



## Is there really animal intelligence? A philosophical review.

¿Hay realmente inteligencia animal? Una revisión filosófica.

DOI: 10.32870/sincronia.axxv.n80.11b21

**Victor Hugo Gutierrez Luna**

Master's Degree in Critical Thinking and Hermeneutics. Autonomous University of Zacatecas (MEXICO)

EC: [victorluna@uaz.edu.mx](mailto:victorluna@uaz.edu.mx)

**Juan Reyes Juarez**

PhD in Philosophy and History of Ideas. Autonomous University of Zacatecas (MEXICO)

EC: [juanrokyreyes@gmail.com](mailto:juanrokyreyes@gmail.com)

This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)

**Received:** 31/03/2021

**Reviewed:** 04/05/2021

**Accepted:** 18/06/2021

### ABSTRACT

In the context of philosophical research on animal intelligence, there are different traditions that deny that nonhuman animals are intelligent. In this article we mention some of these traditions, such as Cartesian mechanism and behaviorism. However, we will focus our attention on the proposals of the analytical philosophers John McDowell and Donald Davidson as representative of this philosophical tradition. His main idea is that by not having a language like that of human beings, the rest of the animals cannot be rational and, therefore, not intelligent either.

Our position is that such an analytical tradition flatly ignores the scientific and philosophical evidence against it. We will give some relevant data in favor of animal intelligence. In addition, we will give an account of a trend that is manifested with increasing force among ethologists according to which there is a continuity between animal and human intelligence, considering the latter as the result of an evolutionary process and, therefore, as a result of a series of skills acquired by different species at some point in their formation.



**Keywords:** Animal intelligence. Rationality. animals.

## RESUMEN

En el contexto de la investigación filosófica acerca de la inteligencia animal hay distintas tradiciones que niegan que los animales no humanos sean inteligentes. En este artículo mencionamos algunas de estas tradiciones, tales como el mecanicismo cartesiano y el conductismo. Sin embargo, centraremos nuestra atención en las propuestas de los filósofos analíticos John McDowell y Donald Davidson como representativas de esta tradición filosófica. Su idea principal es que al no poseer un lenguaje como el de los seres humanos, el resto de los animales no pueden ser racionales y, por ende, tampoco inteligentes.

Nuestra posición es que dicha tradición analítica ignora rotundamente la evidencia científica y filosófica en su contra. Daremos algunos datos relevantes a favor de la inteligencia animal. Además, daremos cuenta de una tendencia que se manifiesta cada vez con mayor fuerza entre los etólogos según la cual hay una continuidad entre la inteligencia animal y la humana, considerando a esta última como el resultado de un proceso evolutivo y, por tanto, como resultado de una serie de habilidades adquiridas por distintas especies en algún momento de su conformación.

**Palabras claves:** Inteligencia animal. Racionalidad. Animales.

## Introduction.

Investigating whether, in addition to human beings, there are animals that are intelligent, is not a simple or trivial task. For centuries a long philosophical tradition has considered that human beings are not mere animals and a marked difference has been established between them. Among the many ways of distinguishing human beings from the rest of the animals are, for example, the distinction between rational and irrational, the attribution of rights to some, but not to the others, the belief that some are free while the others are subject to a natural need, the supposed presence of a spirit, Soul or divine principle in human beings that is absent in animals and many others. The problem with all these distinctions is that they are artificial, since, while we can identify some differences between animals and humans, we must not forget that, at the end of the day, human beings are also animals. Put this way, it would seem that the question about animal intelligence is trivial, since it is evident that



these supposed differences could only be differences of degree, since various studies indicate that the abilities that we consider distinctive of human beings are also to some extent present in various non-human animals, including elephants, primates, wolves, hyenas, dolphins, crows, octopuses, fish and many others. However, for a long philosophical tradition animal intelligence is not at all clear. The truth is that human animals have lived on planet Earth cohabiting with a great diversity of animals and, although some of them bear a certain resemblance to us, such as chimpanzees, gorillas, elephants, dogs and even dolphins; there are others that would seem to have very few characteristics similar to ours; such is the case with anemones, sea sponges, crows, octopuses, fish and a wide variety of insects, to name just a few. Given such diversity and, given that human animals are intelligent beings, it is necessary to ask ourselves if other animals are also intelligent.

### **Cartesian mechanism and behaviorism**

One of the oldest philosophical traditions that deny that animals are intelligent dates back to the beginning of modernity: Cartesian mechanics, which states that animals are mere automatons that act as a finely designed machinery that is capable of transmitting information but does not think. Another is the behaviorism of John B. Watson, who considers that the mental life of animals is a superstition, not accessible to scientific study, so we must be content to study observable behavior, which is not considered intelligent but conditioned. Such a view has profoundly influenced the development of ethology.

