AESTHETICS AT THE INTERSECTION OF THE SPECIES PROBLEM AND DE-EXTINCTION

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ABSTRACT

In this paper, I argue that there are aesthetic reasons to avoid engaging in de-extinction and release projects, even if they pass moral permissibility criteria. The strength of these aesthetic reasons depends on conclusions drawn regarding species authenticity, a problem that arises from the intersection of the species problem and de-extinction technology. There are overlooked aesthetic consequences of the use of de-extinction technology, especially when conjoined with the release of the created organisms into the wild, as aesthetic judgments are inextricable from perceptions of naturalness, and species (in)authenticity would affect the perceived naturalness of the organisms and their environments.

KEYWORDS

Environmental Aesthetics; Environmental Philosophy; Philosophy of Biology; Philosophy of Technology; De-Extinction

'We have erected a monument to commemorate the funeral of a species. It symbolizes our sorrow. We grieve because no living man will see again the onrushing phalanx of victorious birds, sweeping a path for spring across the March skies, chasing the defeated winter from all the woods and prairies of Wisconsin.'

- Aldo Leopold (1992: 108),
A Sand County Almanac and Sketches Here and There
'On a Monument to the Pigeon'

I. Introduction

In Aldo Leopold's eulogistic second section of *A Sand County Almanac,* he mourns the loss of the passenger pigeon, and in a larger way, mourns the loss of a world that might never be again. This second section documents the decline in biodiversity in America witnessed by Leopold as he travels across the North American continent. The passenger pigeon, *Ectopistes migratorius*, iconic to the North American Midwest, reached a recorded population of five billion individual birds at one time, comprising 25–40 per cent of the total land-bird population at the time of European colonization (Cokinos 2000; Haught 2017). Through hunting, habitat destruction, and so-called 'progress,' the passenger pigeon's numbers began to decline. After a steady destruction of the passenger pigeons and their way of life, on September 1 1914, in the Cincinnati Zoo, the last passenger pigeon, Martha, died, leaving yet another species seemingly lost to a lonely, still, life, sitting taxidermized in museums and the pages of books and journals (Beever 2017; Leopold 1992: 109).

Great strides have been made in the fields of molecular genetics and biotechnology. As technology advances, that which was once science fiction may finally be within reach. In the coming decades, de-extinction technology may allow scientists to recreate organisms belonging to extinct species, thus (possibly) resurrecting those species, allowing researchers to learn something more about the biological past. Additionally, there are proposals to reintroduce the (re)created organisms back into their natural habitats, insofar as they still exist. For example, reintroducing wooly mammoths into Eurasia and the North American tundra has been proposed to combat climate change, as the reintroduction of large grazers like the mammoth is predicted to change the tundra into grassland, thus creating a carbon sink (Kasperbauer 2017; Revive & Restore). De-extinction technologies may serve as new methods in conservation biology and advance the preservation of (or increase) biodiversity.[1]

New technology and new possibilities call for philosophical inquiry. Ethicists have begun questioning the moral permissibility of engaging in de-extinction and proposing conditions under which it may be morally permissible. The moral question has thus far been the dominant value-based inquiry in the literature on de-extinction (Blockstein 2017: 35-36; Cohen 2014; Diehm 2017; Haught 2017; Kasperbauer 2017; Rohwer & Marris 2018; Smith,

[1] Derek Turner (2014) and Beth Shapiro (2015) frame the purpose of de-extinction efforts as an ecological one; rather than de-extinct-ing organisms, the goal is to de-extinct certain ecological relations, or at least some currently extinct phenotypes; however, the question of species authenticity remains. The created organism is still either an authentic member of a previously extinct species or not; the taxonomic question remains, even if it is not the focus.

2017). T.J. Kasperbauer (2017) argues that while several potential ecological harms could possibly result from (re)introduction of the created organisms into natural environments, the most serious of the potential harms involves threats to individual animal welfare; that numerous individual animals will inevitably suffer and die in the pursuit of a successful de-extinction and release programme poses a serious moral problem for such efforts. Assuming an ideal scenario that passes Kasperbauer's utilitarian threshold for moral permissibility, there might be other reasons to abstain from engaging in de-extinction projects. In this paper, I will argue that there are serious aesthetic reasons to avoid engaging in some de-extinction projects, even if a case would satisfy most moral permissibility criteria, such as those explicated by Kasperbauer (2017). I will further argue that the strength of these aesthetic reasons depends upon answers regarding species authenticity, a problem that arises from the intersection between de-extinction technology and the species problem(s). I intend to provide a preliminary exploration of the possible aesthetic impacts of de-extinction and release projects, as well as justify concern regarding the aesthetic impacts of de-extinction projects. The aesthetic consequences of these projects provide some reasons to abstain from engaging in de-extinction projects specifically focused upon the eventual release of the created organisms.

