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DO THE LOWER ANIMALS REASON?

C. O. NUTTING.

For the average layman to enter into a discussion involving psychological matters is surely a rather hazardous proceeding and indicates a temerity that needs some apology.

Your speaker, although not a psychologist, has become greatly interested in the evidences of mind that have impressed themselves upon him in his study of animals, and has had his interest greatly stimulated by the perusal of the works of two writers, one of whom discusses animal psychology from the side of the naturalist, and the other from the side of the psychologist. With the latter writer I have been led into the most delightful correspondence involving a discussion of the question "Do the lower animals reason?" a question upon which I have been forced to differ from the gentleman in question.

I referred a moment ago to the difficulty involved in a psychological discussion. This difficulty is two-fold, arising first from the necessity of exact and very careful definitions of terms, and second, from the great tendency to be drawn off into a discussion of side issues, which, however alluring are not strictly pertinent to the matter in hand.

It is my purpose to discuss briefly the attitude of the two authors above mentioned, Romanes and Lloyd Morgan; to point out my objections both to the premises and conclusions of the latter, to state with all diffidence my own position in the question, and finally to cite a sufficient number of facts to justify that conclusion.

George J. Romanes, an English zoologist, whose untimely death has been a severe loss to science, has written two works on "The Intelligence of Animals," and "Mental Evolution in Animals." He has sought to establish a thoroughly consistent scheme of development of mind along evolutionary lines. The following propositions will indicate the keynote to his position.

Evidence of choice on the part of an organism is a criterion of mind.

The evidence of choice is a discriminating response to stimuli. Sensation is feeling aroused by stimulus.

Memory arises from the after-effect of a stimulus and leads to the association of ideas and recollections.

Perception is an establishment of specific relations among states of consciousness. It is a mental interpretation of sensations in terms of past experience. It is everywhere bound up with memory, and in its highest stages involves inference. According to this writer all but the very lowest invertebrates among animals give evidence of perception.

Instincts originate in two ways.

First—By natural selection, by which fortunate actions, although not intelligent, being of advantage, lead to the preservation of the individuals showing such activities.

Second.—By the effects of habit in successive generations, actions which were originally intelligent, become, as it were, stereotyped into permanent instincts.

“Reason is the faculty which is concerned in the intentional adaptation of means to ends. It therefore implies the conscious knowledge of the relation between means employed and ends attained, and may be exercised in adaptations to circumstance, novel alike to the experience of the individual and to that of the species.”

Mr. Romanes is very strongly of the opinion that a great number of the acts of the lower animals indicate reason as above defined. We will not, however, enter at present on the discussion of this question. I wish merely to point out and emphasize the fact that this able writer, approaching the question from the standpoint of the naturalist, has no doubt whatever that the lower animals reason. C. Lloyd Morgan of Bristol, England, is, I believe, regarded as one of the leading psychologists of the day, has written an extensive work on human psychology, and a smaller, but thoroughly scientific treatise called “An Introduction to Comparative Psychology.” He is probably more admirably trained for philosophical discussion than was Romanes, and impresses one as a thinker of unusual ability and accuracy. His style is remarkably clear and lucid, and his writings show little of the intellectual dishonesty that is apt to mar the work of the ordinary controversialist.

He adopts the "wave theory of consciousness." The crest of the wave is the focal point of consciousness. The slopes of the wave are marginal and represent elements which, although not focal, are still dimly within the field of consciousness. They are sub-conscious. It will be seen that that which is marginal at one instant becomes focal with the advancing wave and is for a season again marginal as the wave passes forward.

It will be noted that the wave of consciousness is continuous and this continuity of consciousness is what Morgan calls mind.

The following canon of interpretation is enunciated by this writer as a law that must be followed in interpreting psychical phenomena other than our own, particularly non-human psychical activities.

"In no case may we interpret an action as the outcome of an exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale."

We shall have occasion to discuss this canon further on. I will simply remark in passing that it forms the main line of contention in the correspondence between Professor Morgan and myself.

The following definitions of terms are the ones adopted by Morgan, and indicate the sense in which the words are used in this paper. Only such terms as are necessary to the discussion need occupy our attention at present.

An instinctive act is a sub-conscious motor response to a stimulus and precedes experience. Example, a newly hatched chick will at once begin picking at small objects on the ground. Newly born kittens will spit at a dog.

Intelligent action is one based on previous experience. Example, the young chick will after a little experience pick at small seeds and refuse to pick at grains of sand. Young kittens will not notice a dog with which they are acquainted, but will spit at a strange dog.