The opinion according to which, in order to scientifically describe the behavior of animals, one must dispense with any expression that attributes intentions, thoughts, desires and even sensations to them, is widespread among ethologists. Thus, the belief that there is no way to know if an animal experiences something is not uncommon. An animal could well move and act the way it does based on temperature, wind speed, atmospheric pressure, light intensity, and other similar factors without experiencing anything at all. Thus, the best option, it is said, is not to attribute to animals emotions, nor intentional actions, nor sensations or anything else that suggests that animals have some kind of conscious experience. Attributing "intentions and emotions to animals, was considered naïve" (De



Waal, 2016, p.13). Thus, to say of a dog that is happy to see its master or that wants to protect its puppies, was considered nonsense if what was intended was to scientifically describe animal behavior. If any ethologist showed any interest in the inner life of animals, he risked being accused of being an unscientist and an anthropomorphist.

However, this attitude, apparently scientific, is not at all, since it tends to ignore and even deny the presence of various common elements among animals, such as, for example, that a large number of them have a brain base similar to that of human animals, that they present aggressive behaviors in comparable situations or that they seem to recognize themselves and other individuals. We must certainly avoid interpreting the behavior of animals in an anthropomorphic way, but we must not forget that often psychology, economics, medicine, history and many other sciences attribute to human beings intentions, beliefs, desires and sensations from certain data about their behaviors, the volume of their commercial exchanges, their gestures or the vestiges of the past they preserve, to name a few. The question then arises as to whether it is justified to definitively deny the rest of the animals that mental activity that we without much difficulty attribute to human animals, when both perform operations that are similar. One proposal that seems promising is to start from the idea that the abilities that supposedly distinguish human beings are present, to some extent, in other animal species (Safina, 2015, p.66).

Despite this, in addition to the two traditions that we have mentioned, there are several authors in philosophy who deny that animals are intelligent and who point out a fundamental difference between human beings and other animals. While they do not use the term intelligence, which is preferred in the cognitive sciences, they address the problem of rationality and wonder whether, in addition to humans, there are other animals that are also rational.

## Davidson

In the twentieth century, some analytic philosophers have denied animal rationality. Such is the case of Donald Davidson, who, in *Rational Animals*, after stating that "neither a one-week-old baby nor a snail are rational creatures" (Davidson, 2003, p. 141), explains that the difference between these and



normal adults, in terms of rationality, "consists in having propositional attitudes such as beliefs, desires, intentions and shame" (p. 141). However, this is not enough to deny rationality to all animals, since, while snails do not seem to have any of the traits we associate with rationality, it could well happen that other animals, such as dolphins, chimpanzees or dogs, were rational. With this in mind, Davidson wonders "what makes an animal (or something else, if one will) rational" (p. 142) and then replies that "propositional attitudes provide an interesting criterion of rationality" (p. 142) due, mainly, to its holistic character, since a belief, for example, cannot be held in isolation, but each belief requires other propositional attitudes, such as other beliefs, desires, intentions and language. This makes "the distinction between having them and not having them sharp" (p. 142).

Once this is established, it is clear that a belief can only be justifiably attributed if "we can locate thoughts within a network of related beliefs, identify thoughts, make distinctions between them, and describe them according to what they are" (p. 145). This condition could hardly be satisfied when we infer, when observing some animal behavior, that it depends on beliefs, intentions and desires, since, although it is common to explain animal behavior by appealing to these elements, one might wonder if they actually have them. We say, for example, when we see that a dog chases a cat, that it wants to catch it; but, if Davidson is correct, this implies that we can show that the dog has, at least, certain general beliefs about cats and the intention to perform certain actions to achieve the intended end. All these elements, in turn, would have to be part of a network of thoughts that present a high degree of logical coherence, so that "very soon we will arrive at beliefs about which we will have no idea whether to say that the dog has them and yet they are such that, without them, our confident first attribution seems unstable" (p. 145). This is because each propositional attitude acquires both its content and its identity from many other beliefs to which it is related. From there, Davidson concludes that, even though nothing prevents an observer from inferring what are the beliefs, desires, and intentions that explain an agent's behavior, "if a creature cannot speak, it is not clear that intentionality can be maintained in the descriptions of its supposed beliefs and other attitudes" (p. 147). This conclusion nullifies the possibility of attributing propositional attitudes to any animal that does not belong to the human species, since without language it is impossible to correctly attribute



the presence of beliefs and thus that of desires and intentions to any member of another species, since "only men and women have language, or something sufficiently akin to language to justify the attribution of propositional thoughts" (p. 143)

According to the above, for Davidson, to attribute any thought to an agent "there must be a good reason to believe that there is a complex pattern of behavior" (p. 148) and adds that "there is only such a pattern if the agent has language" (p. 148). Thus, not only can we not attribute any thought to an animal that possesses no language, but "it cannot have a thought unless it has language" (p. 148). And since language is a social activity, we can add that, in addition to being able to express its thoughts, any rational creature must be able to "interpret the speech and thoughts of others" (p. 148), which also implies the presence of a great diversity of true general beliefs. Thus, although we usually explain and predict successfully "the behavior of animals without language attributing to them beliefs, desires and intentions" (p. 149), this would not be sufficient to justify such an attribution, because "it would be wrong to conclude that these speechless animals (=unable to interpret or maintain linguistic communication) have propositional attitudes" (p. 149).