In Section II, I will cover relevant literature regarding the species problem within philosophy of biology that will pertain to and affect the aesthetic concerns. The ontological answers with regards to the species problem have consequences for at least some moral arguments in the pro-de-extinction camp (see, for example, Haught 2017), as well as important implications for the ethics of public science communication (see, for example, Blockstein 2017: 35), but these will not be the focus herein. Within the scope of environmental aesthetics, the main ontological concerns are regarding species authenticity: whether the created organism is a member of the target species for de-extinction or not, i.e., whether the organism is an authentic (say) passenger pigeon, thus resulting in the 'true resurrection' of the species, or whether the created organism is a member of some entirely new species of humanity's making. I will not seek to solve the species problem(s), but will rather explicate the necessary presuppositions regarding 'species' for de-extinction debates that are relevant to the aesthetics discussion.

In Section III, I will argue that there is a connection between the question of species authenticity and perceived naturalness, showing that an organism's status as an (in)authentic member of the target species for de-extinction will affect the degree to which that organism and its environment are perceived as natural. In Section IV, I will argue that there is a

connection between perceived naturalness and the aesthetic judgments of natural environments and their constituents, relying on empirical research into the psychology of aesthetic judgments of natural environments and natural objects. In Section V, I will justify the importance of aesthetic consequences, arguing that they ought to be seriously accounted for before engaging in de-extinction and release programmes, as well as conclude with a call for future research projects in order to develop and employ a 'multisensory aesthetic impact assessment' before beginning a de-extinction and release programme.

Moral values garner more attention in debates surrounding de-extinction, but there are overlooked aesthetic values and judgments that may be negatively affected by the (re)introduction of the created organisms into natural environments. Public opinion and preservation of the aesthetic value people attribute to the land often serves as a reason for the protection of such lands (Abbey 1998; Leopold 1992; Nash 1967; Norton 1991: 17-38). Aesthetic concerns have, up to this point, not been highlighted in the literature surrounding de-extinction, and if they may be negatively affected, then they are worth considering in assessing proposed de-extinction programmes.

II. The Species Problem and De-Extinction Technology

The species problem is not one problem or one question, but rather three: (1) what is species? This is in regards to species criteria (i.e., which species concept(s) should be endorsed) and the ontological type that should be used in conjunction with the endorsed species concept(s) (Are they classes, sets, or individuals?); (2) do scientists need to utilize a singular conception of species (monism) or can they coherently utilize multiple conceptions of species (pluralism); and (3) are species metaphysically 'real' (Ereshefsky 2017)? Questions (1)-(3) will not be given definitive answers here, but it is nevertheless important to consider these questions when engaging in work on de-extinction technology, as the species concepts employed will result in different conclusions about the possibility of true resurrection. Philosophical debates about de-extinction may only be able to proceed under certain answers to these questions. I will proceed to take a look at these questions in reverse order, since the answer to (3) would delimit the set of possible answers to (1) and (2).

While no definitive answers will be given to the species problem(s) in this paper, debates about de-extinction assume that species constitute something metaphysically real, whatever they may be, and thus I will assume an affirmative answer to question (3) in this

paper. A species anti-realist position (those who answer (3) negatively) could treat 'species' merely as a helpful scientific category wherein scientists can employ any specific conception of species they want without regard to strict ontological commitments; any species concept that fulfills research goals adequately and coheres with the literature informing one's study may be suitable, and as such, most species conceptions then find themselves as mere operational definitions (Ereshefsky 1998; Stanford, 1995). Merely operational definitions lack strong ontological commitments, making them inconsequential to the current debate. If working under mere operational definitions of species, then for the purposes of research, one could adopt a definition that allows for true resurrection or, alternatively, if one does not find the prospect of true resurrection favourable, one could adopt an operational definition that disallows true resurrection. In order to avoid this trivializing, 'choose-your-favorite-flavor' version of species concept choice, questions about the possibility of true resurrection call for a realist answer to question (3); species must exist with some sort of metaphysical reality. If true resurrection is possible, it is only possible under the assumption that there is some metaphysical reality to the species category; stronger ontological commitments are called for.

With regards to question (2) of the species problem, debates about the possibility of true resurrection remain neutral, not necessarily committing to monism or pluralism, so I will make no commitments or assumptions regarding this question here. Assuming a realist pluralism regarding species concepts, one would have to keep the species concept constant between the pre-extinction organism and the created organism in order to make meaningful claims regarding an instance of possible true resurrection; therefore, the answer to (2) has no bearing on de-extinction debates.

