Criteria for recognizing sentience
From Animal-Ethics.org
April 2022

There are three general criteria for deciding whether a being is sentient. These involve considerations that are (1) behavioral, (2) evolutionary, and (3) physiological.

A sheep family...

Behavior

When we experience suffering or enjoyment, we tend to behave in certain ways. We grimace, we cry, we groan… And the same is true of other sentient beings. This applies to both human beings and a large number of nonhuman animals. Behavior of this sort indicates that those who behave in these ways are having positive or negative experiences.[1]

There are, furthermore, certain types of behavior that may lead us to suppose that a creature might be having such experiences, namely those that demonstrate an understanding of beneficial or harmful aspects of the environment. For instance, we may see that an animal, after being burned for the first time, will stay away from fire in the future. And the same applies to positive experiences, as when an animal finds food at a certain location and later returns to that spot. However, this behavior alone doesn't provide a reason to believe that these creatures can experience suffering and enjoyment. It is, more generally, a reason to believe that they can have experiences at all and are therefore conscious. Although we should also note that it is perfectly possible that there are beings who are conscious but lack any capacity for learning.

These are examples of specific behaviors exhibited by many nonhuman animals. But these creatures behave in complex ways not only in situations where we may think that they are experiencing suffering or enjoyment. What is most relevant to ascertain whether a being is sentient is not how that being reacts in these specific cases, but how the being behaves in general. The behavior of an animal can lead us to understand that she is sentient, even if she doesn't exhibit signs of suffering or enjoyment. Here's the reason.

The way animals manage to keep themselves alive (and, from an evolutionary perspective, to pass on their genetic material) is by behaving in certain ways. Thus, those beings that avoid what threatens their survival and seek what promotes it do actually survive. The key to this is behavior. Consciousness provides a wide range of possibilities for survival and for passing on genetic material to those organisms lucky enough to have awareness, because it determines whether they act in one way rather than another. The way this happens is through motivation. Positive and negative experiences motivate subjects to react favorably and unfavorably to that which elicits them. This type of reaction to positive and negative experiences could not have been programmed in creatures lacking the kind of motivation made possible by the capacity for conscious awareness.[2]

Thus, we find that the possession of consciousness is the most plausible explanation we can give when trying to determine why an animal acts in complex ways. There is a huge number of animals whose behavior is by no means simple. These animals encounter very diverse situations, where in order to survive they must respond appropriately. The plasticity that this requires is difficult to explain without appealing to consciousness.

Evolutionary considerations

In discussing behavior we consider evolution, which explains why there are conscious beings in the first place. If such beings exist, it's probably because consciousness increased their chances of survival, and thus of passing on their genes to the next generation of sentient beings.

There are two ways in which evolutionary considerations can lead to the conclusion that a being possesses or lacks the ability to have positive and negative experiences. The first refers to the kind of circumstances that may surround the life of an animal and to the animal's capacity to act in certain ways. As indicated above, the capacity to feel arises in evolutionary history in connection with the capacity to act in one way or another.[3]

Now, we have seen that this motivation makes sense when the behavior of the creature can be very plastic, i.e., complex and adaptable to circumstances. When that which helps an animal pass on her genes is a very simple type of behavior, having the capacity for conscious experience is not really necessary. In these cases, consciousness would involve a wasteful use of energy, since it carries a considerable metabolic cost. In the case of humans, up to 20% of energy consumed is spent on maintaining an active brain. A portion of this energy is used to perform functions not accompanied by subjective experience, but a very important portion is involved in the production and maintenance of consciousness. In animals with a lower brain-to-body mass ratio than humans, this portion is not as high, but is still quite high on the whole. If consciousness weren't necessary to carry out behavior required for survival, it would be a drag, as it would needlessly

consume energy that could be used for other useful functions.[4] This would be the case for creatures who are unable to move, such as plants or fungi.