Having established that language is a necessary condition for thought, Davidson returns to the argument that a creature cannot be rational without propositional attitudes and that these cannot occur without beliefs, adding that "to have a belief it is necessary to have the concept of belief" (p. 150). This means that, while not every thought is required to be self-conscious, having any belief implies, in turn, that one has at least one belief about some belief, and that without it it is not possible to have propositional attitudes. If we were to ask what kind of beliefs one holds regarding other beliefs, Davidson would answer that, in order to have a set of beliefs that enables the presence of propositional attitudes, one at least requires that one has "beliefs about the correctness of one's beliefs" (p. 153), and adds that the concept of objective truth is necessary to have the concept of belief. This is because, for Davidson, the concept of belief cannot be separated from the concept of true or false and even from the concepts of right and wrong.

If this is so, the fact that a creature is able to discriminate between sensations or change its behavior to adapt it according to previous learning does not show that the creature masters the



contrast between what is believed and what is the case, as required for beliefs" (p. 154) and language is presented as the only thing that would show the mastery of such a contrast. This is because linguistic interaction enables the concept of the intersubjective world, which ultimately produces the concept of objective truth that, as has been established, is necessary for there to be beliefs and, in general, thoughts. Given this, Davidson concludes that "rationality is a social trait. Only those who are able to communicate have it" (p. 155) and, since animals are not able to communicate linguistically, they are not rational.

## **McDowell**

More recently, another analytic philosopher has followed this tradition. In the lecture *Rational Animals and Other Animals*, McDowell, after denouncing the myth of the given and the philosophical anguish caused by the tendency to explain the spontaneity of understanding in terms of natural laws, proposes to seek "a conception of our nature that includes the ability to tune into the structure of the space of reasons" (McDowell, 2003, p.177), space that is inaccessible to animals lacking conceptual capabilities. This is so, he explains, because conceptual thinking, which depends on the spontaneity of understanding "is what brings both the world and the self to the stage" (p. 182), so that creatures lacking such capacities lack, in turn, "both self-awareness and experience of objective reality" (pp. 182-183). And it is that, for McDowell, the objective world can only be presented to a subject that can attribute experiences to itself, that is, to a self-conscious subject whose experiences can be constituted as consciousness of the world (p.182).

The Kantian thesis defended by McDowell is restrictive with respect to mere animals, since, not possessing the spontaneity of understanding, "we cannot consider them as if they were continually reforming their worldview as a rational response to their grasping of reality" (p. 183). This rational response, as it has been characterized, "requires subjects who take charge of their thinking, who are ready to evaluate what constitutes or does not constitute a reason for something else, and who are willing to change, accordingly, the attitudes of their responses" (p. 183). Such conditions, not being satisfied by mere animals, would be a sufficient reason to deny that they are rational.





Moreover, those same considerations are used by McDowell to cast doubt on the perceptual capacities of mere animals and, finally, to assert that they lack external experience. Despite this, it does not subscribe to Cartesian mechanics or deny that animals have perception and sensation, but this obeys exclusively biological imperatives without any relation to rationality(p.184).

Mere animals would not even have what McDowell calls a done-and-right subjectivity, but only a proto-subjectivity, since while "we need, in fact, to resort to the animal's sensitivity to the characteristics of its environment if we want to understand its attentive life and autonomous movements" (p. 187), then denies that it is necessary to attribute to them a behavior before the world, and affirms that "in a merely animal way of life, to live is nothing but to respond to a succession of biological needs" (p. 187). If this is so, mere animals, which lack an external experience, would also lack an internal experience, since sensitivity does not imply that they are aware of the external world. Accordingly, McDowell argues that even "feelings of pain or fear do not necessarily equate to an awareness of the inner world" (p. 190), so we can well deny that an animal possesses an inner world without denying that it possesses feelings.

Although McDowell makes it clear that he does not agree with the Cartesian idea that mere animals are automatons, he does not believe them capable of having experiences, which makes it impossible for them both to become aware of the external world and to have self-awareness. Thus, the correct question is not one that inquires about whether mere animals are rational, but that which raises "how it has come to the fact that there are animals that possess the spontaneity of thought" (p. 195).