Association of ideas may be explained by again referring to the wave theory of consciousness.

When in past experience the wave has passed through a given series involving a number of sense impressions, any one of those sense impressions received on a subsequent occasion may start again the same wave and cause the same, or some of the same, impressions to again be present in consciousness. And

the oftener this is done the more certain is this group of impressions to recur when one of them is presented as focal in consciousness. For example I can never, try as I may, avoid the recurrence of a mental picture of two little swampy Cree Indians with their mouths wide open, whenever I hear the music of that grand old church hymn "Onward Christian Soldiers."

Morgan distinctly admits the presence of the wave of consciousness in animals. He further admits, as indeed do all men who have thought on the subject, that the phenomena of association of ideas is constantly in evidence in animal psychology. It is also evident that these associations once formed are the basis of intelligent action.

The young chick associates the sense impression conveyed by a seed with the pleasurable sensation caused by eating it.

In the future, therefore, he unhesitatingly eats the seed as soon as he sees it. The grain of sand is not associated with a pleasurable gustatory sensation and he lets it alone. In other words, intelligence is guided by sense experience.

"Memory is the reinstatement or revival, through secondary suggestion, of psychical elements or constituents which have faded from consciousness." It works apparently through association of ideas.

Memory is involuntary while recollection is voluntary.

Memory may be a simple reinstatement, or in its higher phases it may involve a definite localization in time of past events. In the latter event it has to do with relation, some reference to the how, where and when.

Our author believes that many animals habitually exercise memory in the sense of a simple reinstatement through suggestion. He does not believe that they exercise the higher memory that involves the perception of relations.

"A percept is an impression to which is added a conscious or sub-conscious perception of relation to the subject or to other objects."

In our wave of consciousness, the attention is focused on various objects in succession. It is transferred rapidly from one to another. The consciousness of the transition is marginal. Now if we can go back again and focus the attention in the transition itself, we are engaged in perceiving the relation of the two objects, whatever they may be. This operation involves retrospection. Our author here goes into a maze of

nice distinctions through which we cannot follow him. He believes, in fine, that while animals lower than man have an awareness of relations, the transitions are marginal in consciousness; he denies that they are able to make the transitions focal, thereby arriving at a perception of relations. He does not believe that animals can reflect.

Finally, let us see our author's definition of reason, or rather the criteria of reasoning powers. He says, "Our question then becomes: Are there animal activities the performance of which is inexplicable if the animal in question does not perceive the 'why' and think the therefore." He says that there are none. While admitting that animals do reason in the sense that they profit by experience, adapting their actions to somewhat varying circumstances, he does not believe that they reason in the more restricted sense of having a real perception of cause and effect or the true relation between a premise and a conclusion.

To this position I cannot assent and have certain objections to raise in behalf of my friends, the lower animals.

As an example of Professor Morgan's method of interpreting actions which we would unhesitatingly regard as involving reason, I quote the following;

"A well known writer describes the case of a dog which used to hunt a rabbit nearly every morning down a curved shrubbery, and each time ran it into a drain at the end. The dog then appears to have come to the conclusion that a chord of a circle is shorter than its arc, for he raised the rabbit again, and, instead of following him through the shrubbery as usual, he took the short cut to the drain, and was ready and waiting for the rabbit when he arrived, and caught him." Now, says Morgan, "Can we or can we not explain the dog's action as the outcome of sense experience, as indicative of intelligence profiting by association? The terrier used to start the rabbit nearly every morning, and each time saw it escape into the old drain. There was thus ample opportunity for establishing an association between rabbit and drain. That the sight of the rabbit should suggest the drain into which it daily escaped, and that when the idea was suggested, the dog should run there directly, is a sequence not impossible, one would think, to sense experience."

It seems to me little short of absurd to suppose that the dog in his eager and frantic chase after the rabbit could be induced

to leave it in order to go to the drain on account of a mere unreflective association of the idea rabbit with the idea "drain." That he did not in a true sense know why he went. That he did not focus the therefore as a result of his past experience and his knowledge of the short cut.

No matter how apparently conclusive may be the evidence that an animal has reasoned in a given instance Professor Morgan will refer it all to sense experience, as in the case cited. Indeed, I do not see how a human being could, without language, give evidence of reason that could not by a similar course of logic, or rather hypothesis, be referred to sense experience.

I cannot help thinking that Professor Morgan has fallen into two serious errors, the first of which is the adoption of the canon of interpretation before referred to. Let us state this canon again:

"In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale."

