

Making sense? Visual Cultures of De-extinction and the Anthropocentric Archive

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Abstract: *This article examines the operations of visual representations within discourses advocating de-extinction. Images have significant agency within these debates, yet their roles, and the assumptions they naturalise, have not been critiqued. Demonstrating the affective, triumphant and subversive potentials of these representations, this article then turns to the implications of relying on images made by and for humans within the expressly multispecies space of de-extinction. Discourses around de-extinction tend to place undue weight not just on how candidate species look(ed), but on how they appear to human eyes after the mediating processes of representation, and the notion of recreating a nonhuman animal that looks the same as an extinct species is not only limited as an aim of de-extinction technologies, but is problematised when different species' modes of seeing and optical capacities are taken into account. Furthermore, vision cannot necessarily be assumed to play the same role within the sociality of species being reproduced as it does for the humans seeking to instigate these de-extinctions, and this article seeks to situate these imbalances in de-extinction discourses within humanistic 'sensory hierarchies' which have pervaded the domain of cultural representations, including museums and technology. Animal agency thus raises questions about these spheres, and emerges as having the potential to disrupt certain approaches to de-extinction. This article therefore seeks to reframe questions of what 'success' might mean in relation to de-extinction, and argues for the acknowledgement of 'multispecies phenomenologies' as an obstruction to the insistent anthropocentrism of the de-extinctionist gaze.*

Keywords: *de-extinction, representation, image, anthropocentricity, sense, museum, the epigenetic uncanny, multispecies phenomenologies*

Introduction

This article examines the deployment of visual representations within discourses seeking to popularise de-extinction, and situates pictorial sources within broader representational conventions that both extend and obscure understandings of extinct species. ‘De-extinction’ is an emerging and controversial field of science which includes among its goals the restoration of extinct species, and some even refer to it as ‘resurrection biology’. Focusing in particular on images of extinct animals, this article explores how these participate in economies of affect within de-extinction discourses, and mediate their current limits through the reification of an insistent anthropocentrism. As Laura McMahon observes of the ‘meat industrial complex’ (relating to intensive livestock farming under capitalism), this ‘functions not only through the biopolitical management of animal life but also through a rigid control of regimes of visibility’ (206), and I trace a similar process at work in the field of de-extinction. However, visual cultures of de-extinction have additional implications for potential animal lives and experiences, not least in the appropriation of images as proxies for species that can no longer be observed alive. Visual representations thus have significant agency within how these species are remembered, as well as in terms of how biotechnological futures, and the lives of formerly-extinct genetically ‘rescued’ animals, are both envisaged and evaluated. Images inform technical aspects of trying to recreate lost species, at the same time as they promote an optical essentialism, which privileges the human viewer and frequently characterises projections of how creatures resulting from de-extinction experiments might be judged. In turn, particularly within the framework of de-extinction, the limits of images are illuminated through a consideration of animal agency – something indeed that remains largely unacknowledged in discourses advocating for de-extinction. This article therefore emphasises animal agency, positioning it as a critique of the de-extinctionist gaze and fundamental to debates around the futures of lost species.

The visual records on which conceptualisations of extinct species are based – even the representations that have secured legitimacy within scientific circles – are unstable and distorting, and this raises significant questions for de-extinction science, especially when images are used uncritically to guide this technology. However, this article zooms out from this concern to think more broadly about the appropriation of images within de-extinction debates.

Appearance seems to be central within the rhetoric, practices, and appraisals of de-extinction, and in addition to the distorting and selective nature of images being overlooked in this context, visual economies surrounding this field of science are also unscrutinised, including what sort of norms and assumptions are naturalised both by the types and prevalence of these representations. This article seeks to address these themes, in particular by highlighting the limits of images, their fundamental incompleteness in the context of animal experience, and how the overtly visual emphasis within discourses popularising de-extinction obscures the relevance of other sensory considerations. This emphasis insistently inscribes anthropocentric preoccupations onto proposed communities of nonhuman animals whose needs and perceptual make-up often differ significantly from those of humans. Calling for a posthumanist critique of popular discourses of de-extinction and the power relations these both reflect and reinforce, this article argues for the acknowledgement of spaces of multispecies difference among the other unknowns of de-extinction.

