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What Is Suffering and What Sorts of Beings Can Suffer?

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Everyone who is reading this chapter has experienced suffering and knows that suffering is a bad thing. It is bad in the sense that, just considered in itself, it makes things go worse for the subject. Suffering decreases one's experiential welfare or quality of life for as long as it persists—even if it sometimes has longer-term benefits such as growth of character or perspective. Assuming for the moment that animals can suffer, suffering is the object of the interest that is most straightforwardly attributed to them: an interest in avoiding suffering. Whether animals have an interest in remaining alive (as opposed to having a good quality of life while alive), in being free (independently of freedom's effects on quality of life), or in engaging their natural capacities (again, independently of effects on quality of life) is somewhat controversial because one might hold that their good or well-being consists entirely in experiential welfare. Yet, even if that reductionist view of animal well-being is correct, the avoidance of suffering is unquestionably a central interest of animals—a central aspect of their welfare. Suffering is intrinsically bad for any subject who can suffer.

But what, exactly, is suffering? And what sorts of creatures are capable of suffering? This essay addresses these questions. It opens with a conceptual investigation of suffering and distinguishes broad and narrow conceptions. The section that follows addresses what sorts of beings can suffer in the narrow, more restrictive sense of the term. It is argued that if we provisionally set aside radical skepticism about animal consciousness (a position addressed later), there is a strong empirical case for the proposition that many animals, and not only mammals, are capable of suffering in this restricted sense. But insofar as the broader conception of suffering

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proves fundamental for moral purposes, the paper proceeds in the next two sections to ask what sorts of creatures can suffer in this sense. In the first of those two sections, a substantial empirical case is sketched for the thesis that animals from a wide array of species (at least mammals, birds, reptiles, amphibians, and some fish) are sentient, or have the capacity for consciousness, and are therefore capable of suffering in the relevant sense. In the next section, a radical skeptical challenge invoking a higher-order thought theory of consciousness is presented and rebutted. The conclusion is that there is ample reason to believe, and little reason to doubt, that animals representing a wide range of species are capable of suffering in the broad sense of this term. A brief coda considers implications for bioethics.

Before proceeding, it might be helpful to say more about the motivations for this paper. One motivation, purely intellectual, is to help clarify a concept whose meaning may be unclear because of varying uses of the term *suffering* and the subtle relationship between suffering and other mental states and capacities. A second, more practical motivation is to combat two types of intellectual mischief that can interfere with the important objective of reducing animal suffering. The types of intellectual mischief that I want to neutralize are (1) emphasizing a distinction between suffering and pain, and claiming that (a) animals cannot suffer and (b) pain without suffering is trivial; and (2) contending, more radically, that animals entirely lack conscious life and therefore cannot even feel pain. The intended result is that commonsense attributions of morally significant experiences to animals will be seen to enjoy the support—rather than the opposition—of science and philosophy.

What Is Suffering?

To determine what sorts of beings can suffer, we have to know what we're looking for. So, what is suffering? There is no simple answer to this question because the term is used in different ways. In what we might call the objective sense of the term, suffering is roughly equivalent to misfortune. More precisely, the verb *to suffer* is treated as transitive: one suffers a misfortune. Now, one can suffer a misfortune without being aware of it, say if one's house is destroyed while one is away on vacation; and such a possibility highlights the distinction between this objective sense of suffering and the subjective sense that will be our topic. In the subjective sense, *to suffer* is an intransitive verb: one suffers, period, rather than suffering something. Such suffering is subjective in the sense of mind dependent: suffering is a type of mental state or occurrence. Moreover, suffering is consciously experienced, which is why it automatically lowers one's quality of life while it occurs. If suffering could occur without one's feeling it, it would not have this tight conceptual tie to experiential welfare.

Suffering in this subjective sense (the only sense I will discuss for the remainder of this paper) is an *unpleasant* mental state. What more can be said in unpacking the concept? That depends on the specific conception one embraces.

On a broad construal of the concept articulated by Jamie Mayerfeld, to suffer is, roughly speaking, to feel bad.¹ Refining the concept, he proposes that suffering is a disagreeable *overall* feeling—where the qualification is included to account for the fact that good and bad feelings can occur in a subject simultaneously.² One might, say, feel elated upon receiving good news despite having just painfully bumped one's knee; here, presumably, one would not suffer. But our ordinary concept of suffering suggests that mild disagreeable feelings, even overall disagreeable feelings, such as slight boredom or slight impatience, do not amount to suffering. Thus, Mayerfeld proposes that suffering be understood (for most purposes) as a *more-than-mild* disagreeable overall feeling; yet, for other purposes, such as thinking about where an individual falls on a hedonic scale of overall feeling, he employs the term *suffering* to cover the entire negative portion of the scale.³ We therefore have two relatively broad conceptions of suffering. According to one, suffering is any more-than-mild disagreeable overall feeling. According to the other, suffering is *any* disagreeable overall feeling. An even broader conception is possible: suffering is any disagreeable feeling, period. On this broadest of conceptions, any pain or feeling of discomfort, nausea, or distress would count as suffering. Although the breadth of this conception clearly exceeds that of our ordinary concept of suffering, it is useful in considerations of welfare to have an umbrella term for the entire range of disagreeable or unpleasant experiences. Suffering, on this conception, covers any experience that registers negatively for the subject just on account of how it feels.

In contrast to these broad conceptions, suffering is often construed more narrowly as an experience that is intense, attributable to the subject as opposed to a body part (unlike sensory pain and bodily discomfort), and more emotional than sensory.⁴ One might claim that suffering is not really an emotion because it does not orient the subject for a particular type of adaptive action (as, say, fear orients one to escape danger and anger orients one to retaliate).⁵ Addressing that matter would require defending a particular theory of emotions, something I am reluctant to do. In any case, it seems accurate to say that suffering in a relatively narrow sense is an *emotional state*. By this I mean that, in suffering, the subject makes a cognitive appraisal of her overall situation in evaluative terms.⁶ Although such evaluative terms are relatively sophisticated in the case of some emotions, such as guilt ("I did something wrong") and anger ("He wronged me [or someone I care about]"), in the case of suffering, the evaluative terms may be quite primitive, involving only reference to the subject's own welfare ("This is terrible for me") or to the present situation ("This is terrible"), which affects his welfare. If I am correct in conjecturing that prelinguistic human beings are capable of having such thoughts in nonlinguistic form, then lack of linguistic capacity does not preclude one's having emotional states.

