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Animal suffering, the hard problem of consciousness and a reflection on why we should treat animals well

Considerable effort and ingenuity is expended on developing theodicies in response to the problem caused by evolution in terms of pain and suffering in creation and the fact that God is good and his creation is good. From a physiological and neurological perspective, it is clear that many creatures experience pain. However, pain is an essential part of the evolutionary process being clearly adaptive, potentially preventing a worse outcome for a creature, namely death. A more difficult question is that of suffering. It will be shown that the question of animal suffering is identical to the issue of sentience and the ‘hard problem’ of consciousness. After reviewing the evidence for animal consciousness and then suffering, we conclude with a brief reflection on why Christians should treat animals well.

Keywords: animal, pain, suffering, consciousness, welfare

Introduction

It is notable that Darwin seemed to have no doubts that animals¹ could suffer: ‘the lower animals, like man, manifestly feel pleasure and pain, happiness and misery’, and ‘The fact that the lower animals are excited by the same emotions as ourselves is so well established that it will not be necessary to weary the reader by many details.’² A natural question to ask is whether Darwin was right to be so sure. For Christians, if we accept evolution as the means by which species have come into existence, animal suffering appears to pose a challenge to the goodness of God and his creation.

In formulating a Christian response it is often taken for granted that animals suffer. As a result considerable effort has been expended on theodicies³ that try to justify why this has to be the case if God is a good God and has the power to prevent it happening. For human beings the so-called ‘free will defence’ can be used with regard to moral evil. This, *in nuce*,

1 Here and subsequently animal refers to non-human animal.

2 Darwin, C. *The descent of man and selection in relation to sex*, London: John Murray (1871), quoted in Dawkins, M.S. ‘Through animal eyes: what behaviour tells us,’ *Applied Animal Behaviour Science* (2006) 100, 4-10; Dawkins, M.S. *Why animals matter*, Oxford: Oxford University Press (2012) is also relevant to the topic of this paper.

3 The term theodicy was coined by Leibniz in 1710 and means ‘seeking to justify the ways of God to man’.

states that a consequence of humans having free will (a good thing) is the possibility that they will do evil, and so cause suffering. It is unclear how this applies to animals as it is uncertain whether they have free will in the same sense as humans. Recently, Creegan, Murray and Southgate (among others) have tried to provide theodicies for animal suffering.⁴ However, none of these authors discuss the scientific evidence for animal suffering in any detail; they just assume it exists.⁵ Here we seek to address the question of whether animals suffer as we do, focusing on the scientific evidence.

On pain and consciousness

Physiologically, somatogenic pain is commonly considered a consequence of the stimulation of sensory neurons called nociceptors in response to potentially damaging stimuli.⁶ From an evolutionary perspective, pain is adaptive. It serves a number of important functions including the avoidance of dangerous situations or simply keeping damaged limbs still while they heal.⁷ The ability to feel pain has evolved because, being unpleasant, it keeps creatures away from the larger evolutionary disaster of death.⁸ There seems to be no doubt that animals can feel pain in the sense of a

4 Creegan, N.H. *Animal suffering and the problem of evil*, Oxford: Oxford University Press (2013); Murray, M. *Nature red in tooth and claw: theism and the problem of animal suffering*, Oxford: Oxford University Press (2008); Southgate, C. *The groaning of creation: God, evolution and the problem of evil*, Louisville: Westminster John Knox Press (2008). See also Johnson, E.A. *Ask the beasts: Darwin and the God of love*, London: Bloomsbury Publishing plc (2014) and Clough, D.L. *On Animals: volume 1 Systematic Theology*, London: T&T Clark (2012). The most recent animal theodicy is Dougherty, T. *The problem of animal pain: a theodicy for all creatures*, Basingstoke: Palgrave Macmillan (2014).

5 Note too that there is an extensive philosophical and ethical literature concerned with issues such as animal liberation and rights, e.g. Singer, P. *Animal liberation*, 2nd edn., London: Thorsons (1990); Regan, T. *The case for animal rights*, London: Routledge & Kegan Paul Ltd (1983); DeGrazia, D. *Taking animals seriously: mental life and moral status*, Cambridge: Cambridge University Press (1996). A useful summary is provided by DeGrazia, D. *Animal rights: a very short introduction*, Oxford: Oxford University Press (2002). However, these books too do not examine in any detail the scientific evidence for animal suffering. The focus here is on the science and we choose not to pursue the philosophical aspects of the problem, which requires a different and separate paper.

6 Rutherford, K.M.D. 'Assessing pain in animals', *Animal Welfare* (2002) 11, 31-53. Rutherford discusses issues such as the relationship between nociception and pain, which will not be pursued here.

7 Wall, P. *Pain: the science of suffering*, London: Weidenfeld & Nicolson (1999). For a Christian perspective see the now classic Brand, P. & Yancey, P. *The gift of pain*, Grand Rapids, Michigan: Zondervan (1997), (previously entitled: *The gift nobody wants*). Brand was a leprosy doctor and leprosy destroys the ability to feel pain. His view of pain is summed up 'Previously, I had thought of pain as a blemish in creation, God's one great mistake ... pain stands out as an extraordinary feat of engineering valuable beyond measure.' (p.62). He also distinguishes between pain and suffering 'In more advanced cases of leprosy, my patients felt no pain at all ...yet all of them suffered' (p. 251).

