



Defining and Exploring Animal Sentience

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Response to Commentary on [Rowan et al.](#) on *Sentience Politics*

Andrew N. Rowan¹, Joyce D'Silva³, Ian J. Duncan², Nicholas Palmer³

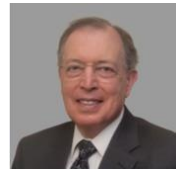
¹WellBeing International

²Department of Animal Sciences, University of Guelph, Canada

³Compassion in World Farming, UK

Abstract: One of the commentaries on the target article notes that "animal sentience" is difficult to define operationally. This response to the commentaries develops a working, usable definition of animal sentience and examines the relationships between animal emotions and sentience.

[Andrew N Rowan](#), former professor at Tufts Cummings School of Veterinary Medicine where he established the Tufts Center for Animals and Public Policy, former CEO of Humane Society International (HSI), and currently President of WellBeing International. [Website](#)



[Joyce D'Silva](#), Chief Executive of *Compassion in World Farming* from 1991 to 2005, has spoken and published widely on the welfare of farm animals and has provided evidence and advice to governments on the genetic engineering and cloning of animals as well as sustainable farming and food in the context of Climate Change. [Website](#)



[Ian J. H. Duncan](#), Professor Emeritus, Department of Animal Sciences, Guelph University, Canada, is a pioneer in the development of animal welfare science. He has spent much of his scientific career developing methods of "asking" farm animals what they feel about the conditions in which they are kept and the procedures to which they are subjected. [Website](#)



[Nick Palmer](#), current head of *Compassion in World Farming* in the UK, served formerly as MP for Broxtowe in the UK from 1997 to 2010 and as Director of Policy at *Cruelty Free International*. A lifelong supporter of animal protection, during his time in Parliament Nick was vice-chair of the All-Party Animal Welfare Group. [Website](#)



We wish to thank the many commentators on "Sentience Politics" for their kind introductory comments and the extensive range of issues they have raised.

1. Cultural Influences

In the abstract of our target article, we noted that our examination of "animal sentience" was limited to Western thought and traditions. **Webster**, **Phillips**, and **Krishna** address this limitation in their commentaries and discuss the perception of animal sentience in Buddhist, Hindu, and Jain traditions and the traditions of indigenous peoples in Australia.

For additional thoughts on how animals and animal well-being are considered in far Eastern philosophies, readers are referred to the book by Peter Li (2021) on animal welfare in China.

Notably, animal welfare and feeling are significant in Western and Eastern traditions. Public opinion surveys confirm the importance of animal welfare across many different cultures. (Turner & Al Hussein, 2013; Izmirli & Phillips, 2012)

Krishna provides considerable detail on the place of animal sentience in India, its influence on animal protection legislation and enforcement in India, and the importance of animal sentience for the four main religions in the subcontinent (Hinduism, Jainism, Buddhism, and Sikhism). As a result, India has had some of the most progressive animal protection laws and policies dating back to the 19th Century.

2. Sentience Definition

Like many legislative initiatives on animal sentience, our target article did not include a formal definition of "animal sentience." The production of a careful (and useful) definition would likely have been very time-consuming. Furthermore, it would probably not have been advantageous in the context of a history of the science and politics of animal sentience. As **Webster** notes, 'sentience' is a generic term that "carries no more specificity than (say) "nutrition" and "covers too wide a spectrum to be of much help in governing our interactions with specific animals in specific circumstances." We agree with **Webster** that 'sentience' (and 'animal welfare' cf. Browning, 2019) are difficult to define operationally. Nevertheless, greater terminological precision would be desirable.