Along the lines of what I am calling a narrow conception, Eric Cassell has influentially defined suffering as a "state of severe distress associated with events that threaten the integrity of [a] person."⁷ He explicitly states his view regarding

what sorts of subjects are capable of suffering: “Only persons suffer.”⁸ Cassell’s analysis is motivated by such observations as the following. Whether and how much one suffers—in this narrower sense that clearly distinguishes suffering from (sensory) pain—can vary in accordance with attitudes or expectations about whatever pain or distress one is in and the context in which it occurs. Even the pain of a mild headache can lead to great distress and suffering if the pain endures with no end in sight, or if the subject believes the headache to be a sign of impending physical collapse. Conversely, soldiers have sometimes received major injuries yet apparently suffered little because of the relief of anticipated removal from battle or positive attitudes about the heroic context in which injuries were incurred. Distance runners who experience pain and discomfort in a race may or may not suffer, or may suffer more or less, depending on such psychological factors as how they evaluate their performance and whether they are confident or fearful about the remainder of the race. Thus, any *meanings* one assigns to one’s situation, as well as one’s expectations for the future, are critical determinants of whether and how extensively a subject suffers.

When Cassell speaks of threats to integrity, he uses “integrity” in the sense of wholeness. The idea is that suffering involves a response to a sense that *the subject herself* is threatened in a substantial way—as when a persisting headache is understood to threaten physical doom or psychological collapse, or a troubled effort in a competition is taken to mean that one may well fail.

Suffering bears a close relationship to distress. Distress, which includes a wide variety of psychological phenomena, may be understood as a typically unpleasant emotional response to the perception of environmental challenges or to equilibrium-disrupting internal stimuli.⁹ It may be caused by such diverse phenomena as the sight of a predator, the belief that one may fail, or diarrhea. The precise relationship between distress and suffering is a subtle matter. Perhaps suffering is a form of severe distress, as Cassell claims. Or maybe suffering is distinguishable from distress but closely associated with it, as in the idea that one can suffer in response to distress. One might be nervous, notice one’s heartbeat, and fly into a panic attack. We might describe this as suffering (the panic attack) as a response to distress (nervousness). I suppose we could equally well describe it as mild distress growing into severe distress, consistent with the idea that suffering is a form of distress. In any case, the conceptual difference between these two ways of specifying the relationship between distress and suffering will have no significant bearing on our investigation.

In addition to having some close relationship to distress, suffering is also closely related to pain, even if (on the present, narrow conception of suffering) it is clearly distinguishable from pain. In a helpful summary statement, Cassell notes that “... people in pain frequently report suffering from pain when they feel out of control, when the pain is overwhelming, when the source of the pain is unknown, when the meaning of the pain is dire, or when the pain is apparently without end.”¹⁰ Suffering here involves an emotional response to the experience of pain. To

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be a response to pain, of course, requires being distinct from pain. Authors who underscore this distinction often claim that suffering requires self-awareness.¹¹ If suffering necessarily involves attitudes towards the future—in particular, one's own future—it makes sense to specify that suffering requires *temporal* self-awareness, an awareness of oneself as persisting over time. If we add to this claim the traditional assumption that only *persons* are self-aware, we arrive at Cassell's thesis that only persons suffer.

Later, I will consider evidence suggesting the great implausibility of this thesis. For now, it is worth considering what the thesis—which some, like Cassell, build into the very definition of suffering—implies. Assuming the concept of a person is defined in terms of psychological capacities, and in such a way as to exclude all or nearly all nonhuman animals, then a person is (roughly) a being who has the capacity for relatively complex forms of consciousness as found in normal human beings of, say, two years or older.¹² With this understanding of personhood, the thesis that only persons can suffer implies that a human infant on whom scalding water is poured does not suffer. Nor does the dog who is left unanesthetized during hours-long surgery or who is slowly tortured by a sadist. I find these implications very hard to believe. But the empirical evidence bearing on this question will prove indispensable to any confident judgment.¹³

In delineating the narrow conception of suffering, it seems fairly plausible to say that all and only beings capable of highly unpleasant emotional states can suffer. Whether the assignment of meaning is necessary for suffering is a question we may leave open. For those who do assign meaning to their circumstances, this factor plays a major role in whether and to what extent they suffer. But perhaps the assignment of meaning is not a necessary condition. Insofar as it may be possible for a young infant devoid of temporal self-awareness to suffer from scalding water or the like, it is also debatable whether any temporal self-awareness is necessary for suffering.¹⁴ At the same time, such self-awareness may be necessary for particular types or manifestations of suffering, such as miserable remorse for a past action or agonizing dread of a future possibility. A being devoid of temporal self-awareness cannot have suffering related to remorse or dread yet may be capable of suffering in a more cognitively primitive way—although, again, even the latter claim is disputable.

One thing that is clear is that suffering, in the narrow sense under consideration, requires strong affect. This is consistent with Cassell's characterization of suffering as a state of *severe* distress. And it is consistent with the observation that mild pain typically doesn't occasion suffering and that even great pain doesn't if the subject does not become very emotional or distressed. I therefore suggest this working definition: *suffering is a highly unpleasant emotional experience associated with significant pain or distress*. Saying "associated with" bypasses the conceptual issue of whether suffering is a form of distress. Mentioning pain is worthwhile insofar as pain so often occasions suffering. Requiring that either pain or distress must be significant accurately accommodates our judgments about when suffering (in the

narrow sense) occurs. For example, while it is true that one can suffer from even mild pain if it is sufficiently long-lasting, or is interpreted as signifying one's doom, it is also clear that in such a case, one's distress would be significant.

Having now analyzed suffering both in a very broad sense and in a narrow sense, we may turn to the question of what sorts of creatures can suffer, beginning with suffering in the narrow sense just sketched.

What Sorts of Beings Can Suffer In the Narrow Sense?

What sorts of creatures can suffer in the sense of experiencing a highly unpleasant emotional state associated with significant pain or distress? My contention is that if we bracket radical skepticism about animal consciousness in general (a position I will address later), there is a strong case that many animals can suffer in this narrow sense. I have in mind at least all mammals, probably birds, and quite possibly other vertebrate species. Of course, to say that these nonhuman animals can suffer in this sense is not to claim that all beings capable of suffering can suffer in precisely the same ways (or to the same degree). Perhaps a relatively broad range of animals, as well as human infants, can suffer in being miserable in some cognitively uncomplicated way. Only those beings with temporal self-awareness can suffer in a way involving guilt or dread. Presumably only persons can suffer existential angst at the possible nonexistence of a deity or the likely eventual extinction of the human race. Thus, to claim that a certain type of creature can suffer in the narrow sense is simply to claim that that type of creature can suffer in *some* way that meets the relevant criteria. The same point applies to suffering in the broad sense, which we will consider later.