Focusing on de-extinction discourses that seek to describe this field to general audiences, rather than on the considerable scientific advances that have been made in various laboratories internationally, this analysis takes its central case studies from Beth Shapiro's 2015 book *How To Clone a Mammoth: The Science of De-extinction*, and some of the talks advocating for de-extinction at the TEDx DeExtinction conference that took place on 15 March 2013 in Washington DC, in connection with *National Geographic* and The Long Now Foundation's Revive & Restore project. While Shapiro's book is not particularly heavy on plates and figures, and contains no pictures that expressly imagine a de-extinct animal, images haunt Shapiro's text. Issues relating to appearances of both specimens and hypothetical futures are repeatedly raised, both embedded within the technical processes described, and in the context of more open-ended questions about what precisely de-extinction might mean. To some extent, the composition of Shapiro's narrative traces several of the genetic rescue projects presented at the TEDx event, and both these sources see scientists engaged in the de-extinction research communicating and attempting to popularise their work. My focus on these sources (instead of examining their scientific research directly) responds to the platitude by some proponents of de-extinction that the decision as to whether to pursue these technologies or not ultimately lies with the public

(see, for example, Brand). This therefore puts particular emphasis on how these ideas are being communicated to this general audience, and necessitates that public-facing discussions be exhaustive regarding both the advantages and the problems of de-extinction. However, how public consensus is to be sought or even estimated remains unclear, and in the meantime de-extinction experiments are being pushed forward at speed, despite wide-ranging objections to these from both some members of the scientific community and some members of the public.

While the purposely-accessible content of both the conference and the book is shaped by an apparent desire to engage a wide audience, their formats imply a relative lack of journalistic mediation. However, sensationalising tactics associated with media representation are apparent in the narratives constructed, not least in their use of images, and in some of their titles.¹ Furthermore, the cultural fascinations tapped into regarding the idea of extinct species returning have in themselves been fostered to a significant extent by visual cultures, including books and films such as *Jurassic Park*, which is frequently mentioned – often with some irony – in discussions of de-extinction (see Horner and Gorman, 7-8; Zimmer; Shapiro, 45, 112). That ‘icons’ of de-extinction research – such as the ‘pickled pup’ publicised as part of the Australian Museum’s abortive Thylacine Cloning Project of 1999-2005 – play a role as popularisers for reaching wider audiences has been pointed out by Amy Fletcher (80), and Jamie Lorimer has noted more generally how celebrated species are often known primarily through representations: ‘Western publics are much more likely to encounter the charismatic organisms about which they are so concerned in print, online, or on TV than they are to meet them in the flesh’ (119). However, this article focuses on the different categories of images within de-extinction discourses, and the ensemble of forces these exert. Furthermore, I argue that a major effect visual representations have is in terms of what they cannot do, on account of the sensory information they are unable to record. These omissions are concealed by representations’ ubiquity, the excessive credibility with which they are treated, and the visual ecologies within which images exist (including museums and technology) – as are variations in the perceptual landscapes that different species inhabit.

Visual representation and the de-extinctionist gaze

In de-extinction discourses, images bear the representational burden of what cannot be seen, either because it is too microscopic or concealed, or because it is no longer around. Arguably by definition, species undergoing de-extinction do not exist in the present, and current candidate species are nearly all species past, which – some believe – will become species future. This absence affects the symbolism of representations that de-extinction discourses call upon to fill the voids, and as unverifiable ‘likenesses’, these images are both freighted and liberated from certain orders of scrutiny. As this discussion seeks to show, there are complex economies of affect within visual cultures of de-extinction, which enlist a range of representational tropes. These animate a narrative that frames de-extinction discourses as existing in a present that is an hiatus within a candidate species’ unfolding history. The images used appear to have been selected with a view to legitimising experiments in de-extinction, and they popularise the field’s long-term goal via sanitised renderings of a post-de-extinction future. Acting in conjunction with notions of ‘moral responsibility’, an oft-repeated justification for de-extinction science, different modes within these representations create dynamics of repulsion and attraction, compunction and confidence, which propel the message that – albeit in different ways, or to differing extents – extinct species should be given a ‘second chance’ (for example, Archer). Phrases such as this ventriloquise for candidate species, and misrepresent their agency within de-extinction debates. At the centre of these discourses, however, is anthropocentric ambition: the species whose representations – and, eventually, bodies – constitute the case-studies are currently silent, odourless, and obscured.