With regards to question (1) there are many competing species concepts. As part of their project, Helena Siipi and Leonard Finkelman (2016: 431) outline whether different species conceptions would allow the possibility of true resurrection. In considering this possibility, Siipi and Finkelman examine four broad species conceptions: phenetic, biological, ecological, and phylogenetic. First, phenetic species concepts define species in terms of trait similarities among organisms, such that similarities between organisms in, for example, appearance, behavior, genetics, or shared survival mechanisms, serve as the basis for species membership (Siipi & Finkelman 2016: 431). Second, the biological species conception, likely the most well-known conception, defines species based on their ability to produce viable offspring through sexual reproduction (Siipi & Finkelman 2016: 431). Third, ecological species conceptions define species in terms of factors external to the organisms regarding their

ecological niches, relation to specific ecosystems, or other 'external reproductive isolating mechanisms' (Siipi & Finkelman 2016: 431; see also, Beever 2017 and Blockstein 2017 for modified/specified conceptions of the ecological species concept).[2] Fourth, phylogenetic species conceptions define species as lineages that fit into a larger historical, evolutionary story. These phylogenetic conceptions typically focus on formalized classification schemas and look towards common ancestry in order to delimit individual species (de Queiroz 1998; de Queiroz 2007; Siipi & Finkelman 2016: 431). These competing species conceptions complicate the question of whether true resurrection is possible in light of a positive assumption to question (3).

Jonathan Beever (2017) rightly draws attention to the ontological issues that plague de-extinction debates. Beever (2017: 18) claims that a fundamental assumption being made by those engaging in de-extinction debates is 'that the thing being "de-extinct-ed" is indeed a member of previously existing species,' i.e., that the organism created belongs to the target species for de-extinction. Beever (2017: 18) goes on to state that '[t]his is the ontological assumption: that genetic make-up of the individual is both a necessary and sufficient condition for species membership.' Philosophers debating de-extinction need to be mindful of the species problem, since scientists engaging in de-extinction research must necessarily consider more than mere genomic similarity, as the developmental environment of the embryo bears a causal relation to the ultimate development of the organism; genetics are not fully causally determinate with regards to embryonic development or behavior (Beever 2017; Blockstein 2017: 35; Slater & Clatterbuck 2018: 10; Sterelny & Griffiths 1999: 94-111). True resurrection may be possible sans a gene-reductive view of species, and those debating the philosophical problems that arise from the possibility of de-extinction need to be acquainted with the

[2] A possible consequence of adopting the ecological conception of species would be that de-extinction technology itself may not be necessary for de-extinction. If the organisms need to *actually* stand in certain ecological relations to belong to a certain species, then insofar as captivity deprives an organism of being a relata for those relations, only release from captivity into the right kind of environment can enact a true resurrection, not the technology itself (Furthermore, the captive organisms might belong to a different species from their wild counterparts). For example, the Axolotl, also known as the Mexican Walking Fish, is critically endangered in the wild, but large numbers of them are kept in captivity for research (National Geographic, n.d.). Current distinctions are made between extinction proper, i.e., no organisms of a certain species existing at all, and extinction in the wild, i.e., no organisms of a certain species existing in the wild while some species members exist in captivity (International Union for Conservation of Nature, 2012). An ecological conception of species would seemingly eliminate this distinction, as the actual ecological relations captive and wild axolotls stand in are different, and a counterfactual notion of ecological species (e.g., were it the case that organism O were in environment E, ecological relation R would be established) would likely cast too wide a net. If wild axolotls go extinct, true resurrection could seemingly then be achieved by releasing captive axolotls into their natural habitat. Therefore, if true resurrection is possible on the ecological view (assuming that extinction is not inherently final), it would be possible through the release of captive organisms, including captive organisms created through de-extinction technology, not through de-extinction technology itself.

philosophical problems that plague the biology. Phenetic species concepts may be sufficient for true resurrection (depending on the one employed), such as Boyd's (1999; 2010) Homeostatic Property Cluster conception of species (Siipi & Finkelman 2016: 439-440). Basic ecological conceptions may also be conducive to true resurrection depending on ecological changes and time elapsed since the extinction event (Siipi & Finkelman 2016: 439-440).

In their assessment, Siipi and Finkelman conclude that the phenetic species concept best supports the possibility of true resurrection. Phenetic conceptions of species focus on similarities between organisms. If de-extinction occurs through cloning technologies, then there would likely be a large number of significant or relevant similarities between those organisms that existed pre-extinction and the created organisms.[3] Siipi and Finkelman's analysis rules out the simple, operationally testable notion of the biological species concept since the more theoretically robust forms of this concept stress the importance of structural, behavioral, or genetic similarities between organisms, and such a focus results in the biological species concept being absorbed by the phenetic species concept (Siipi & Finkelman 2016: 431, especially Note 2). Siipi and Finkelman conclude that while ecological conceptions of species may allow for true resurrection, such a possibility depends upon whether or not the relevant ecological relations would still be present. Siipi and Finkelman argue that phylogenetic conceptions of species are incompatible with true resurrection (Siipi & Finkelman 2016: 439). Beyond these four general species concepts, if specific variants of them are adopted, they may rule out the possibility of true resurrection (see, for example, Beever 2017), such that the discussion by Siipi and Finkelman ought to be taken as a general assessment rather than definitive.