There is another way in which evolutionary considerations can help us determine whether a being is or isn't sentient: kinship. Consider the case of species that are very closely related, as in the case of species that have diverged recently in the evolutionary tree. We have some reason to believe that, if the members of one of these two species are conscious, then so are the members of the other. (Some examples of this can be seen in the section on what beings are sentient.[5])

Physiology

The presence of a centralized nervous system

The criterion that should be the determining factor as to whether a being is sentient relies on evidence from physiology. It is the physical structure and associated functioning that makes it possible for a creature to have conscious experiences. However, as of today we do not know the mechanisms by which this occurs. To be sentient, a being must possess a certain physical structure, but we only have a rough idea of the nature of this structure. This is explained in the section on the problem of consciousness.

The mere possession of a nervous system is not a sufficient condition for sentience, if the nervous system is not centralized. Today we only know that a centralized nervous system is necessary for sentience.

However, the complexity of a centralized nervous system can vary quite considerably. The simplest nervous systems consist solely of nerve ganglia, which are made by a combination of different nerves. They can vary in complexity, ranging from very simple structures to fully-formed brains. And fully-formed brains, too, can vary significantly in their degree of internal organization. A very simple brain may be only slightly more developed than a complex nerve ganglion.

Moreover, there can also be considerable variation in the degree of centralization. Octopodes, for example, are mollusks that have a centralized nervous system much more complex than that of many vertebrates. The organization of the nervous system of octopodes and vertebrates is very different, due to differences in their respective evolutionary histories. Still, the complexity in behavior exhibited by octopodes leads to the conclusion that they are conscious beings. For this reason, we know that sentience doesn't require a brain configuration like ours, like that of mammals or even that of vertebrates.[6] In fact, this suggests that the mode of organization of a nervous system necessary for positive and negative experience may be quite simple. Such a mode of organization would be realized in an ancient structure that evolved prior to the

emergence of the structural complexity observed in the nervous system of an octopus or a mammal. This leads to the conclusion that the animals capable of having conscious experiences are very numerous indeed.

Physiological criteria other than nerve structure

The nerve structure is an essential criterion for deciding whether a being is conscious, but there are other, additional criteria. On the basis of these alone we wouldn't be in a position to conclude that a being without a centralized nervous system is conscious; but they provide additional evidence for consciousness in the case of beings who do possess a centralized nervous system.

One of these criteria refers to a number of chemicals that, at least in many cases, act as analgesics. A number of animals, which we can assume are conscious (among them ourselves), produce several substances that have the purpose of alleviating our suffering in situations where it is not useful for us (for instance, if we must flee from something that threatens us). However, a large number of invertebrates with very simple centralized nervous systems also secrete these substances. Admittedly, the function of these substances could be different in these organisms, but in principle it is natural to think that they could play the same role, on the basis of evolutionary considerations.[7]

Another criterion is the possession of drivers like nociceptors. The function of these drivers is to transmit information of tissue damage to the brain.[8] Nociception is the detection of noxious or potentially noxious sensory stimuli. It occurs when the tissues of an organism are affected in ways that cause or may cause damage. This damage is detected in the tissues and the information is transmitted along the nervous system. This is the mechanism that allows us to experience pain and other physical sensations (such as heat or cold).

Thus, one might think that the study of sentience could be reduced to the study of nociception. This would be wrong, however. The reason is that the information that is received and transmitted through the mechanism of nociception is not as such a sensation of pain. In order for pain to be actually experienced, that information has to be received by a brain that is organized in such a fashion as to make it not only capable of processing it, but of processing it in a way that results in the experience coded by it. And what is unknown as of today is how brains need to be organized in order to give rise to this experience.

However, although the transmission of information through nociception is not equivalent to the experiencing of suffering, in animals like ourselves it is a precondition for it. Moreover, nociception has no additional function. In light of this, when considering a creature having a centralized nervous system with a structure that makes nociception possible, we can safely assume that creature has the capacity for suffering and enjoyment (they are conscious).

However, although we can say this, the issue of which beings are sentient is still unsolved, because there may be creatures that are capable of having experiences yet lack nociceptors. This would be possible in the case of animals with very simple pain transmitters.

Further readings

Allen, C. (1992) "Mental content and evolutionary explanation", *Biology and Philosophy*, 7, pp. 1-12.

Allen, C. & Bekoff, M. (1997) *Species of mind*, Cambridge: MIT Press.

Baars, B. J. (2001) "There are no known differences in brain mechanisms of consciousness between humans and other mammals", *Animal Welfare*, 10, suppl. 1, pp. 31-40.