8 Dawkins, M.S. 'Evolution and animal welfare', *Quarterly Reviews of Biology* (1998) 73, 305-328.

neurophysiological response to stimuli. The range of creatures that are thought to be able to experience pain is expanding. For example, fish are now thought to possess the necessary neurophysiological mechanisms to feel pain, whereas previously this was thought not to be the case.⁹ Likewise, there is evidence that crabs experience pain too.¹⁰ Therefore, the scientific evidence that many creatures can experience pain seems indisputable.¹¹

Suffering, however, is a broader issue than just the question of whether a creature can experience pain per se.¹² For example, withdrawing a hand (or paw) after touching a hotplate on a cooker would involve feeling pain but would not generally be classed as an experience of suffering. Both animal and human would feel pain due to tissue damaging heat, but this feeling would not necessarily be considered suffering in the usual sense of the term. This raises a potentially important distinction, as determining whether an animal responds to painful stimuli, that is, feels them (it must feel them otherwise it wouldn't respond), is possible empirically and, as noted above, has been done for a variety of creatures. In contrast, determining empirically whether an animal is self-aware enough to be considered to be experiencing 'suffering' is more problematic.

In trying to determine what animal suffering (as opposed to pain) might be, it is helpful to distinguish between two types of consciousness:¹³

1. sentience / phenomenal consciousness / irreflexive consciousness / primary consciousness;
2. self-consciousness / reflexive consciousness / meta-cognition / higher order thoughts.¹⁴

9 Sneddon, L. 'The evidence for pain in fish: the use of morphine as an analgesic', *Applied Animal Behaviour Science* (2003) 83, 153-162; Cotte, S.Y. 'Are fish the victims of "speciesism"?' A discussion about fear, pain and animal consciousness', *Fish Physiology and Biochemistry* (2012) 38, 5-15. Anecdotally, one of us once knew a scientist involved in experiments with fish who noted that he had not been troubled by animal rights protestors because fish lacked the 'cuddle factor'. This shows that we as human beings identify with some creatures more than others and this can affect our assessment of the scientific evidence. Or, in postmodern terms, there is no neutral viewpoint/stance.

10 Elwood, R.W. & Appel, M. 'Pain experience in hermit crabs?', *Animal Behaviour* (2009) 77, 1243-1247.

11 An interesting point about pleasure and pain is made by Bloom, P. *How pleasure works: why we like what we like*, London: Vintage Books (2011). On page 52 he notes that pleasure from pain is uniquely human (e.g. eating hot chili or hot curry), and tongue-in-cheek says that the defining feature of humans is that we are the only animal that likes Tabasco sauce.

12 One referee critiqued our distinction between pain and suffering and we agree that this distinction can be difficult to make (not least because the terms are used in different ways in different contexts in the literature). Nevertheless, we choose to retain the distinction as we think it is helpful in understanding the different contributions that biology and philosophy/psychology can make to this issue.

13 Bermond, B. 'A neurophysiological and evolutionary approach to animal consciousness and suffering', *Animal Welfare* (2001) 10, S47-S62; Dawkins *op. cit.*, (2a).

14 higher order thoughts – sometimes abbreviated as HOT.

Type 1 consciousness refers to the basic experiences of seeing, hearing, pain, hunger, thirst, and so on. Type 2 consciousness refers to what might be termed self-awareness or the ability to have thoughts about thoughts. As noted above, there is strong empirical evidence that a variety of animals have type 1 consciousness, but it is less clear as to whether they have type 2 consciousness (and indeed how one might be able to empirically determine this). This is relevant as it may be that whilst pain is an aspect of type 1 consciousness, suffering may be an aspect of type 2 consciousness.

The whole issue of type 2 consciousness has been referred to as the ‘hard problem’¹⁵ of consciousness because, as noted by Dawkins,¹⁶ ‘we have absolutely no idea how nerve cells give rise to subjective experiences... we do not know how sentience arises from brain cells or how, if at all, brains with sentience work differently from brains without it, we have no real idea what to look for in other species in our search for animal sentience.’ Elsewhere the same author notes that consciousness is almost impossible to define.¹⁷ Nevertheless, some researchers make further distinctions among types of consciousness, in order to try to make empirical progress. Tononi & Koch¹⁸ suggest that consciousness is graded and that it changes over the lifetime of an organism. For example, consider the difference in consciousness exhibited by a human baby, a young child and an adult.¹⁹ If this difference is found in humans then there may be varying grades of consciousness exhibited by different species in the animal kingdom. Fabbro et al.²⁰ propose four levels of self: primary self, core self, self-consciousness and narrative self. The last, the ability to unify the self into a coherent story, they ascribe only to humans (and it probably requires language). However, the approach we are interested in here is how the existence of different types of conscious experience might be determined empirically

15 A term first coined by Chalmers, D.J. ‘Facing up to the problem of consciousness’, *Journal of Consciousness Studies* (1995) 2, 200-219.

16 Dawkins *op. cit.*, (2a).

17 Dawkins *op. cit.*, (2b), p. 44.

18 Tononi, G. & Koch, C. ‘Consciousness: here, there and everywhere’, *Philosophical Transactions of the Royal Society* (2015) B 370: doi:10.1098/rstb.2014.0167.

19 How self-conscious is a new-born baby? Of course this impinges of who we consider to be a person and therefore how we might treat infants. The extreme end of this spectrum is seen in the proposal that infanticide might be acceptable, e.g. Giubilini, A. & Minerva, F. ‘After-birth abortion: why should the baby live?’, *Journal of Medical Ethics* (2013) 39, 261-263.

20 Fabbro, F., Aglioti, S.M., Bergamasco, M., Clarici, A. & Panksepp, J. ‘Evolutionary aspects of self- and world consciousness in vertebrates’, *Frontiers of Human Neuroscience* (2015) 9, doi:10.3389/fnhum.2015.00157. Somewhat confusingly they also use the terms anoetic, noetic and auto-noetic to refer to primary consciousness, higher-order consciousness and self-related notions of past and future. They make the interesting point that only humans seem to be able to conceive of their own death, though it is unclear on what basis they make the statement. This impinges on how we might view suffering in humans and animals, as some (perhaps much) of human suffering is undoubtedly connected with the knowledge of impending death. Of course this is where the Christian gospel has tremendous power as Jesus’s death and resurrection free believers from the fear of death (Heb. 2:15).

for animals. For human beings the standard way to assess types of conscious experience is through so-called 'accurate report'.²¹ This depends on the use of language so is of little use when studying non-human animals. Seth et al.²² propose multiple criteria for consciousness but note that not all are easily testable and that some are not currently testable. So, in the absence of language based self-reporting, what aspects of consciousness, in particular type 2 consciousness (an otherwise subjective phenomenon), can be studied objectively?