What considerations support my assertion that many nonhuman animals can suffer in the narrow sense? First, it is a plausible thesis that many animals experience emotions. (Remember that suffering in this sense is an emotional state.) While the emotional life of animals may be impoverished in comparison with ours, there are strong grounds for believing that many animals experience fear at the perception of a threat, anxiety in unfamiliar settings in which vigilant alertness is adaptive, and surprise when expectations are suddenly dashed and reorienting one's perceptions is the thing to do.¹⁵ Some social animals apparently experience sadness at the loss of close associates and a sort of primitive anger when they or their dependents are harmed or threatened by others against whom retaliation is possible. On the positive side of the emotional spectrum, the behavior of some animals gives the irresistible impression of expressing contentment, gladness, sometimes even joy. To focus our discussion, let us concentrate on fear, which may be the most primitive and widely experienced emotion among animals.

Along with anxiety, anger, sexual arousal, and several other states, fear is associated with the autonomic sympathetic nervous system, which is designed for action (or preparation for action, which may involve temporary inhibition)

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in what might broadly be called *emergency* situations. Fibers in this nervous system increase heart rate and general arousal while decreasing digestion and other processes associated with rest. Also implicated is the limbic system, comprising a relatively primitive group of structures that are essential to emotion and motivation. Fear is clearly adaptive for animals unable to get by on simple stimulus–response routines. It motivates appropriate, focused, and often flexible responses to perceived dangers.

The adaptive value of fear is evident, providing one reason to think that natural selection might have conferred this emotional capacity on many animals. There is also the fact that much animal behavior appears to be fearful, for example, attempts to flee at the perception of danger. But consideration of behavior, even in the context of careful reflection on natural selection, is not sufficient to attribute fear—or any other emotion—to animals. An unconscious state that functions similarly to an emotion might generate the behavior and confer the adaptive functioning favored by natural selection. We need to consider further evidence.

What, then, about the physiology and neuroanatomy of fear? Nearly all vertebrates—specifically, all jawed vertebrates—have an autonomic sympathetic nervous system, and at least most vertebrate taxa feature a limbic system.¹⁶ Indeed, benzodiazepine receptors, which are believed to be part of the neurochemical substrate that mediates *anxiety*, have been found in nearly all vertebrate species investigated.¹⁷ (The exception was a cartilaginous fish; the three bony fishes studied had the receptors.) I am assuming that evidence for the capacity for anxiety would a fortiori count as evidence for the capacity for fear. Of course, to say that a particular animal such as an amphibian experiences fear or anxiety is not to say that its fearful or anxious states are as cognitively complex as corresponding human or even mammalian states; it is, however, to say that the attributed emotional states are consciously experienced.

How confident should we be that the presence of these systems and apparently fearful behavior in animals indicate actual fear, a consciously felt emotion? In a later section, I will address radical skepticism about animal consciousness. For now, it is worth noting a few further points about neuroanatomy. First, all mammals have a neocortex, the very thin six layers of gray matter that surround the deeper white matter of the cerebrum. Many experts believe that the neocortex is critical to consciousness in humans and, presumably, other mammals. While only mammals have a neocortex, birds, reptiles, and to some extent amphibians have a type of cortex (sometimes called a *pallium*), which may play a role in the conscious processing of their experiences. My present claim is not that the experience of fear requires a cortex, a claim that might be doubted in the view of the possibility of different neural structures playing this role in animal taxa (not to mention the presence of benzodiazepine receptors in bony fishes). My point is simply that, even if fear is impossible without a cortex, many vertebrate species possess this piece of equipment.

The forgoing observations suggest that many animals experience fear. Presumably, among these animals, many experience some other emotions. Thus, the fact that suffering in the narrow sense is an emotional state does not present a conceptual or empirical obstacle to the claim that many animals can suffer.

Then again, suffering in the narrow sense is a *highly unpleasant* emotional experience. That means that a subject must be capable of strong affect to be able to suffer. Perhaps some animals who have emotional lives experience only weak or dim affect. The dimmer their conscious experiences in general, the more likely this is the case. So, there may be animals who can experience mild fear, say, but nothing affectively strong enough to call suffering.

But consider this. Among animals who experience emotions, it would be adaptive to experience them to different degrees, roughly corresponding to the extent of urgency in a given situation, so as to motivate behaviors to different degrees. For example, an immediate threat of mortal danger should occasion great fear, whereas a more remote threat of moderate danger should occasion less because it may not be adaptive to react right away in the latter case if one is, say, nursing a child or eating. And, if some animals can be mildly afraid, moderately afraid, or terrified, it is fairly plausible that they can experience distress of different degrees and, when distress is significant, suffering.

It is worth remembering in this context that pain varies in degree and often occasions suffering. In humans, pain perception involves a *sensory dimension*, which informs a subject of the location and intensity of a noxious stimulus, and an *affective-motivational dimension*, which motivates adaptive behavior. It is believed that the anterior cingulate cortex (ACC), a portion of the neocortex, is implicated in the experience of the affective dimension of pain,¹⁸ which is associated with suffering.¹⁹ All mammals have an ACC, strengthening the case that at least they can suffer.

At this point, however, I would like to suggest that suffering in the narrow sense, while very important insofar as it involves *highly unpleasant* experiences, is not the only kind of suffering that should concern us. All unpleasant experience is, by definition, disagreeable or aversive to its subject; all such experience is disliked for the way it feels. So, suffering in the broad sense that covers all unpleasant experience is, in a way, more fundamental than suffering in the narrow sense. I am assuming that there is *some* reason not to cause anyone needless pain or distress regardless of its intensity. (Because pain has not only a sensory dimension but also an affective dimension, I assume that all pain is at least slightly unpleasant.) Pain—even without suffering (in the narrow sense)—matters.

Some may find my insistence that pain matters overly solicitous and perhaps maddeningly impractical. Yet even they should admit that it is far more difficult to attribute *degrees* of unpleasantness than to attribute the occurrence of unpleasant experiences. Thus, we should be interested in knowing what sorts of subjects are sentient and therefore capable of experiencing pleasant and unpleasant experiences.

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And, in the world as we know it, the best way to approach this issue is to ask what sorts of subjects have the capacity for consciousness.