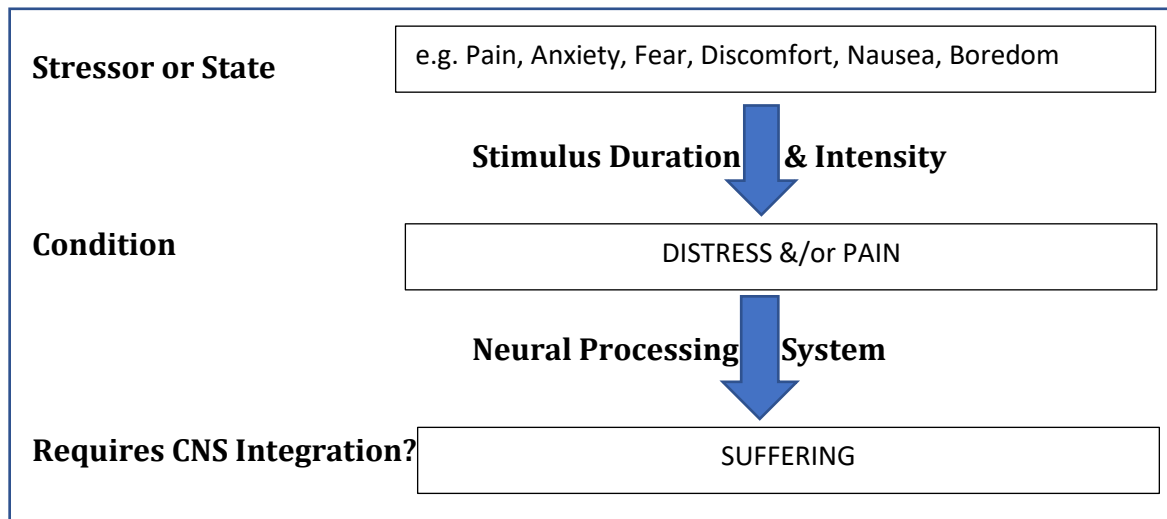
Webster's recent (2022) book, *Animal Welfare: Understanding Sentient Minds and Why it Matter*, quotes Lewis Carroll's *Through the Looking Glass*. "' When I use a word,' Humpty Dumpty said in a rather scornful tone, 'It means just what I choose it to mean, neither more nor less.'" **Webster** uses this quote to introduce the ongoing challenge as regards sentience terminology (and definition) and states that people tend to use "words like stress, sentience, and consciousness in a very loose way" and that such imprecision can "lead to confusion."

We strongly agree with **Webster** on this point. The terms are rarely carefully defined in publications and discussions of sentience, consciousness, pain, suffering, and distress. The resulting lack of precision may (and does) lead to fruitless arguments among scientists and philosophers because the terms carry different (sometimes very different) meanings for the other protagonists. Figure 1 sketches the possible relationships among terms such as pain, distress, and suffering that are common in ordinary speech but are also pressed into service to refer to complex (and preferentially precise?) scientific concepts.

The first level in the Figure 1 includes terms that may be used to refer to either a stimulus (a stressor) or a mental state (the experience of stress). When reporting on the study of stress, it is crucial to be clear whether one is referring to a stimulus or a mental state. Pain language is a particular challenge. The pain experienced when one is tortured is not the

same as the pain experienced when losing a loved one. Torture pain (sometimes described as "physical pain") usually has a specific bodily location. The pain experienced in losing a loved one (sometimes described as psychological pain) has no specific bodily area (and cannot be treated using an analgesic). The two are very different biologically. However, the same word is used to describe both.

Figure 1. Possible Relationships Between Pain, Distress, and Suffering



Psychological pain and distress likely refer to similar phenomena, yet ordinary language mainly focuses on "pain" when expressing unpleasant feelings and experiences. Suffering is a further terminological complication that refers to both a state and a process. It is often considered a synonym of pain or distress, yet, as Cassell (1991) has argued, suffering differs from distress. Consciousness (not included in the figure but likely requiring some form of a central nervous system) is an additional term that is often used when referring to sentience.

A painful stimulus may or may not produce distress, depending on its intensity and its duration. A very painful stimulus would likely always lead to at least momentary distress, but even a mild pain could become very distressing if it continued unabated for a long time. An unending series of waterdrops striking the head become unbearable over time. 'Distress' leads to 'suffering' immediately or in due course if the organism has appropriate neuronal wiring. Typically, people do not distinguish between 'distress' and 'suffering,' but Cassell (1982, 1988, 1991, 1992) has argued that suffering occurs only when an individual's 'personhood' is threatened. For example, athletes may be in pain and even distress. Still, if they competes successfully, they are unlikely to suffer because their self-concept as an active (and successful?) competitor is not threatened.

