THE USE AND MEANING OF THE WORD "SUFFERING" IN RELATION TO NATURE

Wesley J. Wildman

1 Introduction

All complex beings suffer. In fact, the capacity to suffer is as good a measure of biological complexity as any, especially because visceral reactions to physical injury, conscious pain, and emotional distress are visible and measurable. The problem of other minds may prevent us from knowing what pain feels like to another being, but it does not seriously interfere with the conclusion that suffering is widespread in nature. But precisely how widespread is suffering? And in what forms? There is considerable confusion and conflict surrounding these questions. A satisfying account of the characteristics of suffering in nature should gear itself to the various levels of emergent complexity. Such an account should also be multi-dimensional, covering issues important for understanding suffering in nature, such as types of suffering, responses to suffering, and causes of suffering.[1]

The conclusion of this discussion can be stated here. "Suffering" is a more useful category than "evil" to frame the initial phase of the problem because "suffering" is more neutrally descriptive and does not prejudge the moral character of natural disasters, predation, and the like. To render the various problems of evil as particular interpretations of suffering would help keep their guiding moral assumptions clearly in view.

2 Types of Suffering in Nature

A good place to begin is in the middle of the complexity scale, where we encounter a controversial question about suffering in plants. There is some evidence that plants possess biochemical injury mechanisms despite the lack of a central nervous system.[2] For example, some plants release a hormone called jasmonic acid when under attack or sick, and this hormone triggers reactions that minimize damage, defend the plant from further injury, and initiate repairs. There is also evidence that some injury mechanisms extend across the boundaries between individual plants. For example, an acacia tree responds to having its leaves chewed by releasing airborne chemicals (such as a volatilized form of jasmonic acid) that triggers the release of a foul-tasting chemical in neighboring acacias' leaves, irritating the digestion of foraging insects and animals and driving them off. Does the phrase "pain response" fairly describe such chemical mechanisms in plants? Probably not: pain suggests a conscious sensation and that requires a central nervous system, which plants do not have. Yet the fact that

---

[1] Throughout this paper I will be presenting basic science that would be covered in any introductory textbook in biology or biochemistry or cosmology. I only cite special sources when I make an unusual statement or in order to direct readers to a valuable internet resource.

[2] See "Take Two Aspirin for Re-Leaf," from Reuters Online, August 5, 1999, http://flatrock.org.nz/topics/science/dont_wilt_have_a_pill.htm (accessed August 5, 2005).

aspirin inhibits the production of jasmonic acid, just as it blocks the production of the pain-response substance prostaglandin in injured animals, indicates a biochemical and probably an evolutionary relationship between the two situations. This suggests that pain is a fair *analogy* for plant injury, even if plants lack other dimensions of pain familiar to animals, including elements that we should demand of any literal usage of "pain" to describe plant injury. This is the basis for a distinction between conscious pain and physical injury as forms of suffering in nature.

At the low end of the complexity scale, there is a question about the extent of the idea of suffering as physical injury. Can we use injury to describe the effects of tectonic plate movement on Earth's crust, the effect of colliding asteroids on planets, the collisions and gravitational disruptions inevitable within merging galaxies, or the wrenching expansion of spacetime in the big bang itself? Plant responses to injury are integrated and efficacious, in a way that requires complex biochemistry developed in a long evolutionary history, and these features are absent in such physical systems. The argument for using "physical injury" outside the biological realm is difficult to make, accordingly. Yet there are two possible paths along which such an argument might possibly move, one concerning an analogy with death and the other an analogy with disruption of biological integrity, and we shall consider each in turn.

One line of argument involves noting that some nonbiological processes seem loosely similar to dying in the biological realm. A star has a "life cycle" that begins with a cloud of gas and "culminates" with one of several spectacular fates. We sometimes speak of the explosion of a star, or the gravitational collapse of a star into a black hole, as "death." But is death a form of suffering as physical injury or merely a natural stage of anything with a life cycle? I shall argue that death is not a direct cause of suffering even in the realm of living beings so it certainly is not a form of suffering in the nonbiological realm, despite the effectiveness of analogies such as "life cycle" to describe the origin and dissolution of stars. What about cases when the normal life cycle of a star is disrupted, as when galaxies merge and two stars collide? Is this "premature death" a form of suffering through physical injury? This case can be considered in what follows.