Evidence for Consciousness in Animals

Before we consider evidence for consciousness in animals, we should illuminate our target, for “consciousness” has several meanings. First, consciousness is often distinguished from the state of being asleep or comatose. That one is awake or conscious in this sense—which has been called *creature consciousness*—does not directly entail any subjective mental states because even patients in a persistent vegetative state have sleep–wake cycles. By contrast, what Ned Block dubbed *access consciousness* involves the ability of a creature to detect salient features of its environment or body and use the information in responding appropriately—that is, in a coordinated, non–self-defeating way—in behavior or speech.²⁰ A fish, for example, may visually perceive a predator, gaining access consciousness of its presence, stop eating, and swim away. But the type of consciousness that is most important in this discussion—and the type that philosophers have in mind when using the unqualified term *consciousness*—is *phenomenal consciousness*, which involves subjective, qualitative experiences and not just the processing and coordinated deployment of salient information (as in access consciousness) or the state of being awake (as in creature consciousness). To employ Nagel’s immortal phrase, when one is conscious in this sense, *there is something that it is like* to be one at that time.²¹ It is not part of the concept of phenomenal consciousness that the subject be self-conscious or aware of herself; it is sufficient to be conscious of *anything* in the sense of having subjective, qualitative experiences of something.

The concept of phenomenal consciousness is central to our investigation, and some readers may find Nagel’s definition less helpful than I do, so let me offer a few further remarks in an effort to clarify. Rocks are obviously not conscious in this sense. Neither are plants, which lack a brain or anything functionally similar to a brain. Some, but not all, animals—most obviously, normal human beings—have the capacity for consciousness. Now imagine some sort of animal endowed with a brain that can integrate lots of information about the environment, allowing the animal to respond to environmental contingencies in coordinated ways that enhance its prospects for survival and reproduction. This creature has access consciousness. What more is required to have phenomenal consciousness? The relevant information processing must generate *subjective experience*, which *feels like something*, for the creature to be phenomenally conscious at a given time. (Note that in this context, *feels* and related terms such as *feeling* do not imply affect or emotion; these terms simply offer another way of conveying qualitative, subjective experiences.) Now consider artificial intelligence. Imagine a robot that can move around, take in and integrate information of different kinds about its environment and body, and use that information in performing tasks and avoiding damage from objects in the

environment. What would have to be the case for this robot to have phenomenal consciousness? The robot's information processing would need to generate *subjective experience*, which *feels like something or has qualitative features*. What occurs within the robot, therefore, could not be described in purely quantitative terms. Some qualitative description (e.g., "painful," "fascinating," "familiar seeming") would be necessary to describe its experiences.

Because consciousness in this sense is essentially subjective, it is more difficult to demonstrate rigorously that a creature is phenomenally conscious than it is to show that he is awake or that he has access consciousness. Difficult or not, the attribution of phenomenal consciousness is our primary concern because only this kind of consciousness is closely tied to the suffering in the broad sense—that is, unpleasant experiences. I assume here that something cannot be pleasant or unpleasant unless it is actually *felt*—consciously experienced—and that any creatures endowed with phenomenal consciousness are capable of having at least some pleasant and unpleasant feelings. In other words, I assume that in our world (not all possible worlds), sentient creatures and creatures with the capacity for consciousness are the same set of creatures.

So, how can we know whether animals are phenomenally conscious (hereafter, *conscious*, for short)? One might simply appeal to common sense. If we were to poll the public—asking, "Do you believe that animals are conscious, that they not only react to stimuli, and interact with the world, but typically have subjective experiences in doing so?"—I am fairly sure that nearly everyone would answer affirmatively for a broad class of animals that includes at least the vertebrates. Certainly, our spontaneous perceptions of the behavior of most, if not all, animals incorporate the assumption that they are conscious: we perceive their feeding, walking, interacting, and so forth as conscious behavior—as involving feeling or subjective experience. One might take this to settle the matter, as John Searle more or less does,²² and say that we know that, say, the dog is conscious in chasing the ball because we just see that she is.

While this may sound dogmatic, I confess to having *some* sympathy for this approach—in fact, quite a lot of sympathy when it comes to animals as closely related to us as mammals. Yet, this "I just see that a wriggling fish is conscious" approach is inadequate for our purposes. Natural selection has apparently endowed us with an innate tendency to read animal behavior as conscious²³; and it is surely conceivable that this perceptual tendency was adaptive, in terms of predicting animals' behavior, without being accurate about animal minds with respect to the *full range* of animals whose behavior we perceive as conscious. Thus, further work is required.

At the same time, to deny that, say, mammals are conscious is so violently contrary to common sense—which ought to count for something—that those who endorse such a radical denial shoulder a burden of proof. In the next section, I will argue that the most promising effort to carry this burden is unsuccessful. What about animals whose consciousness is less obvious than that of mammals? As noted

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in the previous paragraph, our instinctive attributions of consciousness are fallible. So, we need to consider evidence. My contention is this: what we ought to believe, given available evidence, is that at least mammals, birds, reptiles, amphibians, and the members of some fish species are conscious creatures. There is also considerable reason to believe that, among the invertebrates, cephalopods (octopi and squid) are conscious creatures.

Let us begin with a chart compiled by Gary Varner, who collated information from four publications that addressed, in relatively comprehensive ways, evidence for animal consciousness—more specifically, pain.²⁴ Varner identified six indicators that are reasonably considered relevant in attributing pain to animals: (1) the presence of nociceptors (neural end organs that detect noxious stimuli); (2) possession of a central nervous system; (3) whether the nociceptors are connected to the central nervous system; (4) the presence of endogenous opioids (e.g., endorphins, enkephalins); (5) whether the creature's behavior in response to noxious stimuli is modified by analgesics; and (6) whether its responses are analogous to human responses. I will add a further indicator, which is relevant to the attribution of anxiety and fear: (7) the presence of benzodiazepine receptors. On the basis of the collated findings, Varner maintained the following: mammals and birds satisfied all these criteria. Herpetofauna (reptiles and amphibians) and fish satisfied most of them, but it was somewhat doubtful that they had nociceptors, and it was unknown whether their responses were modified by analgesics. The cephalopods, uniquely among the invertebrates, scored the same as herpetofauna and fish, except that for cephalopods, it was also unknown whether they had endogenous opioids.

The data on which Varner relied are now somewhat old. More recent findings confirm that reptiles and teleost fishes (a classification that includes most extant fish species) have nociceptors and are responsive to analgesics.²⁵ I am willing to assume the same about amphibians, who lie evolutionarily “between” fish and reptiles. Meanwhile, I am unaware of further data that significantly clarify the case of cephalopods.²⁶ As for the indicator that I added to the list—presence of benzodiazepine receptors—we have seen that mammals, birds, reptiles, amphibians, and some fish species make this grade.