The lines of empirical evidence pursued for animal consciousness are: neurophysiological (the search for neural and hormonal correlates of consciousness); behavioural (the search for behavioural correlates of consciousness); and evolutionary. In all cases analogy with human beings plays a major role, with similarities or continuities between animal and human minds often highlighted. However, Darwin's view that the differences are 'one of degree and not of kind'²³ has led to the danger of thinking that similarity implies equivalence. Consider, for instance, the many experiments that have tried to show that animals have a theory of mind similar to humans.²⁴ For example, it has been proposed that the corvid's re-caching of food indicates a theory of mind as individuals try to safeguard the food from other corvids who may have seen the initial caching occur. However, simpler explanations have also been proposed including one based on a relatively simple computer program able to reproduce the apparently complex corvid behaviour.²⁵ The point is that apparently complex animal behaviours do not necessarily require consciousness to be present in the same way as in human beings.²⁶ As Dawkins notes,²⁷ the existence of so-called robo-pets that can mimic the behaviour of real animals also shows that complex behaviour does not necessarily require

21 Seth, A.K., Baars, B.J. & Edelman, D.B. 'Criteria for consciousness in humans and other animals', *Consciousness and Cognition* (2005) 14, 119-139. Even with human beings the concept of accurate report becomes problematic when assessing e.g. the consciousness of patients in cases of serious paralysis or what babies and young infants are actually feeling/experiencing.

22 See Table 1 of Seth et al. 'Criteria for consciousness'.

23 Darwin *op. cit.*, (2), quoted in Penn, D.C., Holyoak, K.J. & Povinelli, D.J. 'Darwin's mistake: Explaining discontinuity between human and non-human mind', *Behavioural and Brain Sciences* (2008) 31, 109-187.

24 van der Vaart, E. & Hemelrijk, C.K. "Theory of mind" in animals: ways to make progress', *Synthese* (2014) 191, 335-354. This paper critically reviews the experimental evidence for the theory of mind in animals. It suggests that computational modelling might be a way to explore cognitive processes, so making it easier to go beyond one's biases.

25 E. van der Vaart, R. Verbrugge & C.K. Hemelrijk, 'Corvid re-caching without "Theory of Mind": a model', *PLoS ONE* (2012) 7, 1-8.

26 As discussed later, humans can also carry out apparently complex behaviours without conscious thought.

27 Dawkins *op. cit.*, (2b), 38.

consciousness.²⁸ More generally the assumption of similarity or continuity between animal and human minds has been challenged in the light of recent discoveries in human brain evolution,²⁹ the brain's neural structure³⁰ and cognitive architecture.³¹ Premack³² makes the important point that in examining similarities it is also important to ask what the dissimilarities are, to avoid confusing similarity with equivalence.

To further illustrate some of the complexities of understanding animal consciousness consider a recent exchange of views on mental time travel in rats.³³ Mental time travel is the ability to mentally travel forward (or backward) in time to imagine possible future events (or review past ones). Humans possess this mental capacity, but do animals? For rats the argument that they can mentally time travel is based on evolutionary continuity and experimental evidence from studies of brain activity and behaviour. The argument that they cannot is based on an alternative interpretation of the experimental evidence and the lack of any clear proof that animals possess flexible foresight in the way humans do. With regard to the possession of flexible foresight, it could be argued that this is just a difference in degree, recalling the earlier point regarding the possibility of grades of consciousness, but this does not rule out that there might be a difference in kind between rats and humans (contra Darwin's view that differences between animals and humans are ones of degree not kind). As noted by Suddendorf,³⁴ people on both sides of the argument admit that they do not know what an animal subjectively experiences and whether a particular type of self-knowing consciousness is involved in mental time travel.

Stemming from these uncertainties there is a need for a more developed

28 It is good to bear in mind 'Morgan's Canon': In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of one that stands lower in the psychological scale. Quoted on page 279 of Manning, A. & Dawkins, M.S. *An introduction to animal behaviour*, 6th edn., Cambridge: Cambridge University Press (2012).

29 Preuss, T.M. 'Human brain evolution: from gene discovery to phenotype discovery', *Proceedings of the National Academy of Sciences* (2012) 109, 10709-10716.

30 Premack, D. 'Human and animal cognition: continuity and discontinuity', *Proceedings of the National Academy of Sciences* (2007) 104, 13861-13867.

31 Penn et al. *op. cit.*, (23), argue that, although humans and animals share many similar cognitive mechanisms, only humans are able to 'reinterpret' the world in terms of unobservable causal forces and mental states. They admit that their hypothesis has a number of substantial holes. Their article occupies pages 109-130, while pages 130- 169 are an open peer commentary, which gives good 'flavor' of the issues involved.

32 Premack *op. cit.*, (30).

33 Corballis, M.C. 'Mental time travel: a case for evolutionary continuity', *Trends in Cognitive Sciences* (2013) 17, 5-6; Suddendorf, T. 'Mental time travel: continuities and discontinuities', *Trends in Cognitive Sciences* (2013) 17, 151-152; Corballis, M.C. 'The wandering rat: response to Suddendorf', *Trends in Cognitive Sciences* (2013) 17, 152. Note that this exchange only occupies four journal pages and usefully illustrates key points, but the literature on these topics is vast.