## **Ethology**

A different approach could balance the way we research and describe human and animal intelligence. Instead of determining whether any animal is intelligent or not by reference to the human animal, which is taken as a model, Frans de Waal considers that "the comparison is not between people and animals, but between an animal species – ours – and a wide variety of other species" (2016, p. 15). The aim is to eliminate the sharp distinction between animals and humans as far as the question of





intelligence is concerned. If humans are animals, then "we are not comparing two separate categories of intelligence, but considering variation within a single category" (De Waal, 2016, p. 15). If so, human intelligence is but one of the various variants in which animal intelligence is presented. This is attested by the results of various studies from ethology and neurosciences

Since the early twentieth century, various studies have been carried out in birds, fish, amphibians, reptiles, primates, dogs, rats, dolphins, squirrels and even mollusks, especially octopuses, aimed at investigating the presence in animals of language, numerical skills, use of tools, recognition of other individuals, understanding of third-party relationships, self-recognition, social behavior, memory, consciousness and other skills. The results of such studies have generated various controversies against the widespread belief that humans are the only animals that possess culture and intelligence.

### **Brain base and consciousness**

A paradigmatic example around the discussion about the possibility of consciousness in non-human animals is the Cambridge Declaration on Consciousness proclaimed on July 7, 2012 at Churchill College, University of Cambridge by Philip Low, David Edelman and Christof Koch. A leading international group of neuroscientists was assembled "at the University of Cambridge to re-evaluate the neurobiological substrates of conscious experience and related behaviours in human and non-human animals" (Low, 2012) resulting in the following statement:

The absence of neocortex does not seem to prevent an organism from experiencing affective states. Converging evidence indicates that nonhuman animals have the neuroanatomical, neurochemical, and neurophysiological underpinnings of conscious states, as well as the ability to exhibit intentional behaviors. Consequently, the weight of evidence indicates that humans are not the only ones who possess the neurological bases that generate



consciousness. Nonhuman animals, including all mammals and birds, and many other creatures, including octopuses, also possess these neurological bases (2012).<sup>1</sup>

While the statement does not openly state that non-human animals have consciousness, it does unequivocally hold that at least some of them have a neurological basis similar to that associated with consciousness in human animals, as well as that associated with affective states and that, in addition, intentional behaviors are observed in such nonhuman animals. These elements, although they do not solve the problem of whether animals have consciousness, do not deny this possibility and provide relevant data from different scientific disciplines that could well be integrated into a philosophical theory of the animal mind.

In this regard, Christof Koch argues that many non-human animals possess a highly complex nervous system whose "constitutive proteins, genes, sinapsis, cells and neural circuits are as sophisticated, varied and specialized as any ever seen in the human brain" (Koch, 2014, p. 27).<sup>2</sup> There is nothing exceptional, he says, either in the structure or size of the brain of human beings. Similarly, José Luis Díaz argues that "given the anatomical conformation and brain function of the various animals, and judging by their behavioral abilities, it is known with considerable certainty that they have perceptions, express emotions, solve problems or have memory" (Díaz, 2007, p. 125).

While many of the questions about how the brain evolved in animals, including humans, have yet to be satisfactorily answered; phylogenetic studies have given rise to various theories that are compatible with an evolutionary explanation. Particularly important are studies in primates to understand the pressures that led to the type of selection that led, for example, to the increase in the

---

<sup>1</sup> All the translations are by one of the authors: Víctor Hugo Gutiérrez. In the original text at the bottom of the page so that it can be read in its original language and collated. Original text: *The absence of a neocortex does not appear to preclude an organism from experiencing affective states. Convergent evidence indicates that non-human animals have the neuroanatomical, neurochemical, and neurophysiological substrates of conscious states along with the capacity to exhibit intentional behaviors. Consequently, the weight of evidence indicates that humans are not unique in possessing the neurological substrates that generate consciousness. Nonhuman animals, including all mammals and birds, and many other creatures, including octopuses, also possess these neurological substrates.*

<sup>2</sup> Original text: Their constitutive proteins, genes, synapses, cells and neuronal circuits are as sophisticated, variegated and specialized as anything seen in the human brain.



size of the neocortex in primates compared to that of other mammals. In the mid-twentieth century the idea arose that what favored such an increase in size was the mere competition to get a sexual partner. However, the theory according to which complex social life is the main cause of the remarkable growth of the neocortex in primates has been gaining ground since it was proposed in the mid-sixties, but "it is not until 1988, with the postulation of the Machiavellian intelligence hypothesis of Whiten and Byrne, that the idea that the social life of primates is the major cause of the evolution of the brain is gaining strength" (Mondragón-Ceballos, 2002, p. 29).

The ability of primates to retain information and manipulate it is shown in their ability to identify objects and individuals of the same species. However, this is possible because "the temporal cortex of primates contains a greater number of connections to the prefrontal cortex than occurs in other mammals" (p. 32). In turn, as we have already pointed out, the increase in the size and complexity of the neural structures of the primate brain depend on the increasing complexity of their social life. There is, therefore, a correlation between brain development and the Machiavellian intelligence of primates "in the sense that large brains (particularly neocortexes) are necessary for the processing of complex information, past and present, which requires an equally complex behavioral output" (p. 33).