The other line of argument involves the idea of integrity. This updates Aristotle's final causes, whereby the form of a thing expresses its purpose and function. Integrity registers the fact that a complex physical process may have zones of equilibrium within which it functions relatively stably and supports complex and interesting behavior. The idea is more metaphysically neutral than Aristotle's final causes because it does not require a first cause to determine and knit together the purposes of physical objects and processes. It is also less susceptible to idiosyncratic value judgments because integrity can often be quantified through analyzing information flow: systemic equilibrium maximizes richness of information, and this defines integrity for a nonbiological process. Yet using a virtue word to describe such zones of systemic functioning can also express a profound aesthetic judgment: the integrity of physical systems is valuable and beautiful because it supports emergent complexity. The human interestedness of such aesthetic judgments is obvious but may also draw our attention to objectively achieved value in nature; a metaphysics of value is necessary for interpreting such possibilities. Of course, integrity is not applicable to all

natural processes; some are not sufficiently systemic but are mere agglomerations of matter or flows of activity lacking deep patterns or significant information. Such processes are subject to change but they do not suffer integrity disruption or physical injury.

The best case for injury in nonbiological systems of nature turns on showing that there is a kind of physical integrity to some nonbiological systems that can be disturbed in a way that is loosely similar to the way injury disrupts the integrity of a biological organism. Returning to the case of an exploding star, we might say that a star has a kind of physical integrity deriving from its physical constitution as a sphere of gas dense enough to support nuclear fusion and to perform its light-emitting function, which has the potential to sustain ecosystems within a surrounding planetary system. We might further say that this integrity is destroyed if the star explodes and thus that the star suffers a fatal physical injury in the explosion. If we were persuaded that the life cycle of stars is relevant to assessing their integrity, we might want to limit our solar injury claim to cases of untimely demise, as in the merging galaxy scenario introduced above.

This best case for linking integrity disruption and physical injury is strained. We can distinguish what we can't identify, however, and we certainly have here the basis for a distinction between physical injury and integrity disruption, with the former being a species of the latter in the biological realm. We should determine whether a physical system can suffer injury based on the richness of its systemic connectedness rather than merely the existence of systemic integrity that can be disrupted. The biological realm has the potential to realize connectedness richly and densely enough to speak meaningfully of injury. The nonbiological realm lacks this potential. This distinction also furnishes a rationale for limiting suffering to physical injury and denying that suffering occurs in the simpler, nonbiological forms of integrity disruption.

An important test case for this distinction and the associated limitation in the idea of suffering is ecological damage. Physical injury requires a high degree of systemic integrity as well as injury responses that serve the end of maintaining structural integrity and restoring it where possible. It presumes the presence of life because we cannot injure a dead animal or a dead plant. It presupposes nutritive and environmental needs because these are conditions of structural integrity. The idea of physical injury probably does not in itself assume the capacity for reproduction, but evolutionary constraints are such that reproduction is almost always present with life, nutrition, and environmental dependence. Thus, we reach the outer edge of the idea of physical injury when we ponder the question of environmental damage. There are ecological cycles and regimes of equilibrium, which means that an ecosystem sometimes tends to return to a state of equilibrium when disturbed from it, and that suggests a certain degree of structural integrity. Moreover, ecosystems are dependent on sunlight for energy, which suggests nutritive needs and environmental dependence. But ecosystems are not alive in the right sense to speak of integrity disruption as injury because their operating parameters are enormously wide; they lack the dense structural integrity and biochemically regulated form of being that is life. They change and adapt but do not suffer. Mars once had flowing water and now does not. This is change through integrity disruption, to be sure, but not suffering through physical injury. From a descrip-

tive point of view we can acknowledge that the new Mars environment cannot support many or perhaps any forms of life, which is the basis for saying that past systemic integrity has been disrupted. From a valuational point of view, we might think of such a change as bad or undesirable or ugly. But such changes are not suffering in the form of physical injury; suffering can only exist in the context of intensely structured, biochemically regulated forms of being.

This is a controversial conclusion among some conservationists, for whom effective political action seems to depend in part on stimulating compassion in typically self-centered human beings through the rhetoric of a "suffering" environment, thereby springing them out of their obtuse and ingenuous assumption that everything is just fine. Elaborate worldviews sustain the idea of a suffering environment and make it conceptually robust. Disruption of environmental integrity is variously framed as harming the spirit of the Earth, as injuring a vast and diverse organism, or as exploiting a generous and fertile mother. Most people have deep sympathy for a suffering planet described in such terms because they impute recognizable human characteristics to nature. Yet it is also possible even for a fervent nature mystic to appreciate nature without taking such imagery literally. Nature is not disvalued or the disruption of its harmonious integrities trivialized when we insist on a denser form of systemic connectedness to justify attributions of suffering through physical injury.

