# Change to conserve? Genome editing threatened species

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## Abstract

Genome editing could be used for saving threatened species or even reviving extinct species, preventing or reversing biodiversity loss, for instance by altering their capacities and making them fit a changing climate. This may be considered a paradoxical endeavour: artificially preserving wild species that are considered valuable due to their independence of human intervention. Can our responsibility to ensure the continued existence of threatened species be fulfilled in this paradoxical way? To examine this moral challenge, we take as point of departure Cora Diamond's notion of animals as our *fellow creatures*. The significance of the otherness of animals pointed to by this term opens up a space for a virtue-based analysis of recent projects using genome editing to save threatened species from extinction. In particular, we elaborate on Hursthouse's proposal that wonder and respect could be considered new moral virtues in environmental ethics. Using these virtues as a lens to examine the case of genome editing threatened animals, we bring Hursthouse in dialogue with Iris Murdoch's concept of attention, which is concerned with proper moral perception of reality, and which implies a recognition of the otherness of animals. Changing basic characteristics of wild animals to preserve them as a species means altering that which made wonder and respect appropriate virtues. We conclude with discussing whether these virtues can be expressed by ensuring that interventions considered necessary are as minimally invasive as possible.

**Keywords:** animal ethics, conservation, de-extinction, virtue ethics

## Introduction

In a famous scene in *Jurassic Park*, the mathematician Ian Malcolm takes a stance against the park creator, John Hammond: The genetic experiment of re-creating dinosaurs to live in an entertainment park seems to him morally inconsistent with treating nature with respect and humility: 'Your scientists were so preoccupied with whether or not they could, they didn't stop to think if they should', Dr. Malcolm exclaims.

Although the kind of scenarios that are portrayed in Jurassic Park are not currently on any tables, Dr. Malcolm's urge that we should consider the ethical aspects of using genetic technologies on animals is gaining a new relevance as such applications are becoming reality. A more pressing question than whether we should re-introduce animals that have already gone extinct, however, is whether new genetic tools could and should be used to save species that are currently threatened by extinction (Adams and Redford, 2021).

Using genome editing to save threatened species may be considered a paradoxical undertaking if the reason is that the value of these species is that they are beings independent of humans, as captured in the expressions 'pristine' or 'wild nature'. We intervene in nature to keep it 'untouched', but haven't we by this very act already lost what we aimed to save? As Clare Palmer has put it, facilitated adaptation of threatened species can be understood as a 'loss of wilderness' that is ethically worrying (Palmer, 2016). The aim of this article is to discuss whether we are obliged to intervene to ensure the continued existence of threatened species, and, if so, whether this moral duty can be fulfilled in this paradoxical way.

Our point of departure is the notion of animals as our *fellow creatures* (Diamond, 1978). Central to this understanding is that the concepts of human beings and animals are not simply handed down to us by biology; they are works of moral thought and imagination, derived from human practices (Winther and Myskja, 2023). We propose a virtue ethical reading of Diamond, according to which our treatment of animals should be determined on the basis of what a virtuous treatment of them would look like in different contexts. Diamond suggests virtues like charity, fairness, respect for independence and pity (Diamond, 1978: pp. 474–475). Rosalind Hursthouse, however, argues that when dealing with environmental issues, we ought, in addition to expanding on such established virtues, to consider new ones, and she suggests that 'wonder' and 'respect for nature' would be appropriate (Hursthouse, 2007). Following Hursthouse, we argue that wonder in particular sheds light on the paradox above, because wonder is something we experience towards wild nature in part because it is independent from us. In addition, wonder is a concept that is mobilized, both directly and indirectly, in de-extinction and conservation efforts to defend the use of genetic technologies, since these species might otherwise be lost. A virtuous display of wonder for animals as our fellow creatures involves appreciating their independence from us, which we ought to respect. In the following, we first give a brief overview over the current field of using genomic technologies to save threatened species before we proceed to discuss how the virtues of wonder and respect can address this issue.