It is clear that the brain of various animals is capable of processing information in complex ways, however, the real problem lies in knowing if the capabilities observed in animals are accompanied by a subjective quality of experience (qualia) as occurs in humans. While we have no difficulty attributing various conscious mental states to other human beings, we must avoid projecting our own mental capacities onto animals. We frequently attribute such states to animals. For example, when we say that the cat feels cold or that the dog wants to go for a run, we attribute conscious states to these animals, just as we do daily with other human beings who, we believe, want to have a coffee or feel sad on a cloudy and cold day. These and other attitudes we adopt toward animal behavior depend on our emotional and cognitive framework skillfully trained to recognize beliefs, desires, intentions, and sensations that, by analogy, are attributed to both human and nonhuman animals. However, these attitudes often produce unjustified inferences whose error consists in



attributing sensations, desires, consciousness, intentions and other elements that we commonly attribute to human beings without solid evidence that they have them. Instead, it is worth analyzing whether there are some cases where we can correctly infer that such states can be attributed to non-human animals.

Experiments with animals given psychotropic drugs have shown that some mammals, including rats, are able to distinguish between two different types of drugs. This result, at first glance trivial, has been pointed out by José Luis Díaz as an important element in the research on animal consciousness from which important consequences can be drawn.

Human beings are able to identify, correctly and consistently, an immunotropic drug that has been administered to them and distinguish it from other similar drugs because they "recognize the subjective states that it provokes them" (Díaz, 2007, p. 135). Such identification is not carried out by observing their own behavior or by pointing out the biochemical receptors that have been stimulated, but is directly related to the quality of subjective experience (qualia), "since subjects accurately recognize how the effect of a drug feels or is experienced" (p. 136). Thus, "recognition happens because the subject becomes aware of or recognizes the state that the drug produces and this is clearly qualitative and subjective: it is a state of consciousness" (p. 136).

In the case of animals that were trained to activate a lever when a certain drug was administered to them, it is worth asking how it is that they manage to identify that it is the same drug and not a different one or a saline solution. In a clear analogy to the way in which human beings recognize the substance psychotropic, José Luis Díaz writes that:

Because this type of procedure does not measure the direct physiological effect of the drug, but a behavior that the animal manifests when it is under its effect, this discrimination could suggest and perhaps indicate that the animals feel or perceive the effect of the drug and then associate the response with the state that the drug produces for them. Thus, the procedure would not only prove that animals perceive and associate a stimulus, but that they do so consciously, that is, that they realize it. In other words: one could say that animal consciousness has been demonstrated in experimental terms (pp. 134-135).



The argument by analogy is simple, if we accept that human beings are able to recognize an ichotropic drug because they have access to certain subjective states that occur when that drug is administered to them and are able to act following such states, why not accept that animals must also have subjective states, of which they are aware, in order to perform the action that has been observed in the experiments. From this analogy, José Luis Díaz elaborates an argument whose conclusion is empirically justified and which I reproduce below:

- 1) Drug discrimination in humans is due to its subjective effect. 2) Drug discrimination in animals closely compares with the subjective effects of drugs in humans. 3) The interest or perception on which discrimination is based is not explained only by the interaction of the drug with its receptors. 4) Conclusion: by analogy, animals feel the subjective effects of drugs (p. 135).

By definition, psychotropic drugs are any substance capable of influencing psychic states, since they act on the nervous system, and can produce temporary changes in perception, mood, states of consciousness and behavior. It is significant that "only those drugs whose effects humans consciously recognize are those that can discriminate against animals" (p. 136), so it is hard to believe that such animals are not capable of inspecting and comparing their own internal states in a manner similar to that of humans. Thus, it can be concluded that "animals correctly discriminate drugs because they perceive their specific psychoactive effects" (p. 138) and such discrimination can only be conscious. This argument implies that certain animals have experiences, unlike what McDowell claims. That is why, along with the subject of consciousness, we must deal with another that is of particular importance in the discussion about animal intelligence, such is that of sensation.

## Sensation

According to Koch, inferring that dogs and other animals experience pain under certain conditions is justified, since, under similar conditions, for example, when sick, these animals behave similarly to



how human animals behave. And it is not only a subjective interpretation, but a measurement of certain physiological signs seems to support that inference.

Injured dogs, like people, experience an elevated heart rate and blood pressure and release stress hormones into their bloodstream. I'm not saying that a dog's pain is exactly like human pain, but dogs, like other animals, not only react to harmful stimuli, but also consciously experience pain (Koch, 2014, p.26).<sup>3</sup>

Although in attributing conscious states such as the sensation of pain to animals we cannot, without more, assure that they have them, it is worth asking what is the most rational attitude when trying to explain behaviors of animals that seem to suppose a conscious mind. In this regard, José Luis Díaz, after analyzing the way in which some ethologists describe animal behavior, concludes that "the ascription of mental states to animals is not always or necessarily anthropomorphic" (Díaz, 2007, p. 129) and adds that "attributions should be treated as a hypothesis whose validity can be tested" (p. 129). Thus, when describing the behavior of a dog that places its tail between its legs and flees, it can be assumed that it feels fear, since a constant connection is observed between that behavior and the presence of a threat. Consequently, in a dangerous situation in which the dog places its tail between its legs, "it can be stated that the dog is afraid, rather than calling it, for example, 'dangerous behavior' or, plain and simple, 'tail between the legs'" (p. 127). If in addition to this we consider that we have common ancestors, brains similar and behaviors analogous to those of many animals, it is worth asking what is more rational, whether to consider animals as completely different from human beings or to consider them as similar to these.