34 Suddendorf *op. cit.*, (33).

theory of consciousness in both humans³⁵ and animals.³⁶ This is especially critical if inferences about the presence or absence of consciousness are to be made. While various theories have been proposed none seems to have gained widespread acceptance.³⁷ There appears to be no clear consensus on whether animals are self-conscious (have subjective awareness) and if so to what degree as compared to human beings. After reviewing the evidence for animal minds Manning & Dawkins³⁸ similarly state that there is 'no question of final conclusions, here'. Taking note of this, we now return to the issue of suffering.

A review of the scientific evidence for animal suffering

Moral beliefs, for example, that it is wrong to inflict suffering, will have different implications for our behaviour depending on the scientific evidence as to which creatures can suffer. At one end of the spectrum it is unlikely that we will ever have any qualms about destroying bacteria that cause disease. At the other end we might choose to adopt a vegetarian lifestyle if we think that animals being bred for food suffer.³⁹ For this reason understanding the scientific evidence must be considered prior to any discussion of its moral and ethical implications.

The term suffering as applied to human beings covers a wide range of feelings: fear, boredom, exhaustion, grief, thirst, hunger and so on. Generally it is taken to mean a subjective experience only truly known to the person experiencing it and known to others primarily by the verbal communication that the person uses to express what they are feeling. As noted above, verbal communication of feelings is not an approach that can be used when trying to determine whether animals suffer.⁴⁰

35 Gosseries, O., Di, H., Laureys, S. & Boly, M. 'Measuring consciousness in severely damaged brains', *Annual Review of Neuroscience* (2014) 37, 457-478. This article discusses the difficulties of assessing consciousness in patients with severe brain damage and distinguishing between these states and something like locked in syndrome, where the patient is conscious but unable to communicate. They conclude that consciousness is tricky to diagnose clinically. Given these difficulties in assessing consciousness in human beings it is unsurprising that we face difficulties in doing likewise for animals.

36 Boly, M., Seth, A.K., Wilke, M., Ingmundson, P., Baars, B., Laureys, S., Edelman, D.B. & Tsuchiya, N. 'Consciousness in humans and non-human animals: recent advances and future directions', *Frontiers Psychology* (2013) 4, 1-20; Dawkins *op. cit.*, (2b), p. 62.

37 See section on theories in Boly et al. *op. cit.*, (36); Dawkins *op. cit.*, (2b), p. 62 makes a similar point. Tononi & Koch *op. cit.*, (18) discuss the so-called Information Integration Theory of Consciousness (IITC).

38 Manning & Dawkins *op. cit.*, (28), p. 293.

39 See Linzey, A. *Animal theology*, London: SCM Press Ltd (1994), for this viewpoint. Note that, in our experience, some who call themselves vegetarians eat fish and some do not. Again the scientific evidence as to whether fish experience pain and suffering might influence that type of decision.

40 While some attempts have been made with regard to 'verbal' communication with certain animals, e.g. teaching language to apes (see pp. 99-110 in Wennberg, R.N. *God, humans*

The science of animal suffering is restricted in the evidence that can be adduced for the view that animals suffer like we do and, as with the study of animal consciousness, arguments by analogy need to be treated with caution.⁴¹ Similarly the lines of evidence used to assess whether animals suffer like we do are often identical to those used to examine the problem of consciousness, namely: neurophysiological, behavioural and evolutionary.⁴²

Neurophysiological evidence

Neurophysiologically it is not straightforward to tell in humans from someone's autonomic responses whether they are feeling angry, fearful, excited and so on. These changes can occur unconsciously, for example, in response to viewing subliminal images of happy or sad faces.⁴³ Therefore it is difficult to distinguish conscious / unconscious responses from observed physiological changes (though one can sometimes distinguish on the basis of a verbal report). Furthermore, apparently pleasurable activities, such as sex and hunting prey, can lead to some similar physiological changes to those that are generated by unpleasant experiences, such as escaping a predator.⁴⁴ For example, in human beings music, sex, food and drugs can 'light up' the same areas of the brain measured using fMRI,⁴⁵ but such techniques are not of a sufficient resolution to allow an experimenter to

and animals: an invitation to enlarge our moral universe, Grand Rapids, Michigan: Wm. B. Eerdmans Publishing Co. (2003)), this has not reached the level of expressing subtleties of feeling (to our knowledge) that would allow the issue of animal suffering to be directly addressed by this approach.

41 Note caution about the argument by analogy expressed by Sherwin, C.M. 'Can invertebrates suffer? Or how robust is the argument-by-analogy?', *Animal Welfare* (2001) 10, S103-S118; Dawkins *op. cit.*, (2b) p. 97 uses the term 'leap of analogy' when discussing the conclusion that emotions in humans and animals must be similar because we have similar physiology.

42 An interesting question (which we do not pursue here) is whether suffering is maladaptive possibly serving no useful evolutionary purpose or even being a disadvantage, in some circumstances. Consider a person suffering from severe depression, for example, who is unable to function in society or deal with simple life issues. To be depressed requires self-awareness, and while self-awareness itself may be adaptive it may allow the maladaptive ability to suffer.

43 Sweeny, T.D., Grabowecy, M., Suzuki, S. & Paller, K.A. 'Long-lasting effects of subliminal affective priming from facial expressions', *Consciousness and Cognition*, (2009) 18, 929-938.

44 Linking autonomic responses to emotions in humans is an active area of research, see chap.5 of Keltner, D., Oatley, K. & Jenkins, J.M. *Understanding emotions*, Hoboken, NJ: John Wiley & Sons, Inc. (2013); for animals see also Dawkins, M.S. 'A user's guide to animal welfare science', *Trends in Ecology and Evolution* (2006) 21, 77-82.