In regards to the assumptions of the following discussion of de-extinction, I will not assume any definite answer to question (1). I do not plan on solving this complex issue in this paper; however, the answer to this part of the species problem will be crucial in determining whether true resurrection is possible, as well as what some of the consequences of a de-extinction project may be. Answers to questions (1) and (2), the correct species concept(s) and the question of monism or pluralism, respectively, are not assumed in discussions about de-extinction; (1) affects whether true resurrection is possible and is thus an essential point of

[3] A focus on similarities introduces problems of vagueness; arbitrariness, and line-drawing are important challenges for such species conceptions to tackle. One would need to specify what degree of similarity is sufficient, how to measure it, and justify why that threshold is where it is, non-arbitrarily. Simple cloning technologies will likely not be a feasible means of de-extinction for the wooly mammoth or the passenger pigeon, since the likelihood of finding living cells belonging to those species is close to zero (Shapiro 2015).

contention, and (2) does not affect debates regarding the possibility of true resurrection. For true resurrection to be possible in any meaningful sense, it must be assumed that species are metaphysically real, since it is meaningless to talk of two organisms belonging to the same species if species don't exist. Thus, debates regarding true resurrection must assume a positive answer to (3), that species are metaphysically real, but need not make assumptions regarding (1) or (2).

III. De-Extincted Organisms and Perceived Naturalness

Assuming realism about species is true, and that species boundaries can be determined to have some degree of rigidity while maintaining an appropriate flexibility to account for the gradual process of evolution, the created organism is then either a member of the target species for de-extinction or it isn't.[4] In order to give due consideration to possible aesthetic consequences and aesthetic reasons to rethink de-extinction projects, I will not address the more traditional, direct moral arguments regarding de-extinction (Blockstein 2017: 35-36; Cohen 2014; Diehm 2017; Haught 2017; Kasperbauer 2017; Rohwer & Marris 2018; Smith 2017), issues of scientific communication (Blockstein 2017: 35), or issues of patenting life (Diehm 2017: 27). My focus is on the aesthetic impacts of de-extinction and release programmes, specifically on how the release of (re)created organisms may affect aesthetic judgments of both natural environments and the organism, as well as why the aesthetics judgments are likely to be what they are.

Perceived naturalness links aesthetic reasons, judgments, and consequences with the problem of species authenticity besieging de-extinction. I will not commit to a rigid, platonic definition of what 'natural' is so as to determine what 'naturalness' is; instead, I will focus on *perceived* naturalness. Focusing on perceptions of the naturalness of natural environments without committing to a strict theory of nature or beauty will hopefully allow my arguments herein to cohere with several different theories about such matters. Regardless of aesthetic theories, people tend to make aesthetic judgments about natural environments in some common ways. Importantly, such 'folk' conceptions of naturalness seem to be gradable, rather than categorical, such that some 'thing' can coherently be conceived of as 'more' or 'less' natural than some other 'thing,' as opposed to natural and unnatural being conceived of as strict,

[4] If such rigidity cannot be obtained, then that might be reason to doubt the realist position concerning species, much in the way Ereshefsky (1998) argues that pluralism ought to make us doubt that realism is true.

categorical concepts.[5] This gradable, folk conception of naturalness lends itself to comparing organisms and environments as 'more' or 'less' natural than one another.

If the created organism is a member of the target species for de-extinction such that true resurrection has occurred, then it will likely be perceived that what has been brought to life is something natural, or at least comparatively more natural than an organism that belongs to a newly created species via the same process. Although the organism would be created through means that are arguably artificial, there would be a historical progression, a story that could be told regarding the flow of genetic material, who those genetic ancestors were, as well as how they interacted with each other and their environments. The natural history carries on at least some of the mechanisms that partially constitute the typical causal processes that would make the organism the one that it is, and this may count towards perceiving the organism as being mostly natural if species authenticity is obtained, as well as not considering a completely new species as being *entirely* unnatural.[6] In general, in terms of the perceived 'naturalness' of different organisms, the most natural would be the pre-extinction organism, followed by the organism created through true resurrection, and finally followed by the new, human-made species. In general, in terms of the perceived 'unnaturalness' of different organisms, the most unnatural would be the new, human-made species, followed by the organism created through true-resurrection, and finally followed by the pre-extinction organism.[7]

The assumed naturalness of the (re)created organism is an underlying motivating factor for the de-extinction project as a whole; scientists want to bring something from the natural world back into existence, not just create a new species of equal aesthetic magnificence. Furthermore, aesthetic values and judgments may be motivating factors regarding the selection