'Sentience' may be defined relatively simply and economically as a felt state. When a human experiences a painful or distressing stimulus or an enjoyable moment, it 'feels' like something to be in that state. In contrast, when water boils on a stove, the water changes from one state to another. But that change in state does not feel like anything.

However, this definition is not particularly helpful when determining how sentience, awareness, consciousness, or other similar terms may be related or may differ. The definition also does not clarify how sentience is or is not associated with or requires the presence of consciousness or self-awareness. **Hughes** broadens the challenge of using ordinary language to refer to complicated concepts when he notes that "when terms are translated into languages other than English, it is vital the meaning be understood and retained." Animal welfare has proved to be a tricky concept to translate into other languages. As Webster notes, animal sentience is likely to encounter similar difficulties in different languages, partly because its use in English is also not precisely defined.

In this regard, **Damasio** comments on the Francis Crick Memorial Conference on Consciousness and the widely cited initiative at that conference stating that animals are conscious. Damasio describes the production of a "thoughtful document" on animal consciousness that was presented to the attendees at the conference "with the idea that those in agreement should subscribe to it. Unfortunately, and sadly, although the facts were solid and intentions laudable, this document – now called the Cambridge Declaration on Consciousness – was only signed by a minority of those present."

3. Exploring Sentience and its Nuances.

In considering this question, we are intrigued by **Webster's** introduction of the Buddhist skandhas as a possible framework for examining the nature and features of animal sentience. The five degrees (skandhas or aggregates) of "clinging" in Buddhist philosophy are, respectively – form (matter), sensation, perception, mental formulation, and consciousness. **Hughes** also comments on the utility of examining the concept of Sentience using Buddhist cosmology. He notes that the term 'sentience' is derived from the Latin verb, *sentire*, meaning to feel. But different writers have used the term to have different meanings, and Hughes stresses the importance of precision when using terms such as sentience, awareness, and consciousness.

Webster (2022) notes that *Matter* is a feature of all living organisms, constituting their physical structure and chemical composition. *Matter* also encompasses the processes that enable each organism to operate in a complex environment. All plants and animals consist of matter and can react to some extent to environmental stimuli, such as the movement of sunflowers orienting towards the sun.

Sensation describes the ability of living creatures to experience feelings, including pain, heat and cold, and hunger and fear. **Webster** suggests that this property is restricted to animals (plants and micro-organisms do not have *sensation*). Animals may experience sensations as unpleasant (aversive), pleasant (attractive), or unimportant (indifferent). These sensations then motivate animals to act, where desired, to adjust their feelings.

Perception describes the ability to recognize and remember objects, experiences, and emotions. Animals with *perception* do not just react to stimuli as they occur. They can learn from experience. From this, one can infer that animals with *perception* are not restricted to living in the present. Such animals may learn to cope with challenges, but

this capacity also carries the potential for suffering if the obstacles are too severe or restrictive.

Mental Formulation describes the ability to create mental diagrams that facilitate the integration and interpretation of complex experiences. Such mental capacity increases an animal's ability to learn from experience and the potential for suffering if the animal cannot cope with a particular environmental challenge.

Consciousness, the final Buddhist skandha or level, is represented by human consciousness and may be characterized as an individual is aware that they are aware. Consciousness carries the potential for enhanced forms of positive and negative social behaviors such as empathy, compassion, and cheating.

Reber et al. argue that all forms of life, "from the simplest unicellular prokaryotes to *Homo sapiens*, have valenced experience—feelings as states of preference—and are capable of cognitive representations." We, **Damasio, Ristau, and Hughes**, argue that the claim that all life is sentient, including plants and bacteria, is a step too far (the Buddhist worldview notwithstanding – but cf. Segundo-Ortin & Calvo 2023). The fact that most (all?) living organisms respond to external stimuli (e.g., sunflowers orienting to the sun and amoeba avoiding acid solutions) does not necessarily mean that such organisms are *feeling* anything (i.e., having a valenced experience). **Reber et al.**, however, cite an experiment examining the behavior of bacteria "fed" on a succession of malate and lactate growth media that raises interesting questions about the capacity of bacteria to integrate immediate environmental conditions that aid in "predicting" what might occur in the surrounding environment in the future (Mitchell et al., 2009).