45 Blood, A.J. & Zatore, R.J. 'Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion', *Proceedings of the National Academy of Sciences* (2001) 98, 11818-11823.

distinguish between the causes of the response. Similarly, while changes in brain chemistry, particularly levels of serotonin and oxytocin, have been studied in relation to emotional states in humans, these relationships are not yet fully understood.⁴⁶ This means that simply measuring neurophysiological responses in animals is unlikely to provide a definitive answer to the question of whether animals suffer. That animals experience such neurophysiological changes is well established (see, for example, a study of hunted red deer).⁴⁷ As it is difficult to know what observable neurophysiological evidence to look for in ourselves to determine whether someone is subjectively experiencing suffering, it is unsurprising that it is very difficult to know what evidence to look for in other species that would conclusively settle the question.

A related approach is to examine neurophysiological similarities in human and animals where, for instance a study of comparative brain anatomy led by McPhail⁴⁸ concluded that only humans are conscious, whilst a study by Baars⁴⁹ concluded that at least all vertebrates are. Here the issue of consciousness impinges on whether suffering can be experienced by animals in the same way as humans. Craig, commenting on animal models of pain, states, "The inescapable truth is that pain in humans is indeed a subjective experience. The available evidence indicates that neither rodents nor monkeys can experience feelings in the same way that humans do."⁵⁰ These studies illustrate that there is a range of scientific views on how similar animals and humans might be in terms of their experience of suffering. Further studies have been carried out using MRI and similar techniques to try to compare human and chimpanzee brains, but this work is in its infancy and conclusive results are still to come.⁵¹ Thus the neurophysiological evidence to date is inconclusive and may need the development of new techniques before more can be contributed to this discussion.⁵²

46 See e.g. Miller, G. 'The promise and peril of oxytocin', *Science* (2013) 339, 267-269; and chap.6 Keltner et al., *op. cit.*, (44).

47 Bateson, P. & Bradshaw, E.L. 'Physiological effects of hunting red deer (*Cervus elaphus*)', *Proceedings of the Royal Society of London* (1997) B 264, 1707-1714.

48 McPhail, E.M. *The evolution of consciousness*, Oxford: Oxford University Press (1998).

49 Baars, B.J. 'There are no known differences in brain mechanisms of consciousness between humans and other mammals', *Animal Welfare* (2001) 10, S31-S40.

50 Craig, A.D. 'A rat is not a monkey is not a human', *Nature Reviews of Neuroscience* (2009) 10, 466.

51 See Cohen, J. 'The inner workings of the chimpanzee brain', *Science* (2010) 328, 40- 41. It may be that obtaining conclusive results from comparative MRI scans of human and chimpanzee brains may prove elusive.

52 For more on this point see Dawkins *op. cit.*, (2b).

Behavioural evidence

The problem of consciousness arises again when considering behavioural responses. Some extremely complex behaviours can be carried out both consciously and unconsciously. For example, driving a car can be done on 'autopilot' with no recollection of the journey – a common experience for many drivers. Another example is playing a musical instrument; an ability that, once mastered (with conscious effort), can be done with little conscious thought. Indeed, being 'lost in the music' may elicit a finer performance from the musician. These are examples of what Dawkins describes as multiple routes to the same behaviour, only some of which are conscious.⁵³ A further complication is that apparently complex outcomes can arise from simple rule following. One of us plays chess and occasionally plays against his computer (which often wins), but the computer is simply following a set of rules and in no way can be regarded as being conscious. Yet it demonstrates complex 'human-like behaviour' that surpasses the abilities of any animal (no one has yet taught an animal to play chess to our knowledge). With these caveats in mind let us consider the behavioural evidence for animal suffering.

Animal behaviour has been extensively studied in the context of animal welfare. An animal's emotional states are often thought to be defined by what animals find positively or negatively reinforcing. So behavioural responses to given situations, for example, seeking to escape from something found unpleasant, can be tested experimentally by giving animals choices. The animals' responses may or may not be accompanied by subjective feelings of pleasure or suffering – this is impossible to determine from this type of experiment. It is important to note that choice per se is no evidence of sentience.⁵⁴ Plants grow towards light and bacteria respond to chemical gradients by moving (chemotaxis)⁵⁵ but we would not consider either plants or bacteria sentient.

Consider a classic experiment on self-medication in chickens.⁵⁶ Given a choice of feeding from two feeders, one containing an analgesic mixed in with the food, lame chickens preferentially eat from the one with the analgesic (presumably to relieve their pain). Chickens that aren't lame show no preference for one food source over the other. This suggests an awareness of pain and a desire to relieve it (avoidance of suffering). However, a non-conscious explanation of the observations is possible. Dawk-

⁵³ Dawkins *op. cit.*, (2a).

⁵⁴ Dawkins *op. cit.*, (8).

⁵⁵ Sourjik, V. & Wingreen, N.S. 'Responding to chemical gradients: bacterial chemotaxis', *Current Opinion in Cell Biology* (2012) 24, 262-268.

⁵⁶ Dawkins *op. cit.*, (44).

ins⁵⁷ example is that of car programmed to fill itself up with several kinds of lubricants, based on which in the past had been shown to result in the lowest fuel consumption. The car could then be said to find one lubricant more 'rewarding', that is, more likely to be ingested in the future, but we would not consider the car to be conscious.⁵⁸

Behavioural evidence that animals experience suffering exists for apes and elephants in the wild, as well as for the domesticated animals (for example, chickens, pigs). Douglas-Hamilton and co-workers describe the behavioural reactions of a herd of elephants towards a dying or deceased matriarch.⁵⁹ They observed elephants exhibiting traits, like humans do, of rendering assistance to the ailing and showing special interest in the dead bodies of their own kind. They conclude that, 'It is an example of how elephants and humans may share emotions, such as compassion, and have an awareness and interest about death.' De Waal describes similar behaviour in primates. After describing how chimpanzees protect injured individuals and clean their wounds, he concludes, 'Does this indeed prove that chimpanzees have empathy, and, by extension, that other injury-cleaning mammals do too? Unfortunately, the tending of wounds per se tells us nothing about the underlying mental processes.'⁶⁰ Clearly such evidence is suggestive rather than conclusive in terms of being analogous to human behaviour. A counter-example is quoted by Wall, who notes that, 'when an old deer is culled by shooting and drops dead, the other members of the herd briefly startle but then continue grazing and ignore the corpse'.⁶¹ This suggests a lack of response to suffering and death.