[5] That people by and large tend to view natural environments as coming in degrees of naturalness is often a presupposition of much empirical research, as evidenced by the use of Likert scale and continuum-based questions to measure perceived naturalness. That many of the responses to such questions are not the extreme poles of the scales supports the inference that people tend to perceive naturalness as gradable (for example, Lamb & Purcell 1990; Simonič 2003; Berman et al. 2014; Hoyle, Jorgensen, & Hitchmough 2018; Liu et al. 2018). Conservationists have developed several models for quantifying naturalness in degrees (for example, Anderson 1991; Machado 2004; Margules & Usher 1981: 91-94). Some philosophers also argue in favor of a gradable view of naturalness (for example, Rolston 2001; Siipi 2008).

[6] While the pre-extinction counterpart to an organism created in an instance of true resurrection might be perceived as more natural, the true resurrection would likely be perceived as more natural than a genesis of a new species. Though this comparative perceived naturalness might be the case, my intentions are to look at the possible consequences of true resurrection versus the creation of a new species.

[7] Additionally, it is possible that the perceived naturalness could be further specified when comparing organisms de-extinct-ed through different methods, for example, if one were to compare an instance of true resurrection through back-breeding (assuming this were possible), versus an instance of true resurrection through cloning methods with genetic modification, versus true resurrection through cloning methods without genetic modification.

of species for de-extinction programmes (Turner 2017). Consider for a moment the kind of poetic language used when describing the passenger pigeon. Chief Simon Pokagon (1907) provides an account of the Passenger Pigeon:

> It was proverbial with our fathers that if the Great Spirit in His wisdom could have created a more elegant bird in plumage, form, and movement, He never did…I have seen them move in one unbroken column for hours across the sky, like some great river, ever varying in hue; and as the mighty stream, sweeping on at sixty miles an hour, reached some deep valley, it would pour its living mass headlong down hundreds of feet, sounding as though a whirlwind was abroad in the land. I have stood by the grandest waterfall of America and regarded the descending torrents in wonder and astonishment yet never have my astonishment, wonder, and admiration been so stirred when I have witnessed these birds drop from their course like meteors from heaven. (Pokagon 1907: 49-50)

Additionally, continued reference to Leopold is appropriate:

> The pigeon was a biological storm. He was the lightning that played between two opposing potentials of intolerable intensity: the fat of the land and the oxygen of the air. Yearly the feathered tempest roared up, down, and across the continent, sucking up laden fruits of forest and prairie, burning them in a traveling blast of life. (Leopold 1992: 111)

The poetic language of both Chief Pokagon and Leopold demonstrates how the passenger pigeon has had an aesthetic appeal to people throughout history. As noted by Derek Turner, 'people often exhibit biases in favour of large, charismatic mammals, toward predators, toward terrestrial animals and toward species that have cultural or symbolic importance;' those animals with phenotypic qualities that we find aesthetically valuable are deemed worthy of protection or resurrection (e.g., pandas, tigers, passenger pigeons, wooly mammoths, etc.) (Russow 1981; Slater & Clatterbuck 2017: 17; Turner 2017). This preference for particular kinds of organisms–charismatic megafauna–is an aesthetic preference, and thus aesthetic preferences partially guide the selection of candidate species for de-extinction (Turner 2017).

IV. Aesthetic Judgments as Related to Perceived Naturalness

In this section I will analyze aesthetic judgments regarding natural environments to clarify aesthetically relevant aspects of those environments, and thus elucidate further reasons and values that ought to be attended to in evaluating proposed de-extinction projects. I will not address how one *should* assign aesthetic value to the (re)created organism or the organism's environment, since my argument should allow for broad application, regardless of one's commitments to any particular prescriptive theory of aesthetic judgment or metaphysical commitments regarding the possibility of objectively true aesthetic judgments. I will instead examine how people evaluate environments aesthetically, focusing on the role that perceived naturalness plays in the aesthetic judgments of natural environments.

In Lilly-Marlene Russow's (1981) paper 'Why Do Species Matter?' she argues that species are primarily valued for the phenotypic traits of individual organisms of that species; what is valued is not the existence of the species class, set, or label, *Panthera leo* or *Equus quagga*, but rather the lion's mane or the zebra's stripes, phenotypic qualities that are often valued for their aesthetic magnificence.[8] In this section, I intend to show that the aesthetic valuation of species reaches beyond mere phenotypic magnificence, and also correlates with perceived naturalness as well.