It is difficult to identify how such bacterial "learned" responses may be evidence of sentience. Browning (2019, p.9), for example, argues that welfare matters to an animal when the "animal experiences something, perceives it, then categorises the experience according to its conceptual framework and ends with an interpretation of the experience that is either a positive or negative emotion. This final stage is subjective experience, which then forms the basis for learning, motivation and behaviour." It is a challenge to explain how a bacterium might develop a conceptual framework leading to negative or positive feelings or how creatures lacking neuronal networks may develop associative learning experiences (e.g., associating a stimulus with an outcome).

Sentience involves valenced (negative or positive) feelings that confer an evolutionary advantage enabling an organism to adapt more effectively and successfully to its environment.

4. Emotions and Sentience

Several commentaries address the connections between emotions and sentience. **Damasio** is the author of an important book (*Descartes' Error*; Damasio 1994) on the role of emotion in decision-making. He cites human case studies in which the ablation of specific brain areas results in human patients with little to no affect. These patients report not being bothered by much (or anything). It sounds like they do not experience joy or

suffering. Although their intellectual abilities may be unimpaired, it sounds as though they may no longer have valenced sentience. Humans who have undergone a pre-frontal lobotomy report that they can still feel a pin inserted into a muscle but it does not bother them because the "agony" is absent (Rowan, 1988).

The relationship between emotions, animal individuality, and a capacity for suffering (or pleasure) is discussed by Fraser (2009) in an important commentary on the influence of positivist thinking in discouraging research on animal emotion and affect that could have advanced understanding of animal behavior and motivation. **Van Kleef** also comments on the evolution of emotions and notes that emotions constitute a "particularly significant suite of adaptations." He argues that animal emotions may be more reliable than human emotions because humans frequently hide their emotions or use them to deceive. **Van Kleef** also notes that it "is so obvious from the state of the science that many non-human animals are capable of feeling that denying it seems pointless."

The development of animal welfare science required investigative methods different from the stimulus-response studies of the behaviorists. Studies involving preference testing and the strength of animal motivations to gain access to particular conditions or resources have enabled a deeper understanding of the impact and importance of emotional responses and feelings on positive and negative states in animals (e.g., Amendola & Weary, 2019).

5. Science and Policy

Dawkins raises an important issue when she argues that scientific understanding differs from public policy development and suggests that the two activities should be kept separate. She notes that whether animals are sentient is a factual question, whereas the question of how animals should be treated is a "matter of ethics and policy-making." The first is an empirical matter, and the second concerns what we ought to do when a group of animals is found to be sentient. She further notes that there is a great deal we do not know regarding animal sentience, even though many people may already be convinced that certain animals are sentient beings. Because of the widespread consensus that certain animals are sentient, some argue there is no need to wait for additional evidence (*vide* **Bekoff's** and **Bender & Brauer's** responses to the target article) before proposing and enacting legislative protections for sentient animals.

Birch and **Crump** (both members of the London School of Economics team who produced the report (Birch et al., 2021) arguing that cephalopod mollusks and decapod crustaceans are sentient) disagree with the distinction **Dawkins** draws between science and policy. **Birch** argues, for example, that empirical scientific research is not in the "business to deliver certainty." Empirical science provides evidence for or against particular generalizations but does not establish factual certainty in the final analysis. **Birch** also does not believe that the standards required for new public policy should be lower than those required in other contexts. Instead, **Birch** argues that we should aim to develop and apply high evidentiary standards to support public policy initiatives. The work of the

group that **Birch** leads at the London School of Economics exemplifies the pursuit of such high (and transparent) evidentiary standards to support public policy initiatives.