At this point, we have discussed four categories corresponding to emergent levels of reality. From the simplest to the moderately complex, they are sheer change, integrity disruption, physical injury, and conscious pain. I have argued that the latter, conscious pain, is clearly suffering. Conscious pain is possible for many animals. There are ample biochemical and behavioral signs of this. But sensation of any kind requires a central nervous system and some degree of awareness, so conscious pain would not be possible for plants or for simple animals lacking sufficient neural complexity for sensory awareness. Yet simpler creatures may be capable of physical injury, providing that they have sufficient density of biochemical connectedness. Physical injury also falls under the heading of suffering, though it is suffering's least intense form. Integrity disruption without physical injury is not suffering because the requisite systemic connectedness is absent, and this is even more the case with sheer change. It is important to note, however, that the disruption of certain systems, particularly ecologies, can be the cause of enormous suffering to plants and animals. The ordinary operation of ecological systems can also cause great suffering, as in the case of tsunamis and earthquakes due to tectonic plate movement, and this is equally true of sheer change when it works out badly for living creatures. We will return to causes of suffering below.

At the high end of complexity lies another form of suffering, emotional distress. This can be an exquisitely agonizing form of suffering for creatures capable of it, but there are not many creatures with the requisite neural complexity. Emotional distress requires cognitive, psychological, and social capacities that need not be present in creatures capable of conscious pain, but conscious pain in response to physical injury routinely involves emotional distress in creatures able to suffer in this way. Emotional distress does not require physical injury, but physiologically it involves many of the same neural processes as pain from physical injury, so it pre-

supposes and builds on the evolutionarily more basic capacities for injury and pain. The main question about emotional distress is which animals are, in fact, capable of it. Almost all human beings suffer emotional distress, and we would think any person incapable of it was profoundly defective. But other mammals seem to grieve the death of a parent or child or mate, and seem to be concerned and solicitous about their own or others' physical injuries or illnesses. The social interactions of some primates, such as chimpanzees, are extremely intricate, and clearly bear the marks of a simple and often distressing emotional life. Thus, it seems fair to assume that suffering in the form of emotional distress appears among higher mammals and reaches a special intensity in higher primates.

The most extreme forms of emotional distress concern peculiarly human existential anxieties. The pertinent measure of the degree of such emotional distress is the phenomenon of suicide. A precise definition matters here: suicide is when a healthy animal capable of reproducing deliberately takes actions foreseeably guaranteed to result in immediate death.[3] Individuals of no other species, *when healthy* and *capable of reproducing,* act so as to end their lives, *foreseeing* the result of their actions. A whale might follow a beached leader into danger, but this is because of trusting habits crucial in a social species, not an attempt to end life out of grief, as is sometimes alleged. An animal fiercely defending its young against a deadly predator may die, but often enough this sort of aggression succeeds by driving off the predator, so death when it occurs cannot be foreseen and is not suicide. Sick or injured animals will often act so as to achieve a faster death, but this is not suicide because the animal in question is not healthy. Some social species, such as ants, have sterile members who sacrifice themselves for the sake of the colony, but this does not meet the definition of suicide because such creatures cannot reproduce, nor presumably are they capable of foreseeing. As defined, suicide is confined to human beings; as far as we know, no other species is capable of regarding existence as a problem that can be resolved through deliberate death.[4]

Because existential anxiety and its dark companion suicide are definitive for being human, it has been common to suppose that there is a sharp distinction between it and emotional distress, corresponding to a qualitative distinction between human beings and other animals. The standard Roman Catholic view, for example, is that human beings possess an ontologically immaterial soul in addition to their physical bodies and brains, and that God infuses this soul at conception. There are compelling reasons to adopt such a supernaturalist hypothesis, including especially the resulting crispness of moral discourse about the value of human life. But nei-

---

[3] See "Does Any Animal Besides Humans Commit Suicide?" on *The Straight Dope* website, Feb. 1, 2001, http://www.straightdope.com/mailbag/mbugsuicide.html (accessed Aug. 5, 2005).

[4] See "Can and Do Animals Commit Suicide?" at http://www.bizarremag.com/ask_bizarre.php?id=208 for a review of controversial cases, including debunking reports of alleged animal suicide. It is widely known now that lemming suicide by jumping off cliffs is a myth. This report suggests that a certain Disney film was a factor in spreading this story and claims that the makers of the film intentionally herded lemmings onto a ledge, forcing them off the edge, presumably to make them behave as it was believed they were supposed to behave in the wild. If true, this is an example of monumental human stupidity leading to stunning cruelty.

ther the interpretation of exotic experiences nor scientific study of human brains, minds, and groups seems to require this hypothesis. I think there is every reason to conjecture that the neural and social requirements for the exquisite suffering of existential anxiety are quantitatively but not qualitatively different from those for emotional distress. With existential anxiety, we have the most evolutionarily advanced form of suffering in nature that we know, its peculiar agony emerging from and depending on more basic forms of achieved complexity, and flowering only in what I shall call, in the sense of nonsupernaturalist theologians such as Paul Tillich, the dimension of spirit.