The major problem with much of the behavioural evidence is that it is ambiguous and open to more than one interpretation.⁶² While such evidence is useful in helping us determine how we might treat animals better, it does not conclusively prove or disprove any assertions about ani-

57 Dawkins *op. cit.*, (44).

58 Of course, there are some who argue that human beings self-conscious awareness may be an after-the-fact explanation rather than a causal force. This issue is explored by Peter Clarke in Faraday Paper no. 17 *The Libet experiment and its implications for conscious free will* (which can be downloaded from http://www.faraday.st-edmunds.cam.ac.uk/resources/Faraday%20Papers/Faraday%20Paper%2017%20Clarke_EN.pdf).

59 Douglas-Hamilton, I., Bhalla, S., Wittemyer, G. & Vollrath, F. 'Behavioural reactions of elephants towards a dying and deceased matriarch', *Applied Animal Behaviour Science* (2006) 100, 87-102.

60 De Waal, F. *Good natured: the origins of rights and wrong in humans and other animals*, Cambridge, MA: Harvard University Press (1996). p. 58.

61 Wall *op. cit.*, (7), p. 12.

62 On a related point Thornton, A. & McAuliffe, K. 'Teaching in wild meerkats', *Science* (2006) 313,227-229 note that 'teaching can be based on simple mechanisms without the need for intentionality and attribution of mental states' (p. 229). It is anthropomorphising to attribute mental states when observations of animal behaviour could be explained by simpler mechanisms (recall 'Morgan's Canon').

mals' suffering like us. This is not inconsistent with similar conclusions more famously highlighted by Thomas Nagel – to paraphrase – we will never know what it is like to be a bat.⁶³

Evolutionary evidence

From an evolutionary perspective, our similarity to other great apes (*hominidae*) suggests that some degree of consciousness might be expected in our close animal relatives. However, even here it is unclear how close the similarity must be for the argument by analogy to hold. Thus Bermond⁶⁴ argues that a prefrontal cortex (PFC; in evolutionary terms the most recent brain region) is a prerequisite for the experience of pain as an emotion, or suffering – on this basis, suffering in animals would be confined to great apes, as only they show a well-developed PFC. He notes that other mammals also have PFCs, but some parts of the PFC are specific to humans. However, it is worth noting that there are significant differences between humans and the great apes,⁶⁵ so it is by no means obvious that the possession of a PFC will lead to a similar response in terms of suffering.

In pursuing his argument, Bermond⁶⁶ further notes that irreflexive consciousness and suffering do not go together – suffering and pain which is experienced as unpleasant is an emotional experience, and reflection is necessary for such experiences. In contrast, the simple perception of pain, which does not induce suffering, is possible with an irreflexive consciousness. This again touches on the 'hard problem' of consciousness.

It should also be noted that the regulation of pain behaviour at the spinal cord level evolved much earlier than that for a conscious response. This means that animals can respond to pain stimuli in cases where no conscious response can be possible. Allen gives examples of this in two of his papers. First, rats with severed spinal cords, so that no information reaches their brains, still show a learning response to noxious stimuli (electrical shocks to their hind legs) that must therefore be being controlled by the spinal cord, resulting in adaptive changes in behaviour.⁶⁷ Second, a headless alligator's forelimbs will swipe quite precisely at the point of a scalpel incision by means of a spinal reflex.⁶⁸ From an evolution-

63 Nagel, T. 'What is it like to be a bat?' *Philosophical Reviews* (1974) 83, 435-450.

64 Bermond *op. cit.*, (13).

65 See e.g. Penn et al., *op. cit.*, (23); also discussion in Taylor, J. *Not a chimp*, Oxford: Oxford University Press (2009), esp. chap. 10 'Inside the Brain – the Devil is in the detail', and Tallis, R. *Aping Mankind: neuromania, Darwinitis and the misrepresentation of humanity*, Durham: Acumen Publishing Ltd (2011).

66 Bermond *op. cit.*, (13).

67 Allen, C. 'Animal pain', *Nous* (2004) 38, 617-643.

68 Allen, C. 'The discovery of animal consciousness: an optimistic assessment', *Journal of Agricultural & Environmental Ethics* (1998) 10, 217-225.

any perspective natural selection leads to behavioural mechanisms that help ensure the survival of the body, which is adaptive. However, such adaptive responses could be the result of simple rules (perhaps operating at the spinal cord level) or conscious choices, but the behavioural outcome would appear similar. As Dawkins notes,⁶⁹ ‘the fact that we share many physiological mechanisms and behavioural responses with other species, particularly mammals, cannot be used as conclusive evidence that they share our conscious experiences, too’.

One issue, apparently not addressed by Bermond⁷⁰ but raised by Dawkins,⁷¹ is his implicit assumption that a particular brain structure is necessary for consciousness. It could be that in species very different to humans other brain pathways using different brain structure could give rise to consciousness (an argument that might be supported by the idea of ‘convergent evolution’ – that is, similar evolutionary ends can be achieved by different evolutionary pathways).⁷² An example would be octopuses (cephalopods), whose neural structure is very different to that of human beings but who are thought to exhibit intelligence.⁷³

Opposing conclusions?

