly-disposed individual came behind him, and suddenly cried in a commanding voice, "Attention!" Immediately the old soldier stood bolt upright, with his hands to his sides, while the pie came to grief upon the pavement. This response to the word "Attention!" had become to him instinctive. But for an action to be rational it must be performed with conscious deliberation, or with thoughtful adaptation of means to ends.

Such, then, being the distinction which I make between instinct and reason, we shall find, if we adhere to it, that many actions performed by man are instinctive, while many actions performed by animals are rational; the only difference between human intelligence and animal intelligence being in the great proportional degree in which the rational element is developed in the former. That man possesses certain instincts in common with the lower animals no one denies, but the other side of the similarity—viz., that animals possess reason in common with man—has been warmly contested.

I cannot now wait to discuss all the difficulties which have been raised against the fact that the higher animals possess the germs of rational thought, but I will give you one or two examples of the display of reason by a dog, which is of more value than any amount of discussion. I drove this dog from its country home, as a present to a friend who lived in a town some ten miles distant. Several weeks afterwards I again drove to visit this friend, and when my horses were being harnessed for the return journey the terrier must have reasoned from analogy that I was about to return home, and thereupon formed the resolution of accompanying me to the hunting-grounds of his puppyhood. But he must further have reasoned that since on the occasion of my previous visit I had purposely left him behind as a present to my friend, I should not on this occasion be inclined to take him home. Lastly, he must have reasoned that there was one expedient whereby he could solicit my protection on the homeward journey without the danger of being imprisoned, and this expedient he adopted; for after we had vainly searched for Skye, to prevent his following my dog-cart, I started, and when two miles on my way home I overtook him, lying in the middle of the road with his face towards the town, evidently expecting my approach. And, as the dog had clearly contemplated, the distance was too great for me to return with him to the town, so that, as he had clearly intended, I had to take him with me to his old home in the country.

I am tempted to give you one other instance of the display of reason by a dog. It was communicated to me by a dignitary of the Church who is so hostile to the theory of evolution that he particularly requests me, if I publish his anecdote, to suppress his name. In conforming to this request, perhaps I may be permitted to express my sorrow that the theory of evolution is now languishing beneath the displeasure of so great and so candid a man. This reverend gentleman had a large retriever, which was one day sleeping, or pretending to be asleep, by the kitchen fire, while a large turkey was lying on the table ready trussed for roasting. During the temporary absence of the cook the dog carried off the turkey to the garden, deposited it in a hollow tree, and immediately after doing so returned to resume his place by the fire, where he pretended to be asleep as before. When the cook returned all things were *in statu quo*, save the absence of the turkey, and great as was his perturbation at the change he never suspected the sleeping dog to have been the thief. Nor was there any reason why the

dog should not have subsequently enjoyed the fruits of his ingenuity, had not the gardener happened to have seen him depositing the turkey in the tree, and spoiled his little device by again bringing the turkey back into the kitchen. Now it seems to me that the dog, having denied himself the immediate pleasure of a feast, having concealed the spoil until some time when he could return to it without exciting suspicion by his absence from the kitchen, and having immediately returned to the fireside and pretended to be asleep—all these facts seem to me to prove the presence both of forethought and of reason.

I will therefore take it as proved by these and by many other instances with which we meet in books devoted to anecdotes of animal intelligence, that the higher animals certainly do present us with evidences of mental processes that can in no way be distinguished from those which in man we term rational. But in maintaining this much, I wish no less strenuously to maintain that the difference between the reason of animals and the reason of man is so prodigious, that unless we can suggest some very good reason for the disproportional development of this faculty in man, the theory of evolution has been weighed in the balance psychological and found wanting. In my previous lecture, therefore, I suggested that the cause of the difference in question might be found largely, if not wholly, in the fact that man alone of animals is gifted with the faculty of speech. This suggestion was not, as most of my critics seem to suppose, original; but in matters of science originality is of very subordinate importance. In the present case we have a great difference to be explained, and we have also a fact which appears to be a not inadequate explanation. The difference to be explained is the enormous development of reason in man as contrasted with that to which it has attained in brutes, and the fact which seems not inadequate to explain this difference is, that man is the only animal which is able to speak.

If you wish to know how this fact appears not inadequate to explain this difference, I am afraid that I cannot tell you within the limits of one lecture. But I may give you a general idea of the naturalistic philosophy of this subject if I ask you to note for yourselves the altogether incalculable influence of language on thought. Only by the help of words is it possible for us to reach ideas of more than the very lowest degree of abstraction. Take, for instance, as good a type as we can of abstract ideas—those namely of number. How would it be possible to conduct the simplest train of reasoning which involves any ideas of number

expect this, because we have no right to suppose that the mental constitution of these animals is in any way fitted to the development of a sign-making faculty. Possibly enough even here this faculty may be present in the germ—just as we should expect that it ought to be on the supposition of mind being everywhere one—but, if so, it is present only in the germ. For my own part I am indeed inclined to believe that parrots do very often appreciate the meaning of the words which they utter—just as most intelligent animals learn the meanings of certain words when uttered by their master. I have known parrots which call proper names with evident discrimination, and I am inclined to believe that there is something more than chance in the apposite nature of the remarks which sometimes fall from their beaks. I will give you two cases of what I mean. My coachman bought a parrot, which for several weeks never uttered a word, so that he concluded it was not able to talk. But one day, while it was hanging in its cage upon the outside of the stable wall, several carts of hay were being unloaded in the stable-yard, with all the stir and bustle which is usually thought appropriate to such occasions. The tongue of Poll was suddenly unloosed, and in loud reproving tones she exclaimed, “More work and less noise.”