I have distinguished four basic forms of suffering. In increasing order of complexity requirements these are physical injury, conscious pain, emotional distress, and existential anxiety, corresponding to the realms of biology, sensation, cognition, and spirit. In less complex situations, outside the biological realm, suffering is not possible, but integrity disruption and sheer change remain important as potential causes of suffering. In more complex situations than we experience, we can only imagine what might obtain with regard to both emergent complexity and suffering. In all things, intensity of suffering co-emerges with the complexity of nature.

3 Responses to Suffering in Nature

A multifaceted appreciation of suffering also calls for distinguishing a number of types of response to injury, pain, distress, and anxiety. These responses are not limited to individual beings reacting to their own suffering but include the possibility of corporate and species and interspecies responses. They do not necessarily presuppose conscious awareness but allow for biochemical responses without attendant sensations. The resulting array of suffering responses is not a strict hierarchy of levels, therefore, though there are strong dependence relations among some aspects due to their relationships with the stricter hierarchy of the four basic forms of suffering.

First, the biochemistry of injury response supports detection of integrity breaches, self-protection, damage control, wound repair, and automatic signaling in many living beings including most animals (internally especially by prostaglandin and externally especially by communication), many plants (for example, by means of jasmonic acid, both within and in some cases between plant organisms), and possibly some other much simpler creatures as well.

Second, a sexually reproducing species whose individuals possess diverse biochemical injury responses may be subject to selection pressures if some injury responses confer differential reproduction advantages. This gives biochemical injury responses a genetic and historical dimension, along with the possibility of different forms of response both among species and even within a single species.[5]

[5] For an example of the latter, consider the fact that male and female mice (also rats and probably humans) have different neural pathways for pain response, which probably will inspire the creation of painkillers customized to sex at some point in the near future. See "One Man's Pain May Be Another Woman's Agony," from *The Dominion,* March 8, 2000, http://flatrock.org.nz/topics/science/dont_wilt_have_a_pill.htm (accessed August 5, 2005).

Third, moderately complex central nervous systems permit the capacity for reflexive habit formation and automatic behavior modification through memory and aversive learning, as when a fish learns to avoid a particular plant through being stung, or a curious puppy learns to steer clear of porcupines through being pricked.

Fourth, some social species are capable of a more complex type of behavior modification through socially-supported mimicry, as when some dolphins teach their offspring to explore the seafloor with sponges over their noses to avoid potentially fatal attacks on the snout from dangerous creatures such as stingrays hiding in the sand.[6]

Fifth, some creatures can also form cognitive attitudes to suffering. A variety of animals with cognitive powers seem to do this. Chimpanzees have different warning calls for different types of predators, which variously trigger flight into trees (when the warning is about a lion), flight down from the top of trees (when the warning is about an eagle), and flight out of one tree altogether (when the threat is about a snake in their midst). Human beings form extremely complex attitudes to suffering, as when we write poems about it, report on it in newspapers, and speak about it as bad or tragic. Many human activities presume cognitive attitudes to suffering.

Sixth, the capacity for cognitive and emotional attitudes to suffering promotes in some creatures the capacity for compassion, even when the type of suffering involved has never been felt directly by the compassionate one. Compassion for suffering creatures depends on a host of conditions, including possessing one's own biological capacities for suffering response, mirror neurons that partially recreate in a witness the experience of the sufferer, memories of one's own past suffering, the cognitive ability to imagine injurious or painful or distressing or anxious circumstances, and even evolutionary pressures toward altruism. It certainly reflects a high degree of sociality: a group can cultivate compassionate responses to suffering within its members, including especially corporate identification with suffering. Such responses are present to different degrees in different individuals.