Beshkar, M. (2008) "The presence of consciousness in the absence of the cerebral cortex", *Synapse*, 62, pp. 553-556.

Chandroo, K. P.; Yue, S. & Moccia, R. D. (2004) "An evaluation of current perspectives on consciousness and pain in fishes", *Fish and Fisheries*, 5, pp. 281-295.

Darwin, C. (1896 [1871]) *The descent of man and selection in relation to sex*, New York: D. Appleton and Co. [accessed on 12 January 2014].

Dawkins, M. S. (1993) *Through our eyes only? The search for animal consciousness*, New York: W. H. Freeman.

Dawkins, M. S. (2001) "Who needs consciousness?", *Animal Welfare*, 10, suppl. 1, pp. 19-29.

DeGrazia, D. (1996) *Taking animals seriously: Mental life & moral status*, Cambridge: Cambridge University Press.

Dretske, F. I. (1999) "Machines, plants and animals: the origins of agency", *Erkenntnis*, 51, pp. 19-31.

Edelman D. B. & Seth, A. K. (2009) "Animal consciousness: A synthetic approach", *Trends in Neuroscience*, 9, pp. 476-484.

Farah, M. J. (2008) "Neuroethics and the problem of other minds: implications of neuroscience for the moral status of brain-damaged patients and nonhuman animals", *Neuroethics*, 1, pp. 9-18.

Griffin, D. R. & Speck, G. B. (2004) "New evidence of animal consciousness", *Animal Cognition*, 7, pp. 5-18.

Jamieson, D. (1998) "Science, knowledge, and animals minds", *Proceedings of the Aristotelian Society*, 98, pp. 79-102.

Panksepp, J. (2004) *Affective neuroscience: The foundations of human and animal emotions*, New York: Oxford University Press.

Radner, D. & Radner, M. (1989) *Animal consciousness*, Buffalo: Prometheus.

Robinson, W. S. (1997) "Some nonhuman animals can have pains in a morally relevant sense", *Biology and Philosophy*, 12, pp. 51-71.

Sneddon, L. U. (2009) "Pain perception in fish: Indicators and endpoints", *ILAR Journal*, 50, pp. 338-342 [accessed on 30 December 2020].

Notes

1 Rollin, B. E. (1989) *The unheeded cry: Animal consciousness, animal pain and science*, Oxford: Oxford University Press.

2 Gherardi, F. (2009) "Behavioural indicators of pain in crustacean decapods", *Annali dell'Istituto Superiore di Sanità*, 45, pp. 432-438.

3 Damasio, A. R. (1999) *The feeling of what happens: Body and emotion in the making of consciousness*, San Diego: Harcourt.

4 Ng, Y.-K. (1995) "Towards welfare biology: Evolutionary economics of animal consciousness and suffering", *Biology and Philosophy*, 10, pp. 255-285.

5 Griffin, D. R. (1981) *The question of animal awareness: Evolutionary continuity of mental experience*, New York: Rockefeller University Press. Cabanac, M.; Cabanac, A. J.; Parent, A. (2009) "The emergence of consciousness in phylogeny", *Behavioural Brain Research*, 198, pp. 267-272. Grinde, B. (2013) "The evolutionary rationale for consciousness" *Biological Theory*, 7, pp. 227-236.

6 Smith, J. A. (1991) "A question of pain in invertebrates", *ILAR Journal*, 33, pp. 25-31 [accessed on 24 December 2013]. Mather, J. A. (2001) "Animal suffering: An invertebrate perspective", *Journal of Applied Animal Welfare Science*, 4, pp. 151-156. Mather, J. A. & Anderson, R. C. (2007) "Ethics and invertebrates: A cephalopod perspective", *Diseases of Aquatic Organisms*, 75, pp. 119-129 [accessed on 9 April 2017].

7 Kavaliers, M.; Hirst, M. & Tesky, G. C. (1983) "A functional role for an opiate system in snail thermal behaviour", *Science*, 220, pp. 99-101.

8 Sneddon, L. U. (2004) "Evolution of nociception in vertebrates: Comparative analysis of lower vertebrates", *Brain Research Reviews*, 46, pp. 123-130.