Of course, other sorts of evidence are also relevant, but most of them have not been so thoroughly investigated across animal taxa. One might suggest, however, that we add this indicator to our list: the presence of some sort of cortex. That addition would strengthen the case for mammals, birds, and reptiles, weaken the case for fish and invertebrates, and leave amphibians somewhere in between. But the relevance of this putative indicator is highly debatable—and debated. In an influential discussion, James Rose has argued that fish are incapable of conscious experience.²⁷ Advancing a spirited argument that a functioning neocortex is necessary for consciousness in mammals, he underscores the absence of a neocortex in fish (and other nonmammalian species). Not surprisingly, this reasoning has been challenged. According to Chandross and coauthors, available evidence indicates that the fish forebrain, even without a neocortex, may have evolved to support

conscious experience.²⁸ And we have already noted that teleost fish have nociceptors and demonstrate relief from analgesics. It seems highly possible that convergent evolution permitted the independent emergence of consciousness in more than one evolutionary line with somewhat differing neural substrata. Indeed, there is now some reason to doubt that a functional cortex is strictly necessary for consciousness *even in humans*.²⁹ So, I will decline to add the presence of a cortex to the list of indicators of consciousness.

It may be worthwhile to mention some other sorts of evidence, even if they have been sought in a limited range of species. Some of this evidence is discussed by Adam Shriver.³⁰ To elaborate on a point made earlier, experts believe that pain in humans involves two largely (but probably not entirely) discreet systems: a sensory-discriminatory system, which conveys information about the bodily location and intensity of a noxious stimulus to the somatosensory cortex; and an affective-motivational system, which makes the experience unpleasant and motivates adaptive action by projecting signals through the anterior cingulate cortex to the frontal lobe.³¹ To a significant extent, the systems can be dissociated—for example, hypnosis or morphine can shut down the affective-motivational system while the sensory-discriminatory system is working. In rats, lesioning the ACC results in persistence of a withdrawal reflex in the presence of a noxious stimulus but less effort to get away. In monkeys, damage to the insular cortex—which, like the ACC, is part of the affective-motivational system—yields similar behavior. These findings strongly suggest that rats and monkeys normally experience both the sensory and the affective dimensions of pain, and at least the affective dimension would entail consciousness.

But pain behavior is not the only sort of behavior that can be suggestive of consciousness. For example, as Colin Allen notes, monkeys whose primary visual cortex has been damaged show impairments that resemble those of human blindsight patients, who apparently have partial, unconscious visual perception.³² Normal humans have conscious visual experiences that allow for normal responses to visual stimuli; damage to the striate cortex can destroy conscious vision apparently without destroying partial, unconscious vision—causing blindsight. Because monkeys with similar brain damage seem to have visual limitations similar to those of human blindsight patients, it is reasonable to infer that normal monkeys, like normal humans, also have conscious visual experience.

Most of the present discussion of evidence for consciousness across animal taxa has focused on Varner's synthesis of the findings of various studies, supplemented by some updates about nociceptors and analgesic response as well as consideration of benzodiazepine receptors. Let me here mention another systematic review of evidence, which incorporates more discussion of animal behavior than does Varner's synthesis, while focusing on just two nonmammalian types of animals: birds and cephalopods. Edelman and coauthors review the various types of evidence at a level of detail that would be excessively space consuming to summarize here, so let me just note their conclusion. They argue that there is a strong case

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for consciousness in birds, while the case for cephalopods remains open.³³ Their findings are consistent with what I have argued.

My thesis, again, is that we should believe on the basis of available evidence that at least mammals, birds, reptiles, amphibians, and members of some fish species are conscious creatures, that they are capable of having (phenomenal) consciousness; we should also be very open to the possibility that cephalopods are among this group. But let us not rest here. There is a theory of consciousness that can reintroduce skeptical doubts into our investigation. Although I consider this theory and its implications intellectual mischief, I have been impressed at how seriously some philosophers take this theory. And philosophers of mind and cognitive sciences often influence the conceptual scaffoldings deployed by comparative psychologists and ethologists. Meanwhile, the findings of these scientists sometimes influence public opinion. So, this theory deserves consideration and a response.

The Higher-Order Thought Theory of Consciousness

In discussing consciousness as a necessary condition of suffering, we refer to phenomenal consciousness, which involves subjective, qualitative experiences. Nowadays, as a result both of the Freudian revolution in psychology and all its intellectual progeny and of contemporary cognitive psychology, we are comfortable with the proposition that some mental states are unconscious. The problem of *state* consciousness is to distinguish mental states that are (phenomenally) conscious from mental states that are not. Higher-order theories of consciousness agree on this general claim: a mental state is conscious if and only if a creature is conscious of that mental state in some suitable way.³⁴ So, for example, having pain does not entail that one feels it, that is, experiences it consciously. Conscious pain occurs when the creature not only has pain but also is conscious of having it in some way specified by the theory. A creature whose pain and other mental states were always unconscious would never suffer.³⁵

Among higher-order theories of consciousness, there are two broad types: *inner sense theories*, which ascribe to each creature capable of having conscious states an inner monitoring mechanism that tracks mental states, and *higher-order thought (HOT) theories*. Only the HOT approach will concern us here because it furnishes the most developed grounds for skepticism about animal consciousness. According to this approach, as it is commonly formulated, a mental state is conscious if and only if a creature has a thought about it. One feels one's pain, on this view, only if one thinks about it. Without the higher-order thought about pain, pain doesn't feel like anything.

This approach does not automatically imply that nonhuman animals lack conscious experiences and therefore suffering. After all, many animals may be capable of thinking. And perhaps they sometimes think not only about their environment and about what to do but also about their mental states, such as their pain, hunger, or sensory perceptions. If so, they can experience these states consciously. (Again,

throughout this section, I am using the term *conscious* as short for “phenomenally conscious.”) Now, one might insist that only creatures with full-blown language can have such thoughts, perhaps on the grounds that thinking implicates concepts, the possession of which requires sophisticated language. One would then have to contend with the rather incredible implication that ordinary human infants have no conscious feelings at all. But intuitive plausibility is not the only theoretical desideratum, and some HOT theorists accept this implication.