Ricardo Mondragón-Ceballos states that primates are not only capable of having primary emotions such as fear, anger or sadness, but that their brain structure allows them to have secondary emotions, that is, essentially social emotions that "correspond to the learned association between a specific situation with an emotion or set of emotions" (Mondragón-Ceballos, 2002, p.36) which may

---

<sup>3</sup> Original text: injured dogs, just like people, experience an elevated heart rate and blood pressure and release stress hormones into their bloodstream. I'm not saying that a dog's pain is exactly like human pain, but dogs—as well as other animals—not only react to noxious stimuli but also consciously experience pain.



even be contradictory to each other. These emotions, while paralleling autonomous bodily changes such as hormone secretion or changes in blood pressure, entail "a series of cognitive and perceptual changes that lead to proper behavioral expression" (p. 36).

In addition to the discussion that refers to consciousness and sensation there are various debates around more specific abilities, as an example, we can mention the question about whether numerical skills are unique to human beings or are also present in other animals.

### Numerical skills

The numerical abilities<sup>4</sup> of some animals have been widely studied since the 1930s, mainly in mammals and birds. However, in the last decade, research into numerical skills in fish has increased significantly and "in many cases, striking similarities in the numerical performance of mammals, birds and fish have been reported" (Agrillo & Bisazza, 2017, p. 1).<sup>5</sup> While more research is needed about the genetic origin of numerical abilities, with the results obtained "the question arises about whether vertebrate number systems have been inherited from a common ancestor" (p.1).<sup>6</sup>

The ability to distinguish and compare quantities is an evolutionary advantage, since evaluating the number of elements that a set has and comparing it between different sets is usually advantageous for an animal. Among the numerical skills that are advantageous for most species that possess it is "the ability to estimate the amount of food that is present in a sector" (p. 3),<sup>7</sup> such as the number of fruit on a branch, the number of zebras in a herd, or the number of red ants that make up a group; such skills make it easier to obtain food for monkeys, lions and voles, respectively. Another ability that is present in most social animals is to estimate the number of members that belong to

<sup>4</sup> The term *numerical skills* designates the ability to discriminate between different quantities, either in terms of number, order, density or the area they occupy, to name a few. The presence of numerical skills does not necessarily imply that you have the abstract notion of number or the possession and application of arithmetic rules but only that, intuitively, you are able to discriminate between two or more elements (or sets) of different magnitudes.

<sup>5</sup> Original text: In many cases, surprising similarities have been reported among the numerical performance of mammals, birds and fish.

<sup>6</sup> Original text: raising the question as to whether vertebrates' numerical systems have been inherited from a common ancestor.

<sup>7</sup> Original text: the ability to estimate the amount of food items that are present in a patch.





their own group and to compare it with the number of members of other groups of animals of the same species. "Chimpanzees, lions, and hyenas, for example, use this ability in their social interactions to decide whether to attack another group of the same species" (p. 3).<sup>8</sup>

In addition, many species adapt their reproductive tactics to the number of males and females in a group. For example, male mosquito fish prefer groups that contain a larger number of females, which likely increases their chances of mating (p.3).<sup>9</sup> It is also known that the females of the peacocks choose their partner, after comparing several males, depending on the number of ocelli they have in the feathers of their tail. On the other hand, fish are more difficult to identify by a predator when they live in large schools, plus the more members the shoal has, the more easily they can detect predators, so "the risk of an individual fish being caught decreases statistically as the number of individuals in the group increases" (p. 3).<sup>10</sup>

Studies with fish indicate that fish can judge the relative amount as well as many birds and mammals. This result is surprising, since, because the brain size of fish is comparatively smaller, it would be expected that their numerical abilities would also be more limited than those of larger vertebrates; however, this is not the case. For example, *poecilia reticulata* fish, or guppies, are able to distinguish the largest school of two schools by up to a ratio of 4 to 5 (0.80), and *gasterosteus aculeatus* or spiny, are right up to a ratio of 6 to 7 (0.86); this proportion is higher or similar to that reported in studies of other species such as dogs (0.75), horses (0.66) and pigeons (0.86), but is lower than that found in humans (0.90) and monkeys (0.87) (p.3). It has also been observed that fish distinguish between continuous quantities, as they are able to identify which is the largest school from the area, density or activity of the school. Experiments in *Gambusia affinis* or mosquito fish showed that it can learn to discriminate between quantities both from numerical information, and

---

<sup>8</sup> Original text: Chimpanzees, lions and hyenas, for example, use this ability in social interactions to decide whether to attack a group of conspecifics.