The scientific evidence that we have reviewed above leads different authors to opposing conclusions. After consideration of the evidence Bermond concludes: ‘Rejoice! Rejoice! For there is far less animal suffering than our anthropomorphic minds are inclined to believe.’⁷⁴ While after her consideration of the evidence Dawkins’ conclusion is somewhat different: ‘Personally, I do believe that many animals subjectively experience suffering but I also believe that my own belief is not scientific and I would not attempt to justify it on scientific grounds.’⁷⁵

After considering the scientific research that has been done to date, our own conclusion is that the empirical evidence leads us into arguments identical to those in the philosophical literature surrounding the hard problem of consciousness. As such a clear answer is not possible at this

69 Dawkins *op. cit.*, (8).

70 Bermond *op. cit.*, (13).

71 Dawkins *op. cit.*, (8).

72 On convergent evolution see e.g. Conway Morris, S. *Life’s solution*, Cambridge: Cambridge University Press (2003).

73 Mather, J.A. ‘Cephalopod consciousness: behavioural evidence’, *Consciousness & Cognition* (2008) 17, 37-48; Mather, J.A. ‘To boldly go where no mollusc has gone before: Personality, play, thinking, and consciousness in cephalopods’, *American Malacological Bulletin* (2008) 24, 51-58; Zullo, L. & Hochner, B. ‘A new perspective on the organization of an invertebrate brain’, *Communicative & Integrative Biology* (2011) 4, 26-29.

74 Bermond *op. cit.*, (13).

75 Dawkins, M.S. ‘The science of animal suffering’, *Ethology* (2008) 114, 937-945.

point in time⁷⁶ (and some say may never be possible).⁷⁷ We note however that this should not be taken as *carte blanche* to ignore the needs of animals – irrespective of whether those animals are domesticated, wild or being studied in the laboratory.

A brief reflection on why Christians should treat animals well

Where does the above review of the scientific evidence for animal suffering leave us in terms of a Christian response? Here a brief reflection is provided as a possible starting point for developing a fuller theological response.

Looking at the Bible overall, and the New Testament in particular, we see that it is future-orientated (eschatological).⁷⁸ This future orientation is relevant to the problem of evil and suffering (animal and human); as Wright notes ‘the ultimate answer to the problem of evil is to be found in God’s creation of a new world, new heavens and new earth, with redeemed, renewed human beings ruling over it and bringing to it God’s wise healing order.’⁷⁹ This gels with one aspect of Southgate’s approach, namely the future fate of animals as explored in his chapter ‘Heaven for pelicans?’⁸⁰ We note that biblical passages such as Isaiah 11:1-9 and 65:17-25 while perhaps poetic imagery – ‘the wolf will live with the lamb’ – are also more than just poetic. They are indicative of the peace of God coming in the animal kingdom in the new creation (even if it is difficult to be specific as to what that means in detail with regard to animals on a renewed Earth).⁸¹

76 In this respect, despite being 27 years on, our conclusions do not differ significantly from those of Rose, M. & Adams, D. ‘Evidence for pain and suffering in other animals’, chap. 3: 42-71 in Langley, G. (ed.) *Animal experimentation*, Basingstoke: MacMillan Press (1989).

77 An interesting anecdote about David Livingstone (nineteenth century medical missionary in Africa) is provided by Jackson, M. *Pain: the science of why we hurt*, London: Bloomsbury Publishing plc (2005), pp. 281-282: Livingstone was attacked by a lion, survived and made the following observation about his experience, ‘The shock produced a stupor similar to that which seems to be felt by a mouse after the first shake of the cat. It caused a sort of dreaminess, in which there was no sense of pain nor feeling of terror, though [I was] quite conscious of all that was happening. It was like what patients partially under the influence of chloroform describe who see all the operation but feel not the knife. This singular condition was not the result of any mental process. The shake annihilated fear, allowed no sense of horror in looking round at the beast. This peculiar state is probably produced in all animals killed by carnivora; and if so, is a merciful provision by our benevolent Creator for lessening the pain of death.’ Of course, whether non-human animals have similar experiences in such circumstances is impossible to determine (it is difficult to conceive of an ethical experimental test).

78 Wright, N.T. *Surprised by hope*, London: SPCK (2007) and Ladd, G.E. *The presence of the future*, Grand Rapids: William B Eerdmans Publishing Co. (1996).

79 Wright, N.T. *Evil and the justice of God*, London: SPCK (2006).

80 Southgate *op. cit.*, (4), chap. 5.

81 John Wesley certainly expected animals to be part of the new creation and saw this as an answer to their suffering in this present age. See his Sermon 60 on Romans 8:19-22 ‘The general deliverance’. Interestingly, both Southgate *op. cit.*, (4), p. 78 and Murray *op. cit.*, (4), p. 123 make reference to Wesley’s views.

This is foreshadowed perhaps in Jesus's peaceful encounter with the wild animals in the wilderness (Mark 1:13).⁸²

How then should we treat animals in the present in light of this future-oriented (eschatological) perspective? Since the concept of thinking and living eschatologically may not be familiar we briefly describe it here.⁸³ Focusing on the end (*eschaton*) should affect our behaviour (ethics) in the here and now, as it holds forth a picture of a future reality which has already begun through Jesus's death, resurrection, ascension and sending of the Holy Spirit (the 'now and not yet' aspect of the kingdom of God).⁸⁴ It is inconsistent for believers to act as if this future hope had no present relevance. Christians aim to realise the prayer, 'your kingdom come, your will be done on Earth as it is in heaven' (Matt. 6:10). This means that we are working in the present for an Earth that reflects the coming new creation, in part, because of the continuity between this world and the one to come (Rom. 8).⁸⁵ The expectation is that the new creation will be just that, a new creation (including animals) and not just a new humanity.⁸⁶ There is both continuity and discontinuity between the present creation and the new creation, just as there is between our present bodies and our resurrection bodies. The latter is exemplified in Jesus, whose resurrection body was clearly both different from, yet similar to, his mortal body (Luke 24:13-49; John 20:19-29). Therefore, how we live now and how we treat God's Earth and the creatures on it, will affect the new creation to come, and this should shape our thinking and our behaviour in the present.