My objection to this law of interpretation may be briefly stated as follows: "Where two organisms are so very much alike in anatomy, histology, physiology, embryology, etc., as are man and the anthropoid, where there is strict homology in so many thousands of particulars, the assumption is that this homology extends to mental phenomena which are apparently alike." Mr. Morgan in a recent letter explicitly agrees to this statement, and adds: "For this reason I believe that the mental phenomena of men and brutes are continuous and like in kind." I am so far unable to reconcile this last statement with the trend of his argument in the work referred to above. and especially in the following statement: "And I believe that the extraordinary difference between men, even the lowest, and animals, even the highest, is due to the introduction of the new factors involved in the perception of relations and conceptual thought."

It seems to me that we would be more apt to arrive at a just conclusion if we should adopt some such law of interpretation as the following:

When judgment is to be passed in the psychological activities of animals morphologically and physiologically like men in thousands of particulars, it is fair to conclude that this like-

ness extends to the realm of psychology, and that activities which would unhesitatingly be ascribed to reason if exhibited by man, should be regarded as evidence of reason when exhibited by organisms closely allied to man, until evidence to the contrary is forthcoming.

It is entirely unnecessary in this presence to show the very great likeness in morphology and physiology between man and the other mammalia. The more minute our investigations, the more are we impressed with this similarity. Almost every bone found in the one is found in the other. A striking illustration of this similarity was furnished lately when a taxidermist used the skeleton of the human hand as an aid in articulating the bones of a fore-foot of the wombat, an animal at the opposite end of the mammalian series. "But," it may be objected, "the great physical difference between man and brute is in the brain." Granted. But the difference is quantitative, not qualitative. So far as I know there is no kind of brain cell in man that is not found in the brute. The difference in quantity is enormous, but that in quality is yet to be discovered.

In physiological matters the same conclusion is inevitable. The various organs in animals are strictly homologous with those of man in structure and also in function. They act, in general, in the same way in both under similar conditions. But that which is rightly regarded as most conclusive of all is the fact that medicines and poisons act in the same way in both. When we know the effect of a certain drug in man we can confidently predict the same effect would ensue if the dog were treated with that drug. It is also true in general that the same diseases affect man and the apes, for instance, in the same way. Consumption might almost be said to be the natural death of captured monkeys, so prevalent is it

I maintain, then, that we have a perfect right to insist that in view of these innumerable homologies, the overwhelming presumption is in favor of like actions being indices of like mental states in both; and that when a given activity on the part of an animal appears to indicate the exercise of reason, the assumption is that the animal does reason, and that assumption logically stands until it is swept away by conclusive evidence to the contrary.

It will be seen from what I have already said that Professor Morgan, in contemplating the apparently rational acts of animals, demands that they be regarded as irrational if it is

possible to conceive of them as being on the plane of sense experience pure and simple. I, on the other hand, in contemplating the same apparently rational activities, assume that they *are* rational until it is proved that they are not.

The second point on which it appears to me that Professor Morgan is mistaken is in his treatment of the perception of relations. His conclusion that the lower animals are unable to perceive relations appears somewhat arbitrary, and open to several objections, the first of which is a thoroughly theoretical one, and may or may not be of weight, although perhaps not unworthy of consideration. Mr. Morgan adopts the wave theory of consciousness for both man and brutes. He admits that the relation is present in the mind of the animal, but says that it is always marginal, never focal. Now, we know, or perhaps it would be better to say that I think I know, that anything that is marginal in human consciousness may become focal. For instance, as I stand before this audience a certain individual becomes focal in my consciousness. My attention is fixed on him; all of the other persons in the room may be regarded as marginal. Now any of these latter may become focal. In other words, I can fix my attention upon any of the things that are marginal or of which I am sub-consciously aware. An opposite state of affairs seems to be the case in dreams. In these we appear to have no control whatever over the wave of consciousness, and the most incongruous impressions result. It appears, moreover, that in the dreaming state the incongruity of the most absurd relations does not strike or impress the consciousness in the least. Perhaps I should not deal with this subject at all, not having studied it sufficiently, but it appears to me that we have in the dream state an example in which the perception of relations is at least reduced to a minimum; in dreams we never, so far as I know, focus the "how" and "why." Moreover, if my own experience be a guide, dreams are in a marked degree irrational and incoherent. There is no consecutiveness of purpose. A waking man acting as he would in a dream would at once be judged as insane. It may be remarked in passing that there is almost as marked a difference between a sane and insane animal as there is between a sane and insane man.

To return from our digression, man can render focal to consciousness anything that is marginal in consciousness. The question then arises, can the other mammalia do the same thing?