In discussions of animals’ mental life, the HOT theory that has received the most attention, by far, is that of Peter Carruthers. In a recent article, Carruthers states that he doubts there would be any need for a creature to evolve the capacity to monitor its own mental states unless the creature could think about them.³⁶ This motivates a focus on higher-order *thoughts* rather than inner sense or a monitoring mechanism (lest anyone think we were neglecting the type of higher-order theory that posits an inner sense). Specifically, Carruthers holds that a state is conscious for a creature if and only if it’s *available to be thought about* by that creature. He believes that there is no compelling evidence that any nonhuman animals are capable of having HOTs and therefore expresses skepticism that any animals have conscious states.³⁷ Why does he think there is such a close connection between phenomenal consciousness and HOTs? His view is that the latter evolved alongside so-called theory of mind: the ability to have beliefs and attitudes about other individuals’ mental states. Theory of mind evolved to allow a highly social type of creature, hominids, to interpret each other’s behavior more accurately: in other words, to engage in fine-grained behavior reading through “mind reading.” If another hominid is vocalizing at you, you can better predict and respond to his behavior if you have a sense of what he thinks, wants, and intends. Because we know that humans typically have a theory of mind, and because (Carruthers believes) there is no compelling evidence that any nonhuman animals have a theory of mind, we may responsibly conjecture that animals’ mental states are devoid of (phenomenal) consciousness. They do not feel like anything or have any qualitative, subjective features. So, animals can’t suffer.

I believe that Carruthers’s view of animal minds verges far from the truth and fails to motivate responsible skepticism about animal consciousness. Let me advance several rebuttals.

First, it is extremely hard to believe that neither apes, nor dolphins, nor elephants can feel anything or be conscious of anything. Anyone who does not sincerely doubt that these complex creatures have conscious experiences should not embrace the HOT view that generates this implication. Now, there is a lively debate about whether some nonhuman primates have higher-order thoughts and a theory of mind, so a HOT theorist might say that her theory can accommodate the intuitive judgment I’ve invoked: that these animals have conscious experiences. But our intuitions are not much less insistent that cats and dogs also have conscious experiences, yet there is no compelling evidence that they have higher-order thoughts. Any theory that implies that cats and dogs are incapable of consciousness bears

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a burden of proof. Carruthers, while perhaps accepting this burden, would assert that our intuitions on the matter of cats and dogs are erroneous. Presumably, he would say the same about young human children before they achieve a theory of mind: these children have no conscious experiences. Since episodic memories, memories of particular experiences, are impossible unless one was conscious when one had the relevant experiences, those of us who believe that we have memories of our toddler days must all be mistaken. Or else we acquired a theory of mind very young. Or else Carruthers's view is incorrect.

Consider a second problem. Higher-order thought is supposed to make a mental state conscious. Presumably, in most cases, the HOT is not *itself* conscious. If it were—as perhaps it is in cases of introspection—there would have to be an even higher HOT that made it, the first HOT, conscious. In any case, to avoid an infinite regress of HOTs, some HOT must be *unconscious* in rendering conscious the mental state it's about. The problem is one of explanatory mystery: How can an unconscious state, an unconscious thought, make another mental state conscious?³⁸ How does this work? This request for an explanation is not, of course, a devastating argument. But it adds to the sense that the theory is a very odd one with more difficulties—in terms of raising questions and bearing intuitive costs—than advantages.

Third, a thought experiment suggests that the theory omits a necessary condition for consciousness. Imagine a robot equipped with sophisticated light-pattern sensors, which function as eyes, and other sensors. The robot can move around in response to environmental conditions and process information about its sensory data in ways that provide information about its own perspective or state (e.g., its location, its physical condition). All this seems compatible with an unconscious robot. Yet this robot, we have imagined without any conceptual or empirical absurdity, has experiences (unconscious ones) that are available to be thought about (unconsciously). The availability to HOT and even the occurrence of such thoughts do not seem to entail that this robot has conscious states. Carruthers, it seems, has failed to capture some necessary condition of what it is to be conscious. I think the necessary condition is simply this: that the state is felt or subjectively experienced.

One might charge me here with a double standard. For I say that the robot, despite such and such behavior and information processing, might be unconscious, while I also claim that various animals, who feature such and such behavior and information processing, ought to be judged conscious. But my position does not reflect a double standard. In the case of animals, I emphasize not only behavior and information processing but also physiology and neuroanatomy in the context of evolution. Of course, I know nothing about what hardware would be needed to enable a robot to have HOTs. But such a cognitive feat does not seem terribly complicated and would not seem to demand hardware (whatever it might be) that would generate consciousness.

A fourth difficulty has been noted by Colin Allen.³⁹ Carruthers's thesis that hominids evolved phenomenal consciousness as a means of better interpreting

each other's minds, which underlies the HOT theory, is poorly motivated. On Carruthers's view, if my auditory experience of your vocalizations and my visual experience of your bodily movements are conscious, then they are available for me to think about, which allows me to manage interactions with you better than if I couldn't think about what I hear and see. So far, so good. But this account fails to explain our conscious experiences more generally. As Allen puts it, "there seems little to interpret regarding others' mental states in the way they smell or taste to us, nor in the way our stomachs feel when we have not eaten for a while."⁴⁰ Much of our conscious life has nothing to do with the ability to interpret other people. Moreover, we are never consciously aware of other people's pheromones, yet our unconscious perception of them affects our interpersonal behavior. So, it seems that there is no tight connection between consciousness and behavior-guiding systems, even in highly social, mind-interpreting animals like us. Considering the overall oddity of Carruthers's view, he owes us some very compelling grounds for accepting the theory despite its oddity. In my judgment, he has not provided such grounds. He has not carried his considerable burden of proof.

Meanwhile, there are some promising functional accounts of consciousness that would support its attribution to many animals. One conjecture is that consciousness evolved to enable creatures to manage complexity in unfamiliar situations.⁴¹ Consider processes that, in humans, can occur either consciously or unconsciously—such as placing your feet while running. These processes work better unconsciously in familiar settings (say, running on smooth terrain) but work better consciously in the presence of novelty or unpredictability (say, running amid pot holes). Perhaps, then, consciousness increases our capacity to manage complexity. Another conjecture, motivated by a variety of experimental results, is that consciousness plays a significant role in learning to avoid noxious stimuli—rather than repeatedly encountering and withdrawing from them—and in correcting one's own perceptual errors.⁴² This conjecture coheres well with the speculation that consciousness helps an agent to manage complexity and novelty. Those are the sorts of circumstances in which learning and self-correction are adaptive. A third conjecture is that the evolutionary function of phenomenal consciousness is to enable, or at least enhance, access consciousness, with which the brain integrates information available to distinct sensory and cognitive systems, thereby directing coordinated, effective behavior.⁴³ A fourth account—which partly overlaps with the second—focuses on (conscious) pain in particular. I find it elegant in its simplicity as well as plausible:

All animals face hazards that cause tissue damage and most have nociceptive reflex responses that protect them from such damage. However, some taxa have also evolved the capacity for pain experience, presumably to enhance long-term protection through behavior modification based on memory of the unpleasant nature of pain.⁴⁴

Unpleasantness, which is motivating, is impossible without (phenomenal) consciousness.