Not all of the presentations at the 2013 TEDx conference advocated that de-extinction be pursued, though trenchant criticism of the idea was confined to only a few of them. One of these was David Ehrenfeld’s stark and sceptical talk titled ‘Extinction Reversal? Don’t Count On It’, and it is significant that this was one of the only ones not accompanied by slides (Ehrenfeld 2013). His closing remarks, delivered in front of a dark, blank screen, cautioned audiences to ‘ease off on the hype: hype can come back to bite you’, and served as a contrast to the way in which many of the other talks, buoyed by images, were cultivating precisely that. The nature of this hype, however, and its construction via a jumble of representational modes, deserves closer

attention. The talks advocating de-extinction presented a hybrid visual culture in which different tropes and approaches indicate the images' differing conditions of production. In addition to technical diagrams, including those that illuminate molecular interactions, and photographs representing landmark technological advances within de-extinction science (such as Dolly, the first cloned sheep), many of the images featured within the TEDx talks (and in other discussions promoting de-extinction) were of species lost to extinction. The images fall into a number of overlapping categories, depending in part upon the extinction date of the species depicted: there are representations made before a species went extinct, such as the photograph of Martha, the last passenger pigeon, who died in Cincinnati Zoo; there are representations made only after a species has disappeared, reconstructing and imagining their forms from biological matter and scientific information, such as the majority of mammoth imagery;² and there are representations created after a species' extinction, but based on accounts and depictions made while the species still existed.³ Furthermore, specimens such as taxidermy, skins, and remains also constitute representations as well as being artefacts of natural histories, and in these, molecular information cohabits with visual clues.⁴

The narrative arc of many arguments in favour of de-extinction is reflected in the varying operations of these different categories of representation. There is an especial sense of elegiac reproach from images made during the lifetimes of the species featured, as they have travelled through time in a way that their subjects have not; somewhere within the social history of these pictures, the species they represent have slipped away, or been deliberately exterminated. These images in particular raise questions of human culpability: they bear witness to the fact that the species was known and observed before all members of the species died. In this way, these representations tap into the sense of guilt that de-extinction proponents frequently evoke when pointing out humans' responsibility for many extinctions (likely to garner further support for their cause). This type of extinction imagery confronts audiences with the wronged animal, which is sometimes framed as an individual, sometimes as a representative of their species, and sometimes as both. The photograph of Martha, reproduced in Shapiro's book, suggests how narrative and representations intertwine. While accounts of the passenger pigeon – including that assembled in Ben Novak's TEDx talk – often emphasise its force as a

species prior to the birds' systematic destruction, including their tendency to travel in enormous flocks that could sometimes take several hours to pass overhead, Martha is captive and alone. Her isolation is emphasised by her small size relative to the frame of the image; she appears vulnerable and exposed, pale and ghost-like against a space etched with shade. Poignantly, shadows on the back wall of her enclosure (possibly including her own, though otherwise shadows of different birds) suggest a species memory of sociality⁵ – a way of life extinguished for an endling, even those in the wild. Photographs, with their overtly indexical quality stemming from the 'imprinting' of reflected light (see Gunning, 40), arguably heighten viewers' sense of connection and proximity to the subject, and by extension their sense of loss.