Crump also weighs in on this topic and argues that, to "matter ethically, animal welfare must assume sentience." The evidence presented by **Birch** et al. (2021) supporting the sentience of cephalopod mollusks and decapod crustaceans was sufficiently robust to persuade British policymakers to add these animal groups to those identified as sentient (i.e., capable of experiencing valenced [negative and positive] feelings). **Crump** notes that the arbitrary exclusion of rats, mice, and birds from the coverage provided by the U.S. Animal Welfare Act (Anonymous 2021) is an example of evidence-free public policy. We strongly agree that policy decision-making should use the best scientific evidence and arguments and be transparent in its assumptions and reasoning.

In sum, we support **Dawkins'** call for more and better science. We also agree with **Bekoff**, and **Bender & Brauer** that we do not need more studies of vertebrate sentience before supporting policies improving the lives of animals that live with humans or providing humans with food and entertainment. However, we agree with **Dawkins'** claim that humans often feel they know more than they do.

6. Advancing Animal Protection

Both **Bekoff** and **Bender & Brauer**, argue that immediate action is required to protect animals from pain, distress, and suffering. The inference in both commentaries is that insufficient attention is being paid to animal welfare and the prevention of animal suffering. We note that, since the publication of the books by Peter Singer (1975) and Donald Griffin (1976; see Ristau 2023, in press) in the mid-1970s, the animal protection movement and its political influence have grown very rapidly. For example, attention to farm animal welfare has increased dramatically since Compassion in World Farming was founded in 1967. Advocates should press for improvements in farm animal treatment (and should the treatment of aquatic creatures: see Section 7, below) to reduce animal suffering. We should also acknowledge the considerable advances in animal welfare over the past few decades.

In the USA, the number of new animal advocacy organizations explicitly founded to address farm animal issues has grown from just two small groups in 1980 to fifteen in 2020. Over the same period, annual expenditures by organizations addressing farmed animal welfare increased from around \$400,000 to just over \$90 million (Farmed Animal Funders, 2021). These sums are still only a tiny fraction of the \$4-5 billion spent annually on animal protection activities in the USA.

Animal protection interests and advocacy campaigns have delivered significant positive policy changes since 1975 and will likely continue to do so in the coming decades. Public opinion and consumer behavior continues to press for greater attention to farm animal needs.

7. Animal Sentience and Pain

Brown points out that fish have been largely ignored in policy initiatives promoting animal welfare. He further notes that fish welfare has gone backward in the last few decades. Mammalian and avian emotions have been considered necessary adaptations and subject to the same evolutionary pressures as other animal qualities and bodily structures since the 19th Century. If mammals and birds display emotions, those emotions are likely to be found (perhaps in a modified form) in fish (and amphibia and reptiles). However, there are significant discrepancies between public perception of fish behavioral complexity, sentience, and scientific reality (Brown, 2015). The claim that fish are sentient is still disputed (e.g., Key, 2016; but see the accompanying peer commentary).

The presence of emotions and sentience in different animal groups (supported by experiments demonstrating that chemicals modifying human emotions and other feelings and resulting behaviors have similar effects in nonhuman animals) implies that having emotions and sentience confers advantages for evolutionary fitness. The RSPCA organized an examination of fish welfare in a 1980 report (Medway, 1980). While animal advocates have been slow to champion the sentience of fish, this oversight is now being addressed more widely by existing and new advocacy organizations. For example, see the materials on fish produced by [Compassion in World Farming](#), [Animal Equality](#) and the [Aquatic Animal Alliance](#).

Both **Phillips** and **Jones** state that the target article identifies pain as the major problem facing farm animal welfare. **Phillips** cites findings from a 26,000-kilometer exploration of rural Australia (Phillips & Phillips, 2012) reporting that the farmers he interviewed identified inadequate nutrition and the lack of other essentials as more critical than relatively short-lived painful episodes resulting from on-farm activities such as branding or castration. We agree with **Phillips** and **Jones** that there are many other negative feeling states besides pain (for example, see Figure 1) and that pain is probably not the dominant negative feeling state in the life of a typical farm or wild animal.