To illustrate this point, consider two idealized cases that could follow from de-extinction programmes and the subsequent release of the created organisms into natural environments where the cases will differ only regarding the question of species authenticity (question (1) of the tripartite species problem):

Case One: Authentic Wooly Mammoth

> Scientists utilize de-extinction technology to create an organism based on genetic material from wooly mammoth remains. Based on some true species concept, the organism created is an authentic wooly mammoth. Some of these authentic wooly mammoths are then released into Siberia and the Canadian tundra. The authentic wooly mammoths thrive in these natural environments and have fully integrated into the

[8] This aesthetic line runs counter to Kasperbauer (2017), as well as Kotchen and Reiling (2000), who argue that people place an existence value on species, or that people think that species have a right to exist, respectively, and that this valuation is separate from a person's own interests in their use, or pleasurable experiences the animals might provide. Arguably, the other options in Kotchen and Reiling's (2000) survey suggest a kind of aesthetic valuing taking place as well. It may be that respondents believe that the world would be a more beautiful place with those animals in it, even if they were never to experience them at all, and that a more beautiful place is, *ceteris paribus*, better than a less beautiful place. There is a similarity here between this way of thinking and the intuitions elicited by G.E. Moore's 'two worlds' thought experiment (Moore, 1993: 135).

ecosystem with no ill effects. Being in the wild, people (whether tourists, scientists, or human inhabitants of these lands) come into contact with these creatures. These people are aware that what they are seeing *really is* a wooly mammoth. Importantly, the authentic wooly mammoth would not be observably distinct from an inauthentic wooly mammoth.

Case Two: Inauthentic Wooly Mammoth

Scientists utilize de-extinction technology to create an organism based on genetic material from wooly mammoth remains. Based on some true species concept, the organism created is not a real wooly mammoth, but rather an inauthentic wooly mammoth. Some of these inauthentic wooly mammoths are then released into Siberia and the Canadian tundra. The inauthentic wooly mammoths thrive in these natural environments and have fully integrated into the ecosystem with no ill effects. Being in the wild, people (whether tourists, scientists, or human inhabitants of these lands) come into contact with these creatures. These people are aware that what they are seeing *is not really* a wooly mammoth. Importantly, the inauthentic wooly mammoth would not be observably distinct from an authentic wooly mammoth.

What would the resulting aesthetic judgments be from those encountering these creatures? Based on the relative perceived naturalness of these organisms, the perceived naturalness of the corresponding environments would likely be affected, as the perceived naturalness of the environments will be based on the perceived naturalness of the parts of that environment. Furthermore, the degree to which something is seen as being natural or unnatural will also likely affect perceived naturalness of the effects that thing has on the environment.[9] A strong relationship between increasing degrees of perceived naturalness and positive aesthetic

[9] There may be an interesting temporal component regarding the perceived naturalness of the 'inauthentic organisms' and their effects. Later generations of inauthentic wooly mammoths may be conceived of as more natural than the first generation, assuming the organisms do in fact integrate with the ecosystem well. Furthermore, it is possible that the introduction of the organisms aesthetically enhances the surrounding environment; however, it is unclear how these enhancements might be perceived if they are the result of the introduction of inauthentic wooly mammoths, whose 'natural' credentials are lacking. The perceived unnaturalness of the inauthentic wooly mammoths could possibly be perceived as 'tainting' the rest of the ecosystem; it may be more beautiful, but its beauty is closer in kind to that of a well-tended garden than that of a wild forest, though it is possible this effect or perception dilutes with time.

evaluations of landscapes is a well-documented psychological phenomenon (R. Kaplan & S. Kaplan 1989; S. Kaplan 1987; Ohta 2001; Ode et al. 2009), and so with the change in the perceived naturalness of these environments, the corresponding aesthetic evaluations of those imagined people in each case would also be affected, as well as the aesthetic evaluations of the organisms themselves. A defense of this claim will follow.

The naturalness of an object ties that object up with a history–it links the object to the past and future of the more than human world (Moore 2004). Leopold's land aesthetic intertwines beauty with history, especially natural history. On this view, such histories partially constitute the aesthetic features of a natural object or environment (Callicott 1989; Leopold 1992). Natural beauty matters enough to Leopold to be referenced in his famous moral maxim: 'A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise' (Leopold 1992: 224-225). Regarding how we ought to consider this natural beauty, Ronald Moore argues that:

> …the appreciation of natural beauty is the insistent vision that what is natural is more than non-human made; it is part of an order of being that has its own modes of growth and development, its own history, its own inter-relatedness. To see natural beauty as natural is necessarily to contextualize it in that way. (Moore 2004: 227)