If audiences feel compunction when confronted with icons of anthropogenic environmental violence such as Martha, narratives advocating de-extinction often then turn to the idea of 'solutions'. Moving away from melancholy around lost biodiversity, visual cultures that accompany notions of how humans might, through science, atone for ecological sins⁶ tend to promote a sense of wonder and optimism. As well as diagrams showing the ingenuity of DNA research, which serve as what McMahon has termed 'display[s] of biopower' (206), the images that traffic in this hope offer visions of a biotechnological future wherein formerly extinct animals have returned, and are thriving. These representations do not necessarily have to have been made with de-extinction in mind – many of the images used in this way have previously operated to give insights into species past. However, when framed within the context of de-extinction debates, a museum's recreation of a woolly mammoth, for example, takes on an ambiguous temporal 'otherness' which suggests a space somewhere between the past and the future, but not the present. A mammoth image used in George Church's TEDx presentation illustrates these transformative effects of changing the context of a representation. Embedded within a slide presenting technical information are two juxtaposed images, one of an elephant and the other of a mammoth (Church 2013). Although their sources are not cited, the mammoth picture appears to be a photograph of a diorama in the Royal British Columbia Museum, taken from the viewing perspective of an average-height person. This vantage suggests the awe-inspiring scale of the mammoth, as well as acting as a metaphor for the anthropocentric terms by which humans represent and engage animal others. While the stagecraft of dioramas is

seldom convincing when viewed in person, surrounded by museological paraphernalia, when framed by the camera this display excels in its suggestion of icy tundra stretching for hundreds of miles into the distance. Through this the mammoth model too appears animated, caught in the instant of a photograph rather than still and breathless as it would appear to museum goers observing it for longer. With its stormy-looking clouds (and possibly a hint of the Aurora Borealis), the surrounding weather and landscape rendered by the diorama heighten the drama of the representation, as does the lighting of the display – effects especially potent when translated into the photograph. These contrasts of light and shade construct a highly-resolved, detailed image which projects a verisimilitude for the mammoth that is in fact difficult to verify exactly – something underscored by the many variations within mammoth imagery. However, as Linda Nochlin argues in a seminal essay of postcolonial art history, highly-finished renderings containing ‘a plethora of authenticating details’ carry the association of truth, giving them the power to convince substantially beyond the actual accuracy of the scene (Nochlin, 38). Furthermore, in the context of de-extinction discourses, this representation of the mammoth projects certainty and scientific triumph through the evocation of a technofuturist sublime, even alongside more measured claims about the technologies currently available, and those anticipated.

As a photograph of a diorama within a natural history museum, this mammoth image blurs distinctions between two of the categories of extinct animal representations suggested above. Part model, part remains, it is a hybrid confection that, when photographed, takes on qualities reminiscent of magic realism⁷ as the clarity of the image contends with the wondrous alterity of what it depicts. Representations that also combine reconstruction and remains, though markedly different in affect, are photographs of the exhumation of the Jarkov mammoth in 1999, an event that Shapiro discusses in her book. For context, a theme through a significant part of the book’s narrative is the quest, by various scientific teams, to find intact nuclei in preserved mammoth tissues. Shapiro is skeptical of this aim, but describes a series of discoveries in which remarkably-preserved specimens raise hopes – both among some scientists and in the media – for a range of technological breakthroughs. Particularly interesting are Shapiro’s observations of a tendency to correlate anatomical completeness of specimens with the

intactness of the DNA contained within. As Shapiro notes in a discussion of mummified remains found in permafrost:

Although the record of DNA preservation in mummies is startlingly poor, we can't seem to separate the remarkable physical preservation of their bodies from the idea that their DNA *must*, somehow, be equally well preserved. With each find, there is renewed enthusiasm that *this* mummy will be the one that defies the odds. (84)

On some level, of course, this seems sensible – the processes that fragment the body correlate with those that fragment the DNA inside. However, the assumptions that the inverse is also true persist despite overwhelming evidence to the contrary, some of which Shapiro describes. One way to interpret the endurance of this supposition is that it demonstrates the power of appearances. As Shapiro acknowledges, these can be highly persuasive, even to experts who have significant evidence contradicting what these appearances imply. It is in this context that the images of the transportation of the Jarkov mammoth, following his removal from the ground, should be considered. To keep the specimen as well-preserved as possible, a huge, rough cube of the frozen earth around him was cut from the permafrost. Before this was transported, dangling beneath a helicopter, to a facility where it could be stored, explorer and mammoth enthusiast Bernard Buigues installed tusks found near the body on one side of the block, creating the convincing illusion that just within its confines stood the complete beast, on the threshold of being revealed. This action created a media-friendly spectacle which suggests the importance of publicity to this sort of scientific research, as well as the awareness that a striking icon such as this would compound it – the removal of the mammoth from the permafrost was already being funded by the Discovery Channel, which hoped he would be cloned (Shapiro, 85-86). Shapiro notes that in fixing the tusks to the block, Buigues acted partly 'because it made the pictures and video even more impressive', and that he acknowledged it was 'creative license' (85). Indeed, Shapiro underscores that:

[t]hey knew that the mammoth carcass in the block of ice was incomplete. They had already removed the head, for example, which had partially thawed and begun to rot. They had also used ground-penetrating radar to try to see beneath the surface, and the results hinted that less than a complete mammoth was preserved within. (85)

Defrosting the block brought further disappointment, revealing scant remains⁸ which dashed the plans of scientists who hoped this specimen might be the one to yield the material necessary to make a significant breakthrough in mammoth de-extinction.

Regardless of Buigues' specific intentions in putting the tusks on the block to make them appear as if protruding from within, the optics of what resulted sets in train a series of meanings. This assembled object is read as much in terms of what cannot be seen as in terms of what can – viewers' perceptions of a complete mammoth body standing within the block rely both on the opacity of its surface, and on what the positioned tusks suggest. This dialectic of evidence and concealment speaks to the way in which all images, to varying degrees, evoke their subjects by way of a combination of the seen and the unseen. James Elkins has explored this idea, and asserts that 'blindnesses are the constant companions of seeing and even the very condition of seeing itself' (13) – a claim that has various additional implications in terms of visual cultures of de-extinction. Furthermore, the Jarkov object – as part-found, part-constructed – resonates with Surrealist practices of image-making,⁹ which frequently involved assemblage, and with their exploration of notions such as 'the uncanny'. Often associated with psychoanalysis pioneer Sigmund Freud, but variously explored by other thinkers, artists and writers, this concept tends to be applied to things occupying the unsettling hinterland between animate and inanimate, between living and dead (like realistic mannequins, for instance). Such things, Freud suggests, are aesthetically compelling and frightening, prompting simultaneous fascination and dread (see Freud 2003). Often comprising parts rather than wholes, uncanny objects stop short of being convincingly lifelike, and the concept is often summarised as 'the familiar made strange' (see, for example, Huskinson, 3). This – or perhaps, 'the strange made familiar' – resonates with the tusked block containing the Jarkov mammoth, especially when it is framed in the context of de-extinction discourses.¹⁰ This is because de-extinction narratives draw on a similar uncertainty between dead and animate, between specimen and living individual, and tout the notion of return, which is also a facet of the uncanny. For Freud, this return might be of the dead (Freud 2003), or of things repressed, such as he believed of visions during *déjà-vu*. The uncanniness of de-extinction lies in both its aims and its representational sources: some, such as animal specimens in museums, already align with this concept, and this is compounded by the

possibility that they contain materials through which their species might be raised from the dead. The uncanny nature of the entombed Jarkov mammoth, as well as of ideas of de-extinction generally, stems from their oscillation between – or simultaneous projection of – fearsomeness and allure. This suggests an ‘extinct uncanny’ within visual cultures of de-extinction, whereby representations powerfully destabilise previous certainties such as the finality of death and extinction. Furthermore, the concealed Jarkov mammoth offers a metaphor for the deceptions of representation more broadly – what is read from an image, for example, is as much about what is not visible as about what is.

In addition to the categories outlined above, there is a fifth kind of extinction image. Unlike the others, this category of representation arises specifically as a result of de-extinction technologies and related research, and yet it is rarely included in public-facing discourses seeking to popularise de-extinction. Comprising images of the results – expected or otherwise – of de-extinction attempts, this category is conspicuous by its relative absence in de-extinction discourses. This is apparently not for want of such images – the birth in 2003 of the clone of Celia, the bucardo ending who had died three years previously, is widely heralded as the first successful de-extinction.¹¹ Significantly, however, popular descriptions of this milestone are seldom accompanied by a photograph of the cloned kid, who only survived for a few minutes. If images accompany this story, they tend to feature a healthy-looking living bucardo. An examination of some of the photographs of the cloned kid suggest why this might be: while the narrative presents a story of triumph, the images suggest something else. While the clone’s live birth represents a significant scientific achievement, her own experience appears to have been traumatic and painful. Towards the end of his presentation at the 2013 TEDx conference, titled ‘The First De-extinction’, Alberto Fernández-Arias showed three images of Celia’s young clone. These begin with a photograph of her birth via caesarian section, its heavily-assisted nature crowding the frame of the image, and end with a photograph taken shortly after, in which she is dead. Laid on her side next to a tape measure, under hard lighting and a camera positioned directly above, the image is dispassionate and clinical, and her somewhat curled posture evokes fearfulness. The directness of this image induces a different kind of pathos to that effected by pictures of animals before they went extinct; here we see the body of an individual that has