<sup>9</sup> Original text: Male mosquitofish prefer groups that contain a larger number of females, which probably increases their mating opportunities.

<sup>10</sup> Original text: the risk of an individual fish being caught statistically diminishes as the quantity of individuals in the group increases.



from continuous information, without any of them involving a greater cognitive effort (p.4). The ordinal abilities of fish have also been studied and it has been found that, for example, guppies "quickly learn to select the third in a row of eight different food dispensers, even when the distance and position of these is systematically changed to avoid the use of non-ordinal signals" (p. 4).<sup>11</sup>

As with humans, not all animals of a species are equally adept at solving numerical problems. In a study in which 8 fish were subjected to a series of increasingly complex tasks it was found that only one could distinguish the highest amount in a ratio of 2 to 3, two up to a ratio of 3 to 4 and 5 to a ratio of 4 to 5 elements, indicating that differences in numerical abilities can be found between individuals of the same species (p. 5). Another study reveals that the laterality of the brain is an important element to explain the differences in numerical skills between individuals of the same species. A group of fish was divided into three: lateralized on the right, lateralized on the left, and non-lateralized. Their ability to perform numerical tasks was then compared and no difference was found between the lateralized fish, either left or right; however, non-lateralized fish were less accurate in identifying the largest school and distinguishing between various numbers of two-dimensional figures (p.5).

By interpreting the data obtained in the experiments, two different explanations can be formulated about how fish distinguish between two different quantities. The first is that the quantities involved are abstractly represented, which are retained for a relatively long time, allowing them to choose the right amount. The second is that the fish identify the largest number from between two distinct quantities by learning a relational rule that they apply to the quantities involved in the experiment. While the first explanation cannot be ruled out, "we now have direct evidence that when we train fish to discriminate between two quantities, they do not encode accurate information about the two numbers involved; but they solve the task by learning a relational rule" (p. 6),<sup>12</sup> this is the same strategy that humans use in similar experiments.

<sup>11</sup> Original text: rapidly learn to select the third position in a row of 8 alternative feeders, even when the distance and position of the feeders are systematically varied to prevent the use of non-ordinal cues.

<sup>12</sup> Original text: we now have direct evidence that when we train fish to discriminate between two numerosities, they do not encode precise information about the two numbers involved; instead, they solve the task by learning a relational rule.



Traditionally, three types of experimental evidence have been considered to attribute the ability to abstractly represent the number to some species. "The first is the ability to generalize numerical information through significant variations of non-numerical physical parameters" (p. 6).<sup>13</sup> The second consists of the ability to identify a quantity in a second presentation that contains a set with the same amount in addition to one or more distractors with different amounts. The third type of evidence, "comes from studies in which a species performs simple arithmetic operations" (p. 6).<sup>14</sup> Such evidence has been compiled by various studies. For example, rats trained to press a lever in front of two visual objects are able to generalize the ruler and apply it to the same number of auditory stimuli.

While the result of such experiments does not imply that animals possess the abstract notion of number, it does assume that they are able to compare between different quantities and relate them in various ways. However, we can go further and ask ourselves if there are also animals that recognize non-numerical relationships, which we could call social relations, either hierarchy or kinship.

### Understanding Third Party Relationships

Elephants recognize relationships between third parties. Carl Safina reports that a female elephant named Tecla, perceiving that the vehicle in which he was traveling had come between a mother and her calf, turns around, bars, adopts a threatening attitude and attracts the attention of the mother, who approaches running and stands in front of the vehicle and then reunites with her calf (Safina, 2015, p.61). This behavior seems to imply that Tecla knows the calf and that she knows who her mother is, that is, that she recognizes the relationship between them. But elephants are not the only ones who recognize the relationships between third parties, but also primates, "as well as wolves, hyenas, dolphins, birds of the crow family and at least some parrots" (p. 61). This implies that they

---

<sup>13</sup> Original text: The first is the capacity to generalize numerical information across significant variations in non-numerical physical parameters.

<sup>14</sup> Original text: comes from studies in which a species performs simple arithmetic operations.



recognize themselves, that they recognize other members of their own species, and that they recognize the relationships maintained by those members.

The recognition of third-party relationships can be inferred from some complex behaviors that various animals present, such as comfort, support or social sabotage, as explained below:

In comfort, after an aggressive encounter, a third animal that did not participate in the fight, issues an act of affiliation to one of the contenders. Support is seen when two animals engage in a fight and a third animal joins the fray by backing one of the contenders against the other. Support is in turn based on alliances, which are formed from frequent affiliate interactions. Finally, social sabotage consists of undoing the affiliation interactions of third parties through acts ranging from direct aggressions to apparently casual behaviors (Mondragón-Ceballos, 2002, pp.33-34).