All these accounts provide more plausible stories about why consciousness might have evolved than Carruthers's mind-reading story. Further, these more promising accounts do not generate the sorts of problems that Carruthers's theory has. Thus, I conclude that Carruthers's HOT theory of consciousness furnishes no compelling grounds for turning a skeptical eye toward what has been marshaled as evidence for consciousness in animals. Many animals have phenomenal consciousness. They can suffer in the broad sense of the term, and a significant subset can also suffer in the narrow sense.

Some Implications for Bioethics

What implications do our findings about suffering have for bioethics? In briefly addressing this question, I will assume that (intentionally or negligently) causing suffering—whether in the weak or the strong sense—to any being we have good reason to believe is capable of suffering is *pro tanto* wrong. That is, causing suffering tends to be wrong and requires special justification in order to be permissible. This is because beings who are capable of suffering in at least the broad sense have interests, and beings who have interests have moral status.

This has implications for human beings who are sentient—that is, have the capacity for consciousness—but whose personhood or full moral status is contested. Infants, late fetuses, and deeply demented individuals who have yet to lapse into a coma all have moral status and a morally important interest in avoiding suffering. This implication leaves open whether such human beings have full or only partial moral status. And it certainly doesn't settle important questions about how these individuals may be treated. But the acknowledgement of moral status for these nonparadigm (yet sentient) human beings should terminate any discussions that tacitly assume that these individuals lack moral importance in their own right. Their capacity to suffer must not be overlooked.

Turning now to animals, we can draw the implication that animal research is morally permissible only if (to state just one necessary condition) it does not impose unnecessary suffering on its subjects. What counts as “necessary suffering” will turn on various considerations, including one's view about how much moral status animals have. However one answers it, though, the present point applies to nearly all research animals. It does not apply to insects, horseshoe crabs, and other invertebrate species regarding which there is little evidence of consciousness. But it applies to all vertebrate species (except perhaps some fish species) and cephalopods. Moreover, because there is an overwhelming case that mammals can suffer in the narrow sense and a strong case that birds can as well, the research community should assume that many harms caused to these animal subjects have the potential to be experienced as extremely aversive.

I also suggest, though I cannot defend the thesis here, that the capacity of animal subjects to suffer—and the moral status based on this capacity—means that we should reverse presumptions about animal research. The tendency within the biomedical

research community is to presume that animal studies should precede human studies that involve risks for their subjects. I believe that the morally correct ~~preemption~~ leans in the opposite direction: we should presume that proposed animal studies are impermissible unless a persuasive justification is advanced, case by case, in their favor.

presumption

In addition, the field of bioethics ought to take animals far more seriously than it does at the present time. Bioethics conferences rarely schedule talks on ethical issues pertaining to animals, while journals rarely publish articles in the area. At a more personal level, hardly any bioethicists I know (at least in the United States) can be bothered to abstain from meat produced in factory farms, and surprisingly few of them even register any moral concern about the issue. A greater awareness of and seriousness about ethical issues as they pertain to animals would be a welcome development in American bioethics. I believe the facts about animal suffering recommend such a development.

Finally, to return to the “intellectual mischief” I have attempted to undermine in this paper, bioethicists should accept that the capacity to suffer is very well established among a wide array of animal species. Neither appeals to ignorance nor appeals to HOT theories of consciousness should be understood as justifying skepticism about animal consciousness and the capacity to suffer. The virtue of open-mindedness should not be confused with the vice of obtuseness, especially when the latter may serve to rationalize the mistreatment of sensitive creatures.

Notes

1. *Suffering and Moral Responsibility* (New York: Oxford University Press, 1999), 11.
2. *Ibid.*, 14.
3. *Ibid.*
4. In speaking of “sensory pain” and “bodily discomfort,” I do not mean to suggest that any sort of pain or discomfort is *entirely* sensory or bodily. On the contrary, I believe that all pain and discomfort have an affective component: unpleasantness. The reason for the modifiers “sensory” and “bodily” is that what is sometimes called “emotional pain” and “emotional discomfort” may not be sensory or bodily in the relevant sense at all.
5. See Peter Moskowitz, “A Theory of Suffering,” *The Pain Practitioner* 16 (2006): 74–81, at 76.
6. For good discussions of emotions as involving evaluative appraisals, see Patricia Greenspan, *Emotions and Reasons* (New York: Routledge, 1988) and Nancy Sherman, “Emotions,” in *Encyclopedia of Bioethics*, 3rd ed., Stephen Post, ed. (New York: Macmillan, 2004), 2:740–745.
7. *The Nature of Suffering and the Goals of Medicine* (New York: Oxford University Press, 1991), 33. See also Cassell, “Pain and Suffering,” *The Encyclopedia of Bioethics*, 2nd ed., Warren Reich, ed. (New York: Macmillan, 1995), 1963.
8. *Ibid.*
9. For elaboration, see my *Taking Animals Seriously: Mental Life and Moral Status* (Cambridge, UK: Cambridge University Press, 1996), 116–117.
10. *The Nature of Suffering and the Goals of Medicine*, 36

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11. See, e.g., Daniel Dennett, *Brainchildren* (Cambridge, MA: MIT Press, 1998), 347; and Michael Tye, *Consciousness, Color, and Content* (Cambridge, MA: MIT Press, 2000), 182.

12. For fuller discussions, see my "Great Apes, Dolphins, and the Concept of Personhood," *Southern Journal of Philosophy* 35 (1997): 301–320; and *Human Identity and Bioethics* (Cambridge, UK: Cambridge University Press, 2005), 3–7.

13. At a workshop in Amsterdam a few years ago, Cassell acknowledged in conversation with me that animals, not only persons, can suffer. His written statements reflect an earlier-held view.

14. Even if temporal self-awareness is necessary for suffering, perhaps because the former is necessary for experiencing emotional states, there is, I think, a strong case that many animals have such self-awareness. See my "Self-Awareness in Animals," in *The Philosophy of Animal Minds*, Robert Lurz, ed. (Cambridge, UK: Cambridge University Press, 2009), 201–217.