## Resurrection, conservation, and the role of ethics

Discussions of how we should direct conservation efforts are gaining traction as species go extinct in a pace that is being described as the sixth mass-extinction (Ceballos *et al*., 2015), with the percentage of threatened species amounting to 28% of all species on some accounts (Kaiho, 2022: p. 1) and estimates stating that between 15–40% will effectively be extinct by 2050 as a result of climate change (Thomas, 2013: p. 485). While some species may adapt to these changes on their own, others will need help in order not to disappear (Palmer, 2016: p.234).

Conservation biologists disagree on the purpose of conservation in these contexts. While some argue that we ought to accept the inevitable species extinction and reduce meddling to interventions in other aspects of ecosystems, others argue that habitat preservation is not sufficient to protect species, and that we need more interventionist methods to ensure their survival (Palmer, 2016: p. 234). There are different methods to achieve the resurrection and re-introduction of a species into an environment, including back-breeding, cloning, and genome editing. In this article, we focus on the latter, though in some cases, cloning might be combined with genome editing. This can involve the use of genome editing to alter the capacities of animals, for example by making them fit a changing climate (Campbell and Whittle, 2017; Sherkow and Greely, 2013; Thomas, 2013). In some cases, it is not sufficient with simple mitigation efforts such as feeding or artificial insemination to preserve a species in an environment where the animals have been unable to survive since the causes of their threatened status still exist. One way of doing this is the adaptation of genes in order to increase resilience to climate change (Kosch *et al*., 2021), giving better physiological tolerance against higher temperatures or better resisting diseases (Thomas, 2013: p. 486). Such research is now at beginning stages, with ongoing projects investigating for example how to increase disease fitness in the Australian southern corroboree frog (Kosch et al., 2021: p. 366) or make a malaria-resistant honeycreeper (Samuel *et al*., 2020). In all likelihood, more projects will follow in the years to come. Since assessment of morally acceptable uses of CRISPR should proceed on a case-by-case basis (Winther *et al*.. 2023), the ethical conversation must keep up with this development.

There are various ways in which we can respond to the problem of disappearing animals. One, of course, is to do nothing. Animals have, after all, gone extinct since before human activity had anything to do with it. On the other hand, there is one pragmatic, anthropocentric reason for saying that we ought to save them: Some extinct and many threatened species serve important roles in ecosystems humanity

rely upon (Kasperbauer, 2017: p. 1). In addition, one can hold that animals have value in themselves, and that we therefore should do what we can to ensure their survival. An even more compelling reason is that our current collective activities are the direct cause of endangering a number of the species now, assuming that we have strong negative duties to prevent harm. If it is in our power to save species directly threatened by climate change and habitat loss caused by collective human actions, we have a strong duty to use any morally acceptable means to do so. There are two problems shared by these three lines of argumentation: The current mass extinction means that we can only save or resurrect a fraction of the species in question. How do we choose which species to prioritize? And is it morally acceptable to change a wild species into a partly human creation — arguably undermining its status as 'wild' — in order to save it? Below, we consider the latter question from a virtue ethical point of view.

## Wonder as virtue

Hursthouse has argued that there are two ways in which virtue ethics can be applied to environmental ethics. First, we can try to use the established virtues and vices, such as humility and greed, and ask what these virtues can tell us about how we ought to treat nature (Hursthouse, 2007: pp. 155–156). Considering old virtues and vices in new contexts can give us new understandings of what is involved in them (Hursthouse, 2007: p. 158). This, she holds, is how ethics advances on a virtue ethical account – we revise and reconfigure our understandings of what virtues and vices involve based on situations that may challenge our initial understanding of them. However, Hursthouse also asks whether new virtues could be brought into play. This is suggested on the basis that the reconfiguration of familiar virtues and vices require radical change in our ways of thinking about the natural world, something which could perhaps, Hursthouse proposes, be achieved by introducing a new virtue (Hursthouse, 2007: p. 160). Hursthouse gives two suggestions: 'Respect for nature' (Hursthouse prefers to call it 'being rightly oriented to nature', wishing to avoid deontological implications. We find this to be less problematic today and will use 'respect') and 'being rightly disposed with respect to wonder'. On our reading of Hursthouse, we understand these virtues to be two sides of the same coin, both concerned with a proper attitude to nature.