Seventh, in sufficiently adept species, the compassionate response produces a desire to intervene. Intervention can involve alleviating suffering through healing injury, easing pain, soothing distress, and calming anxiety. It can involve avoiding injury and pain through protection or rescue, and minimizing distress and anxiety through physical contact or friendly advice. Sometimes intervention places the one intervening at great risk, particularly when the protection of offspring is the goal, yet this behavior is quite common in nature. Cognitive attitudes are crucial in determining which kinds of suffering we focus on and those we marginalize or do not notice. Social animals with warning calls cannot recognize or meaningfully alert fellow animals to every possible danger. Human beings are constrained in their interventions both by variability in intensity of compassion within members of the species and by the way their cognitive attitudes to suffering direct their attention toward some forms of suffering and away from others. For example, we develop technologies to heal or avoid injury

[6] See "Mama Dolphins Teach Their Babies," on *Animals in Translation* website, dated June 8, 2005, http://animalsintranslation.blogspot.com/2005/06/mama-dolphins-teach-their-babies.html (accessed August 5, 2005).

for some house pets but not masses of chickens on factory farms; we create medicines to alleviate the pain of disease in some situations but not others; we strategize about how to avoid distress and prevent suicide for some people but not others. These constraints are particularly important in the way human beings come to take responsibility for alleviating suffering: they require both an accurate grasp of where suffering actually occurs and a lively sense of compassion that motivates intervention; both are difficult to obtain.

Eighth, social species with highly developed cognitive powers engage in what sociologists of knowledge have termed the social construction of reality. The traditions, practices, and beliefs that result serve to disseminate prevailing attitudes to suffering, stabilize strategic responses and produce opportunities for refinement of interventions, legitimate action and inaction in face of suffering, and produce rich tradition-based narratives and theories to give an ultimate explanation of the reality and prevalence of suffering. The religious aspects of this response go to the heart of the form of suffering I have called existential anxiety. Less complex forms of suffering are not eased much by stories and theories, yet existential anxiety positively requires creative, tradition-borne thoughtfulness.

Ninth, at the higher levels of emergent complexity, there emerges the possibility of cultural evolution, chiefly in human societies.[7] This produces socially organized methods of avoiding and alleviating suffering, such as economic arrangements or technologies of healing, and these take shape as cultural traditions that pass to future generations as a set of stable social practices inviting refinement and further innovation. Cultural evolution requires socially constructed realities to confront both challenges and competition. The challenges may take the form of threats to survival, scarcity of food and water, changing environmental conditions, and natural disasters. At a corporate cognitive level, challenges may appear in the form of plausibility difficulties with basic narratives and theories in face of apparently contradictory experience. The competition needed for selection may take the form of cognitive dissonance upon encountering other worldviews. This seems to have been relatively less important in the history of culture, however, than the effects of innovation, whereby new insights and technologies force the abandonment of older practices as less efficient or the rejection of older ideas as somehow deeply mistaken.

4 Causes of Suffering in Nature

A multi-faceted approach to suffering requires some understanding of the causes of suffering, particularly because moral judgments about suffering in nature crucially depend on our understanding of how it occurs and whether anything can be done about it. In this case, I think the analysis is best served with a series of distinctions, some nested, some overlapping.

---

[7] There is a lot of debate over whether cultural learning applies to nonhuman animals. For an interesting discussion of this issue in the case of chimpanzees, see Christophe Boesch and Michael Tomasello, "Chimpanzee and Human Cultures," *Current Anthropology* 39, no. 5 (December 1998): 591–; available on CogWeb's Evolutionary Psychology webpage, http://cogweb.ucla.edu/Abstracts/Boesch_Tomasello_98.html, dated December 1998 (accessed August 5, 2005).

First, suffering in nature may be caused by nature or it may be caused by supernatural beings, discarnate entities, and gods. The Hebrew Scriptures recount several spectacular examples of God personally visiting devastating suffering upon entire cities, as in the destruction of Sodom and Gomorrah; upon all people, animals, plants, as in the Great Flood; and upon human beings, as in the plagues of Egypt. Sometimes the Bible represents God as rightfully causing suffering by the hand of others, as in Jael's execution of Sisera with mallet and tent peg, the Israelite subjection of the native inhabitants of what came to be Israelite territory, and Satan's tormenting of the faithful but unfortunate Job. God visiting destruction by the hands of others is a common biblical motif when prophetic literature interprets the suffering of God's chosen people: the destruction of the northern kingdom of Israel is by God through the Assyrians, and the exile of the kingdom of Judea is by God through the Babylonians. Many world cultures carry forward living beliefs in suffering through demon possession, through haunting by the anguished souls of the dead, or through torment from supernatural monsters. By contrast with all of this, some suffering in nature is caused by nature, not by anything supernatural.

One sharp view on the question of natural versus supernatural origins for suffering in nature is simply that there is no supernaturally caused suffering because there is no supernatural realm that affects the realm of nature. This view holds that all causes of suffering are within nature, that all events (even strange ones) are natural, and that there are no supernatural beings or discarnate entities. The theistic versions of this kind of naturalism affirm God in one way or another as the ground of being, after which God is implicated in every natural event, and thus in every moment of natural suffering as much as in every moment of creative response to suffering. The distinction between natural versus supernatural origins for suffering in nature is not required, therefore, but it has been and still is extremely important in many religions and cultures, partly because it is a key conceptual element in the narrative construction and theory-building activities that we use to furnish a satisfying explanation for suffering.