Moore prefaces this idea, stating that '[t]o perceive something as a product of nature is not to perceive one more thing about it; it is to change the way we perceive everything about it' (Moore 2004: 218). Allen Carlson (2004), echoes this sentiment, arguing that recognizing naturalness is essential to adequate aesthetic evaluations of natural environments, writing that '[w]hat is important is to recognize that nature is an environment and is natural and to make that recognition central to our aesthetic appreciation' (73). While Moore and Carlson make prescriptive arguments concerning how one *should* aesthetically evaluate natural environments, psychological results concerning how people do in fact aesthetically evaluate environments show that they already seem to approximate these prescriptions (R. Kaplan & S. Kaplan 1989; S. Kaplan 1987; Ohta 2001; Ode et al. 2009; Smith, Goodmon, & Hester 2018). Additionally, while facts about (in)authentic species membership may not be visually observable in ideal de-extinction attempts, cognitive information such as facts about (in)genuine species membership, would likely impact aesthetic evaluation, as environmental

knowledge tends to affect a person's aesthetic evaluations (Junge et al. 2019: 86; R. Kaplan & S. Kaplan 1989: 105-115).

If one's aesthetic judgments regarding natural objects is partially determined by the degree to which one perceives that natural object as natural, then whether a true species concept yields true resurrection or not will likely affect aesthetic evaluations. For example, ceteris paribus, the lion's mane perceived as 'natural' would likely elicit a different, comparatively higher, aesthetic evaluation from an observer when compared to an aesthetic evaluation of an inauthentic 'lion's' mane that is perceived as non-'natural,' or comparatively less natural. The perceived naturalness of the lion's mane will likely correspond with a relatively more positive aesthetic evaluation compared to the fake lion's (generalizing on results from, R. Kaplan & S. Kaplan 1989: 105-115; Ode et al. 2009; Smith, Goodmon, & Hester 2018; Junge et al. 2019: 86).[10] The same result can be expected regarding the wooly mammoth cases introduced above. Thus, if the organism created is not a member of the target species for de-extinction, then the aesthetic evaluation of that organism may be negatively impacted, since that organism would most likely not be seen as 'natural,' or at least as natural as an organism created in a case of true resurrection.

More formally, the principles at work here are as such: (Principle 1) ceteris paribus, if a given environment is perceived as being more natural, then the aesthetic evaluation of that environment is more positive relative to a given environment that is perceived as being less natural. Correspondingly, (Principle 2) ceteris paribus, if a given environment is perceived as being less natural, then the aesthetic evaluation of that environment is less positive relative to a given environment that is perceived as being more natural. Since the perceived naturalness of some given environment is in part grounded in its history and the constituent parts of that environment, whether they be oak trees or skyscrapers, wooly mammoths or wooly 'sham'-moths, it can be inferred that, ceteris paribus, the environment containing the authentic wooly mammoths would be perceived as being a more natural environment than the one containing the inauthentic wooly mammoths, and thus would generate a comparatively higher aesthetic evaluation. Correspondingly, it can be inferred that, ceteris paribus, the environment containing the inauthentic wooly mammoths would be perceived as being a less natural

[10] Though perceived naturalness may be a necessary condition for the positive aesthetic evaluation of a natural environment qua natural environment, it is not sufficient for positive aesthetic evaluation. A rotting corpse or violent death of a deer by a wolf pack may be perfectly natural, but fail to elicit a positive aesthetic evaluation, thus demonstrating the insufficiency of perceived naturalness for positive aesthetic evaluation.

environment than the one containing the authentic wooly mammoths, and thus would generate a comparatively lower aesthetic evaluation.

More than mere appearance affects the aesthetic evaluation of natural objects and environments, as the perceived degree of naturalness of a natural object or environment affects aesthetic evaluations. The psychology of aesthetic judgment in relation to perceived naturalness teases out a deficit in Russow's (1981) diagnosis of the value of species. If the natural origins of some organism or species matter in the aesthetic evaluation of that organism or species, then that organism or species is not *solely* valued for the individual phenotypic qualities it possesses; the fact that those phenotypic qualities are perceived of as natural is essential as well. Russow (1981: 109) claims that 'a bird is neither more nor less aesthetically pleasing when we change its name;' however, insofar as species membership and the natural history of that species may actually affect people's aesthetic judgments of the organisms belonging to that species (R. Kaplan & S. Kaplan 1989: 105-115; Junge et al. 2019: 86), though the name of the organism itself may not matter, the history the name links the organism up with does matter.