The virtue of wonder could involve, Hursthouse suggests, 'being disposed to feel wonder the right way, towards the right objects, for the right reasons, to the right degree, on the right occasions, in the right manner, and to act accordingly' (Hursthouse, 2007: p. 161). At a first glance, wonder might seem a strange place to look for a sense of direction on how we should act with regards to nature, particularly when it comes to questions like whether or not we should use genome editing technologies on animals. However, wonder is a particularly relevant emotion to consider precisely in this case, because it sheds light on the paradox mentioned above concerning how we ought to think about the human conservation of animals that are valued in part because of their independence of humans. Wonder, as an emotion, is such a crucial component of reasoning behind both de-extinction and conservation projects (Greely, 2017: p. 35; Minteer, 2015: p. 13). For instance, it has been suggested that the sense of awe and wonder that could come with seeing a revived woolly mammoth could 'increase interest in and optimism about conservation' (Rohwer and Marris, 2018: pp. 138–139). The question is to what extent wonder can be considered a virtue rather than merely a spontaneous emotion.

Liezl van Zyl has argued that wonder can be understood in two different senses: As 'surprise-wonder' and as 'appreciative wonder'. The first one, she writes, is what Kant refers to as *Verwunderung*: our immediate reaction of surprise and amazement when we see something unexpected or new (van Zyl, 2021: p. 77). This is the kind of wonder, we can imagine, one could experience when visiting Australia and happening upon a kangaroo for the first time. Van Zyl contrasts this kind of wonder with a form of wonder she calls 'appreciative wonder'. This is the kind of wonder that does not dissipate as the moment of surprise and novelty wears off (van Zyl, 2021: p. 77). Wonder in this sense, she writes, is what Rachel Carson has

in mind when she describes its role in environmental ethics. For Carson, wonder involves the capacity to *see* in a certain way (Moore, 2005), a point we will return to below. Kathleen Moore has pointed out that this involves a kind of 'attitude of openness' that leads a person to search for meaning beyond oneself (Moore, 2005). As Carson puts it: 'I believe that the more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we will have for destruction' (Moore, 2005: p. 28). Appreciative wonder, then, involves careful attention to and interest in something that has elicited wonder. In this case, van Zyl argues, it does make sense to talk about being rightly disposed with regards to it.

Arguably, something like the virtue of wonder in the second sense van Zyl is proposing can be involved in coming to recognize animals as fellow creatures. For Diamond, this involves a recognition of a fellowship with animals, which is based on our understanding that they, despite sharing with us some often surprising similarities, are also so alien, leading lives that are almost completely different from us. As Diamond puts it, animals are 'beings so like us, so unlike us, so astonishingly capable of being companions of ours and so unfathomably distant' (Diamond, 2008: p. 61). In a sense, it is precisely because they are so close to us that their difference from us elicits awe or wonder. The kind of appreciative wonder van Zyl describes could be understood as involving precisely a recognition of animals as our fellow creatures. Appreciative wonder involves a deeper, more sustained form of attention to that which we may not understand, but sense is important (van Zyl, 2021: p. 81). In the case of animals, their relatedness to us makes this respectful wonder at their 'otherness' even more morally significant, evoking also traditional virtues of charity and pity for the individual animals.