A dog is chasing a rabbit upon which his attention is fixed. He hears the whistle of his master, which is at first marginal to his consciousness; upon repetition it becomes focal. Indeed, if the wave theory applies to the consciousness of animals at all, nothing becomes focal without first becoming marginal in the dawning consciousness that constitutes the front of the wave. This point would, of course, be admitted by Professor Morgan.

Now, admitting as he does, that the relation as such is marginal in the mind of the dog, what warrant has he to assume that it never becomes focal? If this is true, what earthly reason would this be for the dog who is chasing the rabbit to leave that interesting occupation to go to the drain? He could not eat the drain, and so far as the story shows has never attained any satisfaction from the drain in his past experience. On the contrary, the drain must be associated in his mind, not only with the rabbit, but with repeated disappointment and chagrin. Hence, on the very principles which Mr. Morgan insists upon throughout the work, the drain being associated in the dog's mind with unpleasant experiences, would be an object of aversion, and, if sense impressions alone controlled him, he would run away from it as soon as it was present in consciousness through association. Personally, I am unable to avoid the conclusion that the dog knows perfectly well *why* he leaves the direct trail of the rabbit and takes the short cut to the drain. He knows from past experience that he cannot catch the rabbit by following him into the drain. He knows that the short cut is the nearest to the drain. He takes the short cut and *expects* to see the rabbit. I cannot avoid the conclusion that he has reasoned in the most exact sense of the word. That he has focused the relation between the longer and shorter paths and also that between the rabbit and the drain. He has focused the *how* to outwit the rabbit, and the *how* cannot be focused without a definite perception of relation.

As before intimated, my personal knowledge of the psychology of dreams is too limited to permit of my discussing it with confidence, but it appears to me that dreams are governed by association of ideas alone, or nearly so, and that here we have a case of mental action in which the relation is not focal. I should, therefore, expect an animal unable to focus the relation, unable to reflect, to act as does a person in a dream. This animals seldom do. Their actions are consecutive. They

appear to have definite purposes, to form plans and act upon them, both intelligently and rationally.

Again, it may be urged that the focal and marginal intergrade so completely that it is impossible as a matter of fact to distinctly separate them in consciousness. For example, I say that a certain person in this room becomes focal in my consciousness. This is inexact because, perhaps, I see only a small part of that person, perhaps the head and shoulders; or my attention may be fixed on his eyes alone and all the rest may be focal. In practice, then, it is almost impossible to separate the marginal from the focal, just as it would be almost impossible to discriminate exactly between the crest and body of a wave. We know in general what is meant by the terms, but the one blends completely with the other as an actual fact. But this distinction between marginal and focal is the very thing upon which Morgan bases his denial of reasoning to the brutes. He says that in animals the relation is marginal, but never becomes focal. How can he assert this thus positively when focal and marginal denote completely interblending parts of the wave of consciousness? How can he maintain his position in the face of the fact that in actual practice we cannot clearly distinguish the two?

To sum up the argument.

First.—The canon of Morgan appears to be an unjust and inexact law for the comparison of mental phenomena by these physical manifestations in conduct because it ignores the multitude of homologies that exist between man and the higher mammalia.

Second.—These homologies should justify us in assuming that like activities in man and mammals are indices of like mental causes to psychological processes, unless we have independent evidence to the contrary.

Third.—Experience and observation prove that that which is marginal in consciousness may become focal in both man and animals. If this be true the burden of proof rests with those who say that one particular kind of marginal impression never becomes focal in mammals lower than man.

Fourth.—The psychology of dreams may furnish an example of mental activity which is composed of sense impressions or reinstatements without the relations becoming focal. Animals do not act as if dreaming, but show continuity both of conduct and of purpose.

Fifth.—The distinction between marginal and focal cannot be actually drawn either in theory or practice. It is, therefore, too small a one upon which to distinguish rational from irrational conduct. Or if a distinction be drawn upon this basis the difference cannot be great.

It will be seen that I have thus far argued the question propounded at the beginning of this paper entirely from the theoretical or speculative side, leaving no time for the presentation of examples that in my opinion indicate that the lower animals reason. Such instances are so numerous, that no one at all conversant with the matter can doubt that the animals at least appear to reason. As a matter of fact that is all that we can assert in the premises. Moreover, a moment's reflection will suffice to show that this is all that any one of us can positively assert of any other human being. That he *appears to reason*. It is just as impossible for one person to enter into the consciousness of another human being as it is for him to enter into the consciousness of one of the brutes.