struggled and suffered, rather than an animal less aware of their fate, an icon of more distant violence. The middle photograph, presumably taken last, shows her severely deformed lungs, removed from her body and measured. These glisten viscerally under the camera flash, a stark symbol of failings within the project¹² and mysteries as yet unsolved by science, including those around gene expression. Further, the huge extra lobe on the lung suggests the familiar made strange, an ‘epigenetic uncanny’ which appears like a ‘return of the repressed’ within the genome (unlike her clone, Celia’s lungs gave her viable life). Removed from the clone’s body, these organs assume an unsettling trans-species relatability, to which can be applied Gilles Deleuze’s brutal notion that ‘[m]eat is the common zone of man and the beast, their zone of indiscernibility’ (23). Indeed, these three images of the cloned bucardo kid raise with immediacy the question of animal rights so often given only cursory treatment – if it is raised at all – when proponents of de-extinction attempt to popularise their work. Instead, their narratives and representations tend to offer a sanitised portrayal, consciously or otherwise curated to appeal to viewers’ senses of wonder. Celia’s clone is likely the de-extinction breakthrough that is most impressive to general audiences, yet her photograph is not a headlining image within these discourses; instead, when it *is* used, it unmask the optimism that thrives on the omissions and abstractions of the verbal summary of facts, and raises questions about who exactly it is that benefits when de-extinction experiments produce ‘results’. Within the anthropocentric narratives of de-extinction, the clone’s image troubles the implicit triumphalism of many accounts of her existence.

The anthropocentric archive

What emerges through the examples described above is the agency of visual representations within discourses seeking to popularise de-extinction – be this in support of, or subverting, optimistic projections for the future of these technologies (which are premised upon the relative silence over what this will mean for the experiences of the animals involved). Because images have the potential to work in both directions, they are selected or omitted in broad alignment with the inflection of the narrative they accompany. Of primary significance here is not necessarily the extent to which such curation is intentional on the part of proponents of de-

extinction; rather, it is how such discourses might read to audiences. However, while images are powerful, they are also profoundly limited. De-extinction is by definition recreation across species lines, with humans trying to remake nonhuman animals, yet detailed records of candidate species' sensory experiences, and capacities for these, are not only missing from images, but are arguably obscured by the ubiquity of the visual within de-extinction discourses. Not only can images distort our understandings of extinct species, but they threaten to promote an excessive opticality in how de-extinction experiments are implemented and evaluated. In discourses advocating de-extinction, for example, there is an overwhelming focus on how animals produced through these technologies will 'look and act' (see, for example, Shapiro, 12-14). This phrase recurs throughout Shapiro's book, and admittedly both of these terms can be broad. However, other attributes and senses upon which intra- and interspecies interactions depend are neglected in de-extinction discourses. The question of scent, for example – species' olfactory capacities, how they smell to their peers, and what role this might play within communication – is not discussed at the TEDx conference, nor in Shapiro's book. This omission is striking, especially given the centrality of smell in the sensory landscapes of so many animals, and its key role in how these species live. In the absence of public-facing discussions about this, yet in the light of questions surrounding epigenetic and environmental effects, whether it is reasonable to expect that individuals within a revived species would be able to use smell in the same way as their extinct counterparts seems unclear. Furthermore, human assessments of this, both qualitatively and quantitatively, seem likely to fall short (given human aptitudes, significant gaps in preserved sensory records, and currently available technologies). The discussion that follows seeks to highlight the need for de-extinction discourses to acknowledge these lacunae, as part of an effort towards what I am terming a 'multispecies phenomenology'. This would insist on attempts to consider other species' experiences, illuminating and problematising the anthropocentrism of assessments of such as 'likeness' and 'success', and revisiting perennial questions about the extent to which the experiences, sensory worlds and inner lives of other species can ever fully be understood.