Second, nested within the first distinction is a second: natural causes for suffering in nature are lower level, same level, or higher level. The levels refer to the various levels of emergent complexity in nature and correspond to the four realms of suffering as existential anxiety (in the realm of spirit), suffering as emotional distress (in the realm of cognition), suffering as conscious pain (in the realm of sensation), suffering as physical injury (in the biological realm)—and also the realm of no suffering despite integrity disruption and sheer change (in the rest of nature). Lower-level causes of suffering are devastating earthquakes or storms or cosmic collisions that affect plants and animals. This includes cosmic rays that cause point mutations in DNA with injurious consequences to an organism or its offspring, plants that sting or cut or feed on hungry or unlucky animals, and animals that bite or frighten human beings. Same-level causes include plants competing for sunlight and soil nutrients, animals injuring each other over breeding rights or preying on each other for food, and human beings behaving in cruel or hurtful or neglectful ways toward one another. Higher-level causes are animals feeding on plants, and human beings killing almost any living being for food and dominating habitable environments so as to endanger animals and plants through malnourishment or toxins.

Suffering has different tones depending on whether its cause is lower level, higher level, or same level. In particular, higher-level causes sometimes suggest intentionality or deliberation that is lacking in lower-level causes, as when human beings hunt a lion, or the lion hunts a gazelle. Lower-level causes suggest misfortune through the intersection of independent causal chains, as when a lion steps on a thorn or dies of thirst and hunger in a drought, or when vast hosts of plants and animals are destroyed by an asteroid colliding with the Earth.

Third, overlapping the second distinction is one that pertains only to the realm of cognition, and opens up questions of responsibility for and power over the causes of suffering in nature. Some causes of suffering are beyond deliberate, effective, compassionate intervention, while others are not. As applied to human beings, this distinction is a dynamic one. New medical technologies and new understandings of the workings of nature and society place more causes of suffering under the control of human beings and so subject to deliberate, effective, compassionate intervention where the determination to intervene exists. For example, complex societies and economies have many effects, some of which are unintended and disastrous. With greater understanding of economic and social life, human beings have become better at predicting such side effects and better at managing some of them—this is part of the meaning of modern managed economies. Many other suffering-causing effects remain outside the realm of deliberate, effective, compassionate intervention, such as the impact of modern capitalistic economies on traditional cultures. Many more suffering-causing effects that could be targets of compassionate intervention are not targeted for lack of will to alleviate suffering, as when cruel forms of factory farming persist even in nations that could afford to cause less pain to the animals they rear for food, or when wealthy nations do not intervene decisively to alleviate needless disease and starvation caused in part by the predatory economic and agricultural practices of those same nations.

Fourth, some causes of suffering are instances of evil and others are not. This idea is difficult to stabilize because of the fluid semantic scope of the word "evil" but the distinctions already introduced help to some degree. In terms of the third distinction, evil requires the presence of a high degree of control and responsibility, and so can only apply when causes of suffering are within the reach of deliberate, effective, compassionate intervention or avoidance. This may arise, on the one hand, with the deliberate infliction of avoidable suffering, as with predation. But most human beings would not be willing to say that deliberately hunting and injuring an animal for food is evil by itself, so two other elements are required. The most important necessary condition is that the suffering must be understood and yet still enjoyed or discounted; in other words, cognition and cruelty and selfishness must be present. The bird that "cruelly torments" a dying mouse does not meet this condition because the bird probably does not understand the suffering it causes, even if the bird is capable in some sense of savoring the struggles of the vainly writhing mouse. We would be less inclined to make an exception of the human being that deliberately tortures an animal for the sake of breaking taboo by being in the presence of the mysterious mana of pain, and thereby exercising godlike control over another being's experience and life. And we would certainly call evil the deliberate and cruel infliction of pain by human beings when, in terms of the second distinction,

the cause is same-level rather than higher-level, which is to say when the victim is capable of more dimensions of pain and the interpreter understands this, as when a human being deliberately tortures another human being for the pleasure only of the torturer. On the other hand, causes of suffering may be evil when suffering could be alleviated but is not. The necessary condition in this case is that the degree of control must be high, so that intervention is minimally difficult, as when a powerful person witnessing an act of cruelty does nothing to intervene even though intervention would surely succeed.