Phillips asks, "Is sentience the only condition for an animal to have interests?" While Singer (1975) places sentience at the core of his arguments regarding the moral status of animals, other philosophers have identified different characteristics as key elements conferring moral status. For example, Rollin (1981) based his animal rights philosophy on the existence of an animal's telos (simply, the purpose or fulfillment for an animal). Regan (1983) presented a deontological (rights-based) argument and held that animals were rights-bearers if they were "subjects-of-a-life." More recently, Nussbaum (2023) has taken the capabilities approach she had used in developing her theories of justice and has applied it to create "a good theory of justice for animals." In other words, sentience is an important property when considering animal welfare, but not the sole property that might be relevant.

Webster also comments on the development of "behaviorism" and its influence on how animals are viewed and treated. Behaviorists had argued that "good" science should be based on what can be observed and measured. Subjective terms such as sensation, perception, image, desire, thinking, emotion, and consciousness, they had argued, could not be examined objectively. Therefore, they concluded, these states are outside what

behavioral research might examine and document. Nor were behaviorists the only discipline to reject subjective conditions and desires in the 21st Century. Economists also rejected concepts that were not measurable (such as well-being) and insisted on tracking "hard" evidence (e.g., the money raised and spent).

However, since Griffin's (1976) book on animal awareness, techniques have been developed that allow researchers to measure what animals prefer and how strongly they might prefer a particular environmental condition. As **Webster** notes, behavioral motivation is driven by feelings modulated by cognition and enforced by experience and, in some cases, education.

8. Legal Implications of Recognizing Animal Sentience

Kotzmann has published articles on the recognition of animal sentience in public policy (specifically in Australia) but agrees with the target article that such public policy declarations about the sentience of animals have had relatively little practical impact. Animals are still broadly categorized as property in Europe despite the E.U. declaration that animals are sentient. Spain's recent declaration on animal sentience has not yet significantly affected bullfighting or the treatment of farm animals or galgos (greyhounds) kept and used in hunting. Animal welfare laws still discriminate against certain groups of animals. Companion animals receive the most protection, but wild animals are offered little to no animal welfare protection. There are laws and policies addressing species declines and extinctions, but these laws do not (or only rarely) address the welfare of free-living individual animals.

Kotzmann argues that we "appear to be at a significant crossroads in the way the law governs human-animal relations" and that, regardless of practical outcomes, a "crossroads is nevertheless a crossroads." Animal law and animal law curricula have spread around the world. It is likely only a matter of time before the legal impact of animal sentience policy initiatives is realized (Reddy, 2020).

For example, **Jones** cites positive outcomes from the recognition of animal sentience in Colombia and suggests that recognizing sentience could also have policy significance for biodiversity protection. **Bass** describes how government policy has, in some cases, promoted systems and structures that ignore what is known about animal sentience but, despite such actions, market forces and consumer demand have led to significant animal welfare improvements. The campaign that **Bass** and her organization launched against using glue traps to catch and kill commensal rodents was passed into law at the same time as the U.K. Animal Sentience Act. The passage of the law banning rodent glue traps did not relate directly to any specific recognition of animal sentience but is part of a larger, global trend where governments are paying more attention to animal welfare concerns.

9. Wild Animal Welfare

Palmer & Sandøe comment on the target article's farmed-animal welfare focus and suggest more attention be given to wild animals' needs. We agree that the target article uses many examples from the study of farm animal sentience, behavior, and welfare. This focus is partly because animal welfare science and historical assessments of animal welfare were significantly influenced by the Brambell (1965) report and the subsequent responses to Brambell in Europe. Animal welfare science is indeed also expanding to address the welfare problems of other domestic and wild animals. Several university research centers now concentrate on canine behavior (and welfare); and we note also the recent development of the [Wild Animal Initiative](#), a movement aiming to address wild animal welfare.

There are some intriguing data on free-roaming animal welfare. For example, sterilizing free-roaming street dogs reduces disease prevalence (Yoak et al., 2014), and contracepting wild horses results in a tripling of the average life spans of mares (Kirkpatrick & Turner, 2006). Both outcomes indicate a significant improvement in the welfare of individual animals with the prevention of the metabolic demands of reproduction and lactation.

Hughes provides an essential addition to the history of animal welfare science and animal sentience. He states that the Five Freedoms (namely, animals should be able to stand up, lie down, turn around, groom themselves, and stretch their limbs) that the Brambell Commission formulated was a pioneering response to the recognition that farm animals are sentient. The Brambell Commission also recommended funding support for ethological research to provide scientific evidence for future policy.