15. I discuss the evidence in *Taking Animals Seriously*, chap. 5.

16. Regarding the latter, less well-known point, see L. L. Bruce and T. J. Neary, "The Limbic System of Tetrapods: A Comparative Analysis of Cortical and Amygdalar Populations," *Brain Behavior and Evolution* 46 (1995): 224–234; and Guenther Stockinger, "Human Limbic System = Fish Telencephalon," *Spiegel Online* (11 March 2011).

17. M. Nielsen, C. Braestrup, R. F. Squires, "Evidence for a Late Evolutionary Appearance of a Brain-Specific Benzodiazepine Receptor," *Brain Research* 141 (1978): 342–346.

18. See Colin Allen, Perry Fuchs, Adam Shriver, and Hilary Wilson, "Deciphering Animal Pain," in *Pain: New Essays on Its Nature and the Methodology of Its Study*, Murat Aydede, ed. (Cambridge, MA: MIT Press, 2005), 351–366.

19. Moskowitz argues that the ACC and its connections with certain other brain parts "play an important, if not central, role in the experience of suffering," ("A Theory of Suffering," 78).

20. "On a Confusion about a Function of Consciousness," *Behavioral and Brain Sciences* 18 (1995): 227–247.

21. See, e.g., Nagel, "What Is It Like to Be a Bat?" *Philosophical Review* 83 (1974): 435–450.

22. "Animal Minds," *Ethica & Animalia* 9 (1998): 37–50.

23. For valuable reflections on this matter, see Adam Arico et al., "The Folk Psychology of Consciousness," *Mind & Language* 26 (2011): 327–352.

24. Gary Varner, *In Nature's Interests?* (New York: Oxford University Press, 1998). The studies Varner cites are Jane Smith and Kenneth Boyd, ed., *Lives in the Balance* (New York: Oxford University Press, 1991); David DeGrazia and Andrew Rowan, "Pain, Suffering, and Anxiety in Animals and Humans," *Theoretical Medicine* 12 (1991): 193–211; Patrick Bateson, "Assessment of Pain in Animals," *Animal Behavior* 42 (1991): 827–839; and Margaret Rose and David Adams, "Evidence for Pain and Suffering in Other Animals," in *Animal Experimentation*, Gill Langley, ed. (New York: Chapman and Hall, 1989): 42–71.

25. See Craig Moseley, "Pain and Nociception in Reptiles," *Veterinary Clinics of North America* 14 (2011): 45–60; Lynne Sneddon, Victoria Braithwaite, and Michael Gentle, "Do Fishes Have Nociceptors? Evidence for the Evolution for a Vertebrate Sensory System," *Proceedings of the Royal Society of London* 270 (2003): 1115–1122; and Lynne Sneddon, "Evolution of Nociception in Vertebrates: Comparative Analysis of Lower Vertebrates," *Brain Research Reviews* 46 (2004): 123–130.

26. Regarding invertebrates more generally, Robert Elwood, who stresses behavioral evidence such as avoidance learning and responsiveness to analgesics, argues that such evidence is consistent with the thesis that crustaceans and mollusks (which include cephalopods) experience pain but is, at yet, inconclusive ("Pain and Suffering in Invertebrates?" *ILAR Journal* 52 [2011]: 175–84).

27. "The Neurobehavioral Nature of Fishes and the Question of Awareness and Pain," *Reviews in Fisheries Science* 10 (2002): 1–38.

28. Kristopher Chandroo, Stephanie Yoo, and Richard Moccia, "An Evaluation of Current Perspectives on Consciousness and Pain in Fishes," *Fish and Fisheries* 5 (2004): 281–295.

29. See Bjorn Merker, "Consciousness Without a Cerebral Cortex: A Challenge for Neuroscience and Medicine," *Behavioral and Brain Sciences* 30 (2007): 63–81. See also the open peer commentary on this article (*Behavioral and Brain Sciences* 30 [2007]: 81–134).

30. "Minding Mammals," *Philosophical Psychology* 19 (2006): 413–442, at 435–438.

31. While perhaps exaggerating the discreteness of these two systems, V. G. Hardcastle has influentially characterized them and many of the relevant empirical data (*The Myth of Pain* [Cambridge, MA: MIT Press, 1999]).

32. "Animal Consciousness," sect. 5.1.

33. David Edelman, Bernard Baars, and Anil Seth, "Identifying Hallmarks of Consciousness in Non-Mammalian Species," *Consciousness and Cognition* 14 (2005): 169–187.

34. This is helpfully explained in David Rosenthal, "Higher-Order Theories of Consciousness," in *The Oxford Handbook of Philosophy of Mind*, Brian McLaughlin, Ansgar Bekermaun, and Sven Walter, ed. (Oxford, UK: Clarendon, 2009), 239–252, at 240.

35. Here, for ease of reference, I use the term *pain* such that it is conceptually possible for there to be unconscious pain, even though this conflicts with my usual use of the term.

36. "Animal Mentality: Its Character, Extent, and Moral Significance," in *The Oxford Handbook of Animal Ethics*, ed. Tom Beauchamp and R. G. Frey (New York: Oxford University Press): 373–406, at 375.

37. *Ibid.*

38. Cf. Mark Rowlands, "Animals that Act for Moral Reasons," in *The Oxford Handbook of Animal Ethics*, ed. Tom Beauchamp and R. G. Frey (New York: Oxford University Press, 2011): 519–546, at 538–539.

39. "Animal Pain," *Nous* 38 (2004): 617–643, at 629–631.

40. *Ibid.*, 630.

41. See my *Taking Animals Seriously*, 103–105; and Marian Stamp Dawkins, *Through Our Eyes Only? The Search for Animal Consciousness* (Oxford, UK: Freeman, 1993), 171–172.

42. See Colin Allen and Marc Bekoff, *Species of Mind* (Cambridge, MA: MIT Press, 1997), chap. 8 and Allen et al., "Deciphering Animal Pain," 355–361.

43. Shaun Nichols and Todd Grantham, "Adaptive Complexity and Phenomenal Consciousness," *Philosophy of Science* 67 (2000): 648–670. Their approach allows that access consciousness and phenomenal consciousness are logically distinct and separable in principle. The present conjecture is that in natural selection as it actually occurred, the two types of consciousness are closely connected and possibly the same phenomenon.

44. Elwood, "Pain and Suffering in Invertebrates?" 175.

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