The most frustrating and sinister forms of evil arise in two situations. On the one hand, in particularly rigid forms of social organization, intervention can be easy to accomplish but personally costly. For example, in every instance of group killing, it is easy to alleviate suffering in a given circumstance by simply not inflicting it or by preventing someone else from inflicting it, but the price of intervention is often such severe punishment that few are willing to try to stop the group killing as it unfurls like a vast black banner. This might apply to human or chimpanzee societies, though it is rare among chimps and sadly common, even in the extreme form of genocide, among human beings. On the other hand, in particularly loose forms of social organization, and now perhaps only in relation to human beings, intervention on a small scale is relatively easy but utterly ineffective in changing things on a large scale, as when a single hungry child can be fed but poverty and avoidable disease persists on a massive scale. The sinister character of the evil in this case consists in human beings deceiving themselves about how much control they really have: in fact we now have enough control to intervene on a scale as massive as the problem itself, but we rationalize neglect by saying that hunger and avoidable disease is an uncontrollable side effect of complex societies and economies. This rationalization was partially correct at one time, but it is true no longer, and the difficulty of the task does not mask the evil of self-deceiving neglect.

Fifth, how do causes of suffering relate to death? On my account, decay and dissolution is the natural and inevitable fate of all forms of complex self-organization, from planetary systems and ecologies to the individual beings within them. We reserve the word "death" in its literal sense for the realm of living creatures: it is the process of decay and dissolution that ends life. As the natural and inevitable fate of all living beings, death is not a form of suffering in itself. This would not change even if aging and death were to become subject to delay through creative medical or artificial intelligence technologies; in that case, aging and decrepitude would be avoidable forms of suffering, at least temporarily, but death would still be simply the end of life. Indeed, this is precisely the situation of modern social organization and medical technologies, which together have vastly increased human life span, and may continue to do so. Similarly, even so-called "untimely" or "unnatural" death is not suffering in itself; these qualifications merely redescribe the cause of death in value-laden ways. The key distinction here, therefore, is between death itself, which is not a form of suffering or a direct cause of suffering, and the physical injury, conscious pain, emotional distress, and existential anxiety associated with death, whether untimely or unnatural or otherwise; death in its psychological and social and natural connections is a profound cause of suffering. Among human beings, the anticipation and denial of death are psychologically potent, culture-

conditioning phenomena that produce stupid acquisitiveness and heartless deflection of responsibility. Relentless grief and the compassionate identification with those who grieve can be agonizing. Watching the dying can be terrifying, especially when it is from violence or disease. By contrast with this endless turmoil of creatures capable of existential obsession with death, death in itself is not a terrible thing, despite its definitiveness. It is merely the final confirmation of a creature's finitude, of its naturalness—indeed, of its life.

Sixth, we appear to require a distinction among intra- and extra-organismic causes of physical injury and conscious pain. Predation, natural disasters, and even viral illness are extra-organismic causes because the source of suffering derives from outside the suffering plant or animal. Cancer and disintegration are intra-organismic causes because the source of suffering is inside the suffering plant or animal. In practice, intra-organismic causes can be triggered by external conditions, as when carcinogens in the environment or food render an organism more vulnerable to cancer, so the distinction is not clear-cut. This reflects the fact that every creature is deeply entangled with its context, biochemically, environmentally, and evolutionarily.

Seventh, and finally, can knowledge of causes of suffering illumine questions of the frequency and necessity of suffering? Indeed they can. Decay and dissolution are inevitable features of complex self-organization and also forms of injury, relative to the ideal of health or integrity. So suffering due to injury is universal in the biological realm. The necessity of predation means that all animals and cellular organisms must inflict suffering to live, even if not all creatures are the victims of predatory feeding. In the realm of sensation, conscious pain is startlingly common. Some creatures may escape extreme pain for the whole of their lives, but this must be exceptionally rare given the conditions of life. In the cognitive realm, distress is utterly universal, though to greatly varying degrees and in many different modes. This is due to the social embedding, psychological complexity, and emotional capacities of creatures in the cognitive realm: this is a potent combination of factors. In the spiritual realm, the very idea that there may be creatures that somehow transcend existential anxiety stimulates religious hope to an extraordinary degree, yet existential anxiety may not be universal in another sense: not all human beings may achieve this kind of sensitivity, perhaps because of neurological deficits or trauma. There certainly is evidence of sociopathic human beings who appear to lack the capacity for guilt, so the universality of existential anxiety must be a similarly complex issue.

Knowledge of the causes of suffering suggests, in sum, that all creatures suffer in some respects and cause suffering in other respects. All creatures capable of a given level of suffering do experience it, though to varying degrees. The safest generalization is this: suffering is universal, inevitable, and frequently intense.