The Influence of Donald Griffin on Animal Sentience.

Donald Griffin, the Rockefeller University scientist who identified how bats use echolocation to move around in their environment, wrote a very influential book on *The Question of Animal Awareness* (Griffin, 1976). His book launched the field of cognitive ethology and marked the first significant deviation from the dominance of the behaviorist movement. Griffin died in 2003 and could not comment on the animal sentience developments. Still, his colleague Carolyn **Ristau**, who is writing a biography of Griffin (Ristau, in press; which will be accorded open peer commentary in this journal), has "channeled" Griffin in her commentary on the present target article. **Ristau's** commentary described Griffin's approach and thinking on the question of animal awareness and sentience. Critics argued that attention to animal thinking grew from unjustified anthropomorphism. However, Griffin responded by coining the terms "zoomorphism" (cf. Segundo-Ortin & Calvo 2023) and "mechanomorphism" to counter the criticism that he was engaged in anthropomorphist thinking. **Ristau** notes that Griffin welcomed the progress in techniques (e.g., the preference tests used by **Dawkins**) investigating mental experiences and was inspired by their ingenuity. Griffin initially avoided commenting on the ethical implications of his work and kept some distance from animal welfare because of the tremendous backlash from his colleagues after publishing his book, *The Question of Animal Awareness*. However, in his last book (Griffin, 2001), he included an entire section on the "ethical significance" of animal consciousness.

Griffin's 1976 book may have been almost as influential as Singer's 1975 volume, *Animal Liberation*, on the global thinking and the developing concern about animal welfare. The two books appeared within a year of each other. Singer's book provided clear and easily understood arguments addressing how humans should consider animal interests and treatment. Griffin's book provided lucid descriptions of studies of animal cognition. The book significantly altered the thinking of the research community on animal awareness, feeling, and sentience and influenced the subsequent course of their scientific investigation as well as the practical application of the findings..

10. Meat Eating and Cognitive Dissonance

Two comments (one by **Lifshin** and one by **Bender & Brauer**) address human cognitive dissonance (Zentall 2016). **Lifshin** comments on the possibility that human denial of animal sentience may result from human death denial tendencies. For example, reminders of death made participants in the study more inclined to reject the theory of evolution. **Lifshin** argues that humans need to feel protected from death to dissociate themselves from their animal roots and assert their superiority over animals. The focus on animal sentience tends to undermine human feelings of superiority (cf. Chapman & Huffman 2018). **Bender & Brauer's** commentary focuses on the dissonance between recognizing that animals are sentient and eating them. It draws attention to Melanie Joy's characterization of "carnism" as an "unconscious belief system that conditions people to eat certain animals and thereby gives rise to several defense mechanisms that enable people to sustain the dissonance." Both commentaries examine how ideas regarding animal sentience might trigger cognitive tendencies that try to resolve inconsistencies in belief systems by rejecting evidence and arguments that animals are sentient.

Reading these two commentaries reminded us of the influential analysis by anthropologist Edmund Leach (1964) on "Animal Categories and Verbal Abuse." The focus of Leach's essay was the anthropological topic of 'taboo.' However, the paper covered several topics, including animal terms used as swear words, animal edibility, and marriage customs. Leach noted that distance from the actor was critical for edibility and marriage. For example, typically, one does not marry a close relative or somebody far outside one's usual circle.

In the same way, distance from the consumer is important in determining edibility – pet animals and wild animals (e.g., predators) are not typically regarded as edible. Although Leach's analysis is not directly relevant to the **Lifshin** or **Bender & Brauer** commentaries, his reflections on taboos, and his examples of animal categories, provide rich additional context for the cognitive dissonance described by **Lifshin** and **Bender & Brauer**. (Leach's original paper, a critique of Leach, and additional comments on his arguments can be found in Leach 1989 and Liberman 1990.)

11. Conclusion

Investigations of animal sentience and research on animal welfare represent two sides of the same coin. Both topics are critically important in developing appropriate policies to guide the world's treatment of animals.

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