This obligation to live in light of the future needs to be worked out in terms of the tension that exists in relation to the continuity/discontinuity between this world and the renewed Earth. Therefore, we need to look carefully at what the Bible says with regard to that continuity/discontinuity⁸⁷ and that is considered here briefly with respect to animals.

82 On this passage see Bauckham, R. 'Jesus and animals II: what did he practice?', pp. 49-60 in Linzey, A. & Yamamoto, D. (eds.) *Animals on the agenda: questions about animals for theology and ethics*, London: SCM Press Ltd (1998).

83 Srokosz, M.A. 'God's story and the Earth's story: grounding our concern for the environment in the biblical metanarrative', *Science & Christian Belief* (2008) 20, 163- 174 and Wright, *op. cit.*, (78).

84 On the 'now and not yet' of the kingdom of God see the reprinted, and now classic text, Ladd, *op. cit.*, (78).

85 On the continuity/discontinuity between the present creation and the new creation see Stephens, M.B. *Annihilation or Renewal: The Meaning and Function of New Creation in the Book of Revelation*, Tübingen: Mohr Siebeck (2011).

86 The presence of animals in the new creation has most recently been discussed by Snyder, H.A. & Scandrett, J. *Salvation means creation healed: the ecology of sin and grace*, Oregon: Cascade Books, Eugene (2011), and references therein.

87 As noted by one of the referees, marriage will not exist on the renewed Earth (Matt. 22:30) but that is not necessarily a reason for advocating celibacy in this life. Clearly, God intends marriage for this world (Gen. 1 & 2) but not the next (Matt. 22:30). Similarly, in considering animals we need to examine the scriptures to tease out the continuity/discontinuity

Whatever our view of animal theodicies or other ways of explaining the suffering of animals and the scientific evidence, our responsibilities seem clear. Living in the light of God's future purpose for his creation⁸⁸ means that we are to care for animals and other creatures just as God does (e.g. Ps:104:16-28; 147:9). This means that we must take seriously Jesus's peaceable interactions with the wild animals (Mark 1:13) and Isaiah's vision of a peaceable future kingdom (Isa. 11:1-9; 65:17-25). Are we aiming to live at peace with the wild animals? How is that to be accomplished? Perhaps as a starting point we should be concerned about the reduction in the habitats available to wild animals across the globe. In addition, we should express concern about the needless exploitation of wild animals, such as the slaughter of elephants for their tusks, rhinoceroses for their horns and tigers for their bones (there are many other examples).

In a scientific context there is the issue of whether or not it is right to use animals in laboratory experiments and in what circumstances. In what way should our practice as scientists reflect God's coming kingdom? We do not propose any easy answers to such questions here. As a minimum requirement, Proverbs 12:10 tells us 'the righteous care for the needs of their animals,' so at the very least the Bible requires us to look after domesticated animals and so Christians should have a concern for animal welfare. Practically, this might affect the choice of experiments that we do as scientists or the food we buy and eat.⁸⁹ If we are to be the image of God in creation⁹⁰ we need to care for the whole of it, as he does. The challenge is: do we?

Conclusions

When we started writing this article we thought that the scientific evidence would enable us to answer the question of whether animals suffer like us. However, as can be seen from the review of key aspects of the science, matters are rather more complex than we expected. The main conclusion that can be drawn from the scientific evidence is that the problem of animal suffering is remarkably similar, if not identical, to that of the hard problem of consciousness. Wittgenstein's aphorism, 'If a lion could

issues and some pointers are given here, but not a complete biblical theology (see Snyder & Scandrett *op. cit.*, (86) for more on this point).

88 On this approach see Srokosz *op. cit.*, (83) and Wright *op. cit.*, (78).

89 This is not the place for an extended discussion of the issue of vegetarianism, nor of ethical shopping for food, but they are issues worth thinking about further. Note that in Gen. 9:3 God gave permission for humans to use animals for food in this world, but it is unclear what provision will be made for food on the renewed Earth. Feasts (Matt. 22:1-14; 25:1-13) and fruit (Rev. 22:2) seem to play a part.

90 For more on the image of God and how this relates to animals see Moritz, J.M. 'Animals and the image of God in the Bible and beyond', *Dialog* (2009) 48, 134-146.

talk, we could not understand him' may be relevant here.⁹¹ Can we ever really expect to understand what animals feel if we cannot tell whether they are self-aware like us? Furthermore even if animals could talk, would we be able to understand their experiences, which differ significantly from our own – we have enough trouble understanding members of our own species at times! Another difficult question is: how much do we project our own experiences onto animals? We do this often, and quite often incorrectly, with other human beings. Is it likely that we will do better with animals? Interpretation of the scientific evidence is clearly coloured by a priori beliefs and by our tendency to anthropomorphise, from which we ourselves do not claim to be immune. It may be that advances in neurophysiology, behavioural science, evolutionary theory and the study of consciousness will eventually allow a conclusive answer to the question of animal suffering, but for now the best that can be said is that we don't know. It would appear that Darwin's confident assertion that 'the fact that the lower animals are excited by the same emotions as ourselves is so well established...' was made prematurely and that considerable work is required to determine whether or not this is the case scientifically.

In terms of our (Christian) response to the question of animal suffering, even if the scientific evidence is inconclusive, it seems clear that humanity is biblically mandated to care for God's creation. Therefore, our response should be to care about the welfare of God's creatures in God's creation. This implies that our aim should be to minimise any potential for suffering,⁹² not on a utilitarian basis (a calculus of suffering being an impossible calculation), but out of love for God and care for his creation. We do this in the hope and anticipation of the new creation – a new heaven and new earth – where suffering will be no more.⁹³

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91 See also Nagel, *op. cit.* (63).

92 It is beyond our human abilities to eliminate the potential for animal suffering.

93 Rev. 21:4; Rom. 8:18-23.