These types of complex behaviors have been widely documented in primates, not limited to them, and assume that they are able to establish and identify relationships between third parties. These relationships can be of kinship, rank, social hierarchy, affiliation, dominance or subordination, among others. Now, knowledge of these relationships presupposes at least the following cognitive capacities: 1) memory, 2) ability to classify the various relationships between individuals, 3) ability to infer transitive relationships, 4) recognize that the exchange of acts of a certain type are socially different from others, 5) infer that such exchange of acts may be associated with other exchanges of acts that include a third party and, in such a scenario, 6) decide to trigger or prevent the occurrence of the final series of acts (Mondragón-Ceballos, 2002, pp.34-35). The theory of Machiavellian intelligence, by integrating these results, assumes that primates can act according to their own convenience using prior knowledge and projecting it as an expectation directed towards the future, for this, it puts into practice various strategies learned in order to achieve their ends. Thus, according to current evidence, "primates know their own social relationships as well as those of third parties and make use of that knowledge to guide their social behavior" (p. 34).



In addition to the aspects we have mentioned, the one related to the vocalization of primates has been extensively studied. It has been found that these, in addition to possessing a wide repertoire of vocalizations, "are able to identify relations of kinship or dominance between third parties from such vocalizations" (p. 30). This naturally leads us to the question of whether there are animals, besides human beings, capable of developing, learning and using a language. This question is especially relevant when considering Davidson's point of view that we have discussed above.

## Language

Francisco Conesa and Jaime Nubiola point out that we can distinguish between human language and animal communication according to four elements. First, animal communication is instinctive and involuntary, while "in human speech there is no appreciable instinctive basis" (Conesa & Nubiola, 2002, p. 21). Second, while animals use an iconic communication system, in which the relationship between message and signal is relatively simple and direct; human language is mostly digital, since the relationship between the signs used and the message is arbitrary, using a limited number of signs an infinite number of words can be constructed (pp. 21-23). Thirdly, animal communication has limited productivity and is presented in direct contact with the conditions or events to which it refers; on the other hand, human language is infinitely productive, its semantic universality allows it to transmit information about present or absent aspects, past or future, and one can even name the unknown, all this without the need to have the presence of what a linguistic expression refers to (p. 23). Finally, in animal communication it has not been found that the symbols used can refer to themselves, while human language can refer to itself, that is, it possesses reflexivity or metalinguistic capacity. The differences pointed out would lead, according to these authors, to conclude that "language competes in its own and intrinsic way only to the human being" (p. 24).

Despite the above, the question about whether mere animals have language has generated a debate that has been fueled by the various attempts to teach language to some primates since the sixties. In the first experiments, an attempt was made to teach the language of the deaf-mute to some chimpanzees. Washoe, a female chimpanzee, managed to use up to 132 signs, while a female gorilla



named Koko went on to use 300 signs. In later projects the language of the deaf-mute was replaced by lexigrams, that is, geometric plastic symbols that were made to correspond with words from a human vocabulary, Lana, otr female chimpanzee, came to use up to 200 of these symbols, while Sherman and Austin managed to communicate with each other through lexigrams. Kanzi, a bonobo, in addition to using lexigrams expertly, learned to recognize some phrases from English. These and other studies led to the idea that some primates have the ability to communicate through symbols and to use syntax, which suggests that they are able to use a language that is quite similar to human language. However, the debate continues between those who defend the ability of primates to symbolize and those who point out the radical discontinuity between the way primates use symbols and human language(p.20).

## References

- Agrillo, C., & Bisazza, A. (2017). Understanding the origin of number sense: a review of fish studies. *Philosophical TransactionsB*, 373(20160511), 1-13.
- Conesa, F., & Nubiola, J. (2002). *Philosophy of Language* (Second ed.). Barcelona, Spain: Herder.
- Davidson, D. (2003). *Subjective, intersubjective, objective*. (O. Fernández Prat, Trad.) Madrid, Spain: Chair.
- De Waal, F. (2016). *Do we have enough intelligence to understand the intelligence of animals?* (A. García Leal, Trad.) Barcelona, Spain: Tusquets.
- Diaz, J. L. (2007). *The living consciousness*. Mexico City, Mexico: Fondo de Cultura Económica.
- Koch, C. (January-February 2014). Ubiquitous Minds. *Scientific American Mind*, XXV(1), 26-29.
- Low, P. (2012). *The Cambridge Declaration on Consciousness. Statement, The University of Cambridge*, Cambridge.
- McDowell, J. (2003). *Mind and world*. (M. Á. Quintana Paz, Trad.) Salamanca, Spain: Follow me.
- Mondragón-Ceballos, R. (October 2002). The Machiavellian intelligence of primates and the evolution of the social brain. *Mental Health*, 25(5), 29-39.



Safina, C. (2015). *Wonderful minds. What animals think and feel*. (I. Oliva Luque, I. Clavero Hernández, & P. Aguiriano Aizpurua, Trans.) Barcelona, Spain: Galaxia Gutenberg.