5 The Meaning and Use of the Term "Suffering"

We might elaborate forms of suffering, responses to suffering, and causes of suffering in intricate detail. Indeed, this has been done movingly and often in literature—particularly the variations and causes of emotional distress,

the elaborate human responses to existential anxiety, and the intensification of the causes of suffering into the realm of evil. But the four types of suffering, the nine facets of response to suffering, and seven ways of thinking about the causes of suffering in natural creatures serve as a basic framework for determining the meaningful use of "suffering" and related terms. Indeed, I have been using key words in accordance with a specific policy, which I now state compactly.

Where the biochemical basis for "injury response" is lacking, application of any suffering words is straightforwardly tropic. Human beings frequently impute human-like suffering responses to aspects of natural reality that do not have the capacity for them. Thus, the apostle Paul's reference to creation being subjected to futility and in bondage to decay, groaning in travail and longing for freedom (Rom 8:18–23), when interpreted within a modern naturalistic cosmology rather than in Paul's own ancient worldview of a cosmic battle between supernatural spiritual powers, is an inspiring poetic reference to the fact that suffering is inevitable and often tragic. But the cosmos does not literally suffer hurt or pain or distress; entropic systems do not groan in travail or long for liberation, no matter how much sympathetic and imaginative human beings do this on their behalf. I have also argued that ecosystems do not suffer, even in the sense of physical injury, because they are not sufficiently densely biochemically connected. We reserve the phrase "integrity disruption" for ecological damage, which leaves it available for moral debate as a cause of suffering.

In cases where some of the facets of suffering response are present but not others, we should understand the meaning of "injury," "pain," "distress," and "anxiety" in terms of the facets actually evident, taking care not to ascribe other dimensions of meaning, except self-consciously for the sake of poetic expressiveness. In cases of nonnatural creatures experiencing emotional distress, as when angels weep, presumably this refers to the response of compassionate co-suffering, but in isolation from any biochemical roots. I will not consider this possibility beyond noting its importance in religious piety. My concern is with suffering in nature. More specifically, in terms of facets of suffering response, I have used "injury response" to refer to situations in which only the first two facets are present—biochemical response and evolutionary conditioning of biochemical responses to injury. We should reserve "pain response" for the various higher kinds of reactions to pain: aversive learning, social learning, emotional and cognitive attitude formation, compassion, intervention, social construction, and cultural evolution. We should use "distress response" and "anxiety response" only for the more complex pain responses, when specifically emotional suffering is in view, whether caused by physical injury or not. We should use "suffering response" to describe injury responses, pain responses, distress responses, and anxiety responses collectively, just as we use "suffering" to refer to all of injury, pain, distress, and anxiety. This is slightly prejudicial, admittedly, because "suffering" is a loaded word for human beings. But all of the wealth of suffering words—such as "affliction," "agony," "anguish," "misery," "torment"—suggest pain sensation or emotional distress more directly than "suffering" does, so "suffering" may be optimally neutral and thus the best general word available in English. Moreover, the foregoing should clarify the breadth of situations to which "suffering" applies and prevent inappropriate attribution of aspects of suffering that are not actually present.

We should limit "evil" to the realm of cognition, where suffering can be controlled or avoided and yet is caused cruelly or ignored selfishly, with several conditions discriminating less from more evil. When people use "natural evil" in reference to anything else—such as earthquakes, tsunamis, tornadoes, and a host of other situations of lower-level causes of suffering—it is not literal usage but analogical. The analogy is between human beings and imagined supernatural beings that control and wield natural disasters as punishment or as perverse forms of play. Death is not a form of suffering, in itself, but, among cognitive creatures, its social and psychological embedding causes a formidable array of intense forms of suffering.

These are stipulations about how to use suffering words as much as they are descriptions of the extent of suffering in nature. Nevertheless, I intend this presentation to create a burden of demonstration for those making alternative proposals for the extent of suffering in nature, and substantively different recommendations for how to use suffering language.

The types of suffering distinguished above and the associated word-use recommendations are summarized in the following diagram. The social dimensions of suffering are not reflected in the diagram. This is because I assume they are causes rather than types of suffering, much as I treat death as a cause rather than a type of suffering. Yet death and the social dimensions of suffering are no less important for that reason. Other diagrams could register the various collective manifestations of suffering. This diagram focuses on distinctions supportable from biochemistry and neurophysiology. A partial exception is this: the biochemical basis for suffering in plants is related to the biochemical basis for suffering in animals but the lack of a central nervous system makes the two types of suffering quite different. The recommendation to include plant injury as a form of suffering is partly practical; this usage engages literature in which this kind of usage is common.