V. Conclusions & The Importance of the Aesthetic

Aesthetic reasons and valuations are important in terms of motivating action and protecting natural environments. The aesthetic appeal of certain natural places has, historically, been a driving force for the preservation of such places, whether wild or non-wild nature (Abbey 1998; Leopold 1992; Nash 1967; Norton 1991: 17-38). Furthermore, decisions from the United States Supreme Court recognize damage to the aesthetics of land as actual damages to be compensated if human aesthetic interests are affected (Friends of the Earth, Inc v. Laidlaw Environmental Services (TOC), Inc 2000; Sierra Club v. Morton 1972). In a more radical proposal, outlined in his *A Wilderness Bill of Rights* (1965), former United States Supreme Court Justice William O. Douglas highlights the values that 'The Wilderness Act' (1964) is supposed to protect, and writes about the healing and educational value of natural spaces, as well as the unique forms of beauty found only in wilderness that art imitates:

> There are aesthetic values in nature's form and resolution that are important to creative art. The stark, naked beauty of winter, like the first blush of spring or the last hues of fall, is unparalleled…The open space of wilderness gives art forms of infinite variety—from

> the glories in an undisturbed floor litter to the ancient stance of a white pine on a windblown shoulder of mountain. (Douglas 1965: 31)

Focusing aesthetic attention on valuing natural nature as natural and theorizing the aesthetics of natural environments enables one to approach natural environments in a way that fosters not only positive aesthetic evaluations, but also positive environmental attitudes that support environmental protection efforts. Thus, with regard to natural places, the aesthetic sensibilities may be an inroad to attached moral sensibilities (Eaton 2004: 180).

The release of organisms that may or may not be authentic members of a target species for de-extinction would likely affect aesthetic judgments of the natural environments into which they are released. Aesthetic judgments and aesthetic reasons should not be ignored, as environmental aesthetics, both in the study of actual aesthetic judgments of environments and in theorizing such objects of aesthetic evaluation, can assist with ensuring that humankind properly respects both other people and natural environments themselves (Berleant 2004: 86). Furthermore, taking the aesthetic preferences of people into consideration when making decisions that may affect those preferences may constitute part of what it is to express respect for those persons qua persons.

De-extinction efforts that include the release of the created organisms into natural environments have the potential to negatively affect the aesthetic judgments of people with regards to those environments depending on the species authenticity of the organisms. The aesthetic value people place on natural environments serves as good reason for their protection and preservation as there is great public interest in their protection for these aesthetic reasons, among others. Thus, there is good reason to abstain from such de-extinction and release projects until the development of a 'multisensory environmental aesthetic impact assessment' that could be employed to assess the possible aesthetic harms that such a project could inflict. Much needed empirical research can help develop methods for carrying out such an assessment, though a satisfactory assessment may be difficult to develop.

De-extinction projects seek to resurrect long dead species or ecological relations and entertain the hope of releasing the created organisms into natural environments, often to repair extinctions or ecological harms. Releasing these organisms will likely affect people's aesthetic judgments regarding the natural environments they are released into, as well as the ecological trajectory of that ecosystem. There are good moral reasons for caution, limits, and abstention

from de-extinction projects, set by either a strong environmental ethic or an individualistic animal ethic, but there may also be good aesthetic reasons to refrain from engaging in some de-extinction projects, even if they pass some proposed or imposed ethical or legal standards.

The strength of any particular positive aesthetic evaluation of a natural environment will likely reflect the perceived naturalness of the natural environment under consideration. Both perceived naturalness and subsequent aesthetic evaluation of organisms and environments will depend on the authenticity of the created organisms in relation to the target species category of the de-extinction project. Answers to the species problem are key to the aesthetic judgments elicited. The species problem consists of three very complex questions to which philosophers and biologists may not find adequate solutions anytime soon. Very likely, de-extinction technology will be viable before the related philosophical problems have settled answers. As the technology outpaces philosophical analysis, assessing possible aesthetic impacts in order to better understand the consequences of the technology remains necessary. Aesthetic evaluations with regards to, (1) the current environment, (2) the same environment with authentic de-extinct-ed organisms added to it (i.e., true resurrection), and (3) that same environment with inauthentic 'de-extinct-ed' organisms added to it (i.e., 'de-extinction' without true resurrection) need to be assessed and compared for adequate consideration of how human actions through de-extinction may affect natural environments and the aesthetic appreciation thereof.

Current research clearly indicates that the perceived naturalness of environments correlates with higher aesthetic evaluations (R. Kaplan & S. Kaplan 1989; S. Kaplan, 1987; Ohta 2001; Ode et al. 2009), but this research has largely been done with visual representations of natural environments, so the arguments above merely generalize on those results. Actual immersion in a particular environment would be preferred, allowing respondents to tune into aspects of an environment in a multisensory way that may increase or decrease the aesthetic evaluation of a natural environment, since, for example, auditory components like bird song or car horns are also relevant aesthetic properties of environments (Fisher 2004).[11] More research is needed, while also perhaps being species-specific, and utilizing comparative cases like the wooly mammoth ones constructed in Section IV. The importance of these potential aesthetic impacts calls for more empirical study that builds off of the splendid work that's already been

[11] In light of this, more qualitative approaches to landscape aesthetics may be called for. See, for example, Ohta, 2001.

done, as well as more philosophical inquiry, in order to attempt to keep pace with rapidly advancing technology in the new field of resurrection biology.

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