The other instance of appropriate remarks by parrots that I shall give was communicated to me by a clergyman who kept one of these birds, which was of so vociferous a disposition that it always had to be turned out of the room during family worship. One evening, however, this exclusion of the parrot from the exercises of devotion was forgotten. During the reading of the Scriptures the bird remained quite silent—trying, no doubt, to understand, if not the sense of what was read, at all events the sense of reading it. But when the reading was concluded, and all the household solemnly knelt down to pray, the sight was too lugubriously painful for poor Poll’s feelings to endure, and so to change at last the aspect that things were assuming he cried out in a remonstrating voice, “Cheer up, boys, cheer up.” It is needless to add that this injunction had, for a time at least, the desired effect.

Now I have thus briefly alluded to the apposite remarks which are often made by parrots, in order to show that even among these comparatively non-intelligent animals there is some rudimentary appreciation of the use of verbal signs. Not only may these birds attach appropriate significations to proper names and noun-substantives, but they may even use short sentences in a way

seeming to indicate that they appreciate—not indeed their grammatical structure—but the applicability of the sentences as a whole to particular circumstances. “Cheer up boys” was probably known to have the effect of making people laugh, and was therefore probably chosen by the parrot as the most appropriate of his phrases to attract attention during the unlaughable ceremonies of prayer-time, just in the same way as when he wanted his head rubbed he might have made the verbal sign, “Scratch poor Poll.”

I know that in thus claiming for parrots some dim understanding of the words which they utter I am saying more than most psychologists will be prepared to accept ; but antecedently there is nothing more incredible in the fact that a talking bird should use a verbal sign than that a sporting dog should use a gesticulating sign, as it does in the act of pointing. However, as an evolutionist I have no interest in proving that parrots do understand the meaning of any word, and I have only alluded to this subject at all because some of my critics have argued that the fact of certain birds being able to talk is evidence that the faculty of speech cannot be the source of the difference between human and brute psychology. I maintain, on the contrary, that even if we go further than my critics are prepared to go, and concede, not only the fact that birds can talk, but also the possibility of their being able in some measure to understand the meaning of what they say—even then, the fact of some birds being able to articulate is no evidence against the view that in language we have the source of the difference between animals and man. For the mere faculty of articulating has in itself no magical power of developing thought. It is merely a convenient and subtle system of signs which acts on thought and thought on it in a reciprocal manner. And for the possibility of such mutual operation of reason and language highly delicate conditions of psychology are certainly required ; so that even if we allow that parrots are able in an imperfect manner to comprehend the meaning of the words which they utter, it is not to the parrots but to the man-like apes that we must look for the animals which, if they could speak, would have the best chance of developing a man-like faculty of reason.

My time is now exhausted, but I think that in it I have been able to show you that the theory of evolution has nothing to fear, while it has everything to welcome, in the science of comparative psychology. Some of you may not like to hear that it is so. You may not like to face the fact that all time-honoured distinctions between man and the lower animals are in process of dissolution.

You may not like to feel that your life is one with the life of brutes, or that the magnificent structure of your mind has its roots far hidden in the depths of the soul bestial. You may think that in dissolving these time-honoured distinctions the science of our time is depriving you of all your most valued beliefs, dissipating all your most cherished hopes, and as an angel of darkness will hurl you to the gulf of an utter and an awful destruction. In thus thinking and in thus feeling you may be right or you may be wrong. I am not here this evening to discuss the present tendencies or the future consequences of scientific research. But I may be permitted to observe that in any advance which Science has hitherto made in the region of traditional beliefs, she has been similarly met by a cry of terror similarly wrung from a people that walked in the darkness of a dreadful mystery and in the shadow of a universal death. Yet on looking back through the history of years we find that this terror of Science has not yet been justified, but that all men are now agreed that at least thus far what humanity has seen in Science has indeed been a "great light." What has been in the past may also be in the future ; and although it is true that in touching man's own personality Science is approaching more near than ever to the shrine of his highest hope, I do not myself see any reason to conclude that she must be approaching it with a desecrating hand. At all events, looking upon this subject as a mere logician, I should say that those who have at heart the cause of their traditional beliefs would act most wisely by avowing themselves prepared to accept the probability of the human mind being a product of natural growth. Throughout her career the chief work of Science has been to prove the universal supremacy of Law ; so that if in these her latest utterances you again recognise the tone of her former teachings, you ought to remember that in the unfolding conception of universal Law men as yet have only seen that which is unspeakably, transcendently sublime. And if ever this conception should, as I believe it eventually must, extend in all its entirety to the facts of our own personality, I do not see that the then completed doctrine of the uniformity of Nature need any further have its sublimity marred by its negativity. Whether or not the law-governed mind of man is itself the highest form of mind—whether it may hold communion with a mind as far above it as the heavens are above the earth, or whether it is alone save in such companionship as it may hold with the mind of brutes—this is a question on which Science is as voiceless as Speculation is vociferous. But whether or not Mind

is in Nature supreme, the human mind assuredly is not so, and the question as to the mode of its origin in no wise affects the fact of its existence. Here and now you and I are alive—feeling, thinking, conscious; and the stupendous mystery of this fact is not solved by the supposition or the proof that you and I have derived this life from lower grades of mental being. If the doctrine of the supremacy of Mind in Nature is true, man's place in Nature does not become the less exalted because his origin is proved to have been natural; so that, unless you believe the idea of Law to be incompatible with that of God, there is nothing in the doctrine of evolution that need deprive you of any belief you may have in the doctrine, either that His are the cattle on a thousand hills, or that in virtue of the splendid endowment of rational thought, only a little lower than the angels, and as it were in the image of God, created He man.