Sensory perception in animals, including humans, draws on complex constellations of interacting senses numbering considerably more than the five usually cited. However, my

purpose here is not to give a more comprehensive account of what these are, but to highlight how – even for the commonly acknowledged senses (seeing, hearing, smelling, touching and tasting) – there are significant and probably unbridgeable gaps in our knowledge of extinct species. About these species and more generally, the knowledge we have inherited from forebears not only privileges visual (and, to some extent, sonic) information, but is mediated and limited further by the specific sensory capacities of humans: within a given ‘sense’, different species perceive differently. Birds, for example, see very differently to humans (Varela, Palacios and Goldsmith, 77). Their fields of vision differ, as do their visual acuity, sensitivity, and perception of colours, and indeed there is significant variation in these abilities between bird species (see Birkhead, 2-32). Even focusing on colour alone, one gets a sense of how different a bird’s world might look. As Tim Birkhead explains:

However good we (arrogantly) think our colour vision is, compared with that of birds it is rather poor because they have four single-cone types: red, green, blue and ultraviolet (UV). Not only do birds have more types of cone than ourselves, they have more of them. What’s more, birds’ cone cells contain a coloured oil droplet, which may allow them to distinguish even more colours. (24)

As this suggests, while it is recognised that birds’ colour vision differs from humans’, the full extent to which this is the case is currently uncertain. It is unclear what such interspecies variations mean for de-extinction attempts – partly because the popular discourses around these are yet to address such perceptual differences. Indeed, this oversight is particularly striking in some, such as Ben Novak’s talk at the TEDx DeExtinction conference. In this, Novak described his plan for raising a group of recreated, parentless passenger pigeons. These, he believes, would be socialised and learn to migrate by following a group of homing pigeons which would be dyed to look like passenger pigeons. However, in addition to the dubious ethics of the initial process of dyeing the birds, there are obvious nodes of weakness in his plan which were not addressed. These include deficiencies within the visual record – even skins and taxidermy fade in colour, and photographs and paintings are unlikely to record gradations in colour as seen by a passenger pigeon.¹³ Especially given this complexity, it will not be an easy task to recreate intricately even what humans *do* and *can* understand of a passenger pigeon’s colouration by dyeing a surrogate

species, let alone the additional colours that birds see. Aside from the question of whether these dyed birds manage to induce juvenile passenger pigeons to join their flock, it is possible that the applied colouration on the homing pigeons will affect how they interact with one another, and issues such as whether they become more vulnerable to predation. Finally, could dyeing techniques ever ensure that the recreated passenger pigeons would perceive other pigeons as members of their own species, or even as sufficiently similar? And even if it managed to convince visually, would things like the sounds, smells, movements and interactions of the surrogate flock allow this illusion to be maintained, or destabilise it? It is said that flocks of passenger pigeons were incredibly noisy – surely it is possible that it was this, or other aspects of their flocking behaviour (or indeed some combination) instead of their appearances, that would impel juveniles to join the group. Indeed, Susan McHugh links the mystery to humans of birds flocking to its visually spectacular qualities, noting how flocking sees birds ‘covering territories on their own collective terms ... occupying spaces with senses and reasons that we can only guess’ (273). While musical scores of passenger pigeon vocalisations were compiled by Wallace Craig in 1911, in his TEDx talk Novak does not mention sound as a component of his plan to get de-extinct passenger pigeons to bond with their surrogate community. Like images, however, records of animal sounds are also the site of elisions and potential misrepresentations. The range of audible frequencies varies from species to species, affecting both what gets preserved and how recordings sound to human listeners, and – especially when notated on a standard musical stave – animal vocalisations are strained through the structured tonality this inevitably imposes, and which is entirely arbitrary in this context. Furthermore, Craig’s notations of passenger pigeon vocalisations were based principally on second-hand accounts of captive birds, raising questions about how typical or representative this collection of calls is. As this discussion of the passenger pigeon seeks to suggest, this