## What does this mean for the question of genome editing animals

Having argued that wonder is relevant to environmental ethics and can be thought of as a way of coming to recognize animals as our fellow creatures, a crucial question still remains: What kind of guidance can this recognition give us concerning genome editing of animals to save them from extinction? Van Zyl states that an obvious objection to understanding wonder as a virtue is that it can be misdirected: 'We can feel wonder in response to a beautiful sunset, but remain oblivious to the fact that it was created by air pollution. We can wonder at the complexity and mystery of a termite mound, but in the process of satisfying our curiosity end up destroying it' (van Zyl, 2021: p. 76). Similarly, the fact that wonder motivates the resurrection of extinct species like the woolly mammoth or the dodo, doesn't mean in itself that this is something we should do. Wonder can also be biased in a way contrary to virtue (van Zyl, 2021: p. 80). De-extinction projects tend to prioritize animals that are charismatic or cool (Molhuizen, 2021; Sherkow and Greely, 2013). There are thousands of species still to be discovered and learned about — what conservation efforts should be undertaken for their sake is an even more difficult question to answer. Van Zyl's distinction between surprise-wonder and appreciative wonder is useful to answering these objections. As she correctly argues, wonder in the former sense can hardly be understood as a virtue at all — surprise and fascination as immediate emotions does not in themselves entail any recommendable actions. However, sustaining wonder after the initial reactions wear off requires us to pay attention to animals beyond our immediate fascination. Understanding wonder as a virtue, as we propose following Hursthouse, means paying attention to animals and considering what it means to treat them with respect.

A term that may be fruitfully brought in dialogue with Hursthouse new virtues, is Iris Murdoch's concept of attention. According to Murdoch, attention is a moral faculty that involves considering reality with 'a just and loving gaze' (Murdoch, 2001: p. 33). In other words, it involves seeing reality in a certain way, as Carson describes. Part of this moral faculty involves setting aside our own desires and prejudices ('the fat, relentless ego', as Murdoch terms it), which translated to the case of animals means considering what is required of us to do in respect to them independently of the uses we may have of them, whether it be the

roles they play in ecosystems we rely upon or the value we place on not losing them. Crucially, Murdoch brings out the connection between moral perception and action, arguing that 'I can only choose within the world I can see' (Murdoch, 2001: p. 36). Proper attention to reality, which can brought about by wonder, involves recognition of what a respectful treatment of others requires. The question remains, however, what morality requires from us with regards to the survival of threatened species when the act that formerly meant being respectful, namely staying away, only ensures that these species will meet their end, precisely on account of other human activity.

There are several virtue-based reasons for altering our way of life, as well as for engaging in mitigating activities. Here we have considered how wonder, understood as moral attention to nature, can inform our understanding of what it means to treat nature respectfully. What can it mean to intervene in animals' lives to conserve the species, but in such a manner that expresses wonder and respect in the right way? As stated in the introduction, we hold that this question must be answered on a case-by-case basis. Crucial questions to be asked, are what kind of intervention is required, what it will achieve, how it will impact the surrounding ecosystems, and what the alternatives are. Too often, human efforts to conserve species start when the time for alternatives that are not invasive has run out. We hold that there are interventions that perhaps is the virtuous choice for such wicked problems, though this will always be a matter of degree. An example of what we have in mind here is the condor recovery program, which was undertaken in 1987 and involved capturing the remaining 27 Californian condors for a breeding program. After these efforts had proved to be successful, birds were released into the wild again. Today, there are more than 500 condors. Although this program undoubtedly also involved a loss of wilderness, it was a minimal intervention aimed at repairing damages we have caused the planet. In the extreme cases of threatened species required for the continued existence of unique ecosystems, more invasive measures may be appropriate, including genome editing enhancing their disease resilience or adaptation to changing climate. But changing basic characteristics of the animals surrounding us using means like genome editing to preserve them as a species, means that we change and intervene in what elicited our wonder to begin with, namely their otherness. Interfering in these animals' capacities to make them fit into ecosystems they are no longer capable of surviving in, ignores that wilderness hinges on otherness, and that this otherness is diminished with every human intervention in their awe-inspiring form of life. What kind of intervention that is expressive of wonder and respect, must be decided in each particular case. Arguably, the more their continued existence is a human accomplishment, the less likely it is that these interventions should be considered virtuous. In many cases, the virtuous act would be to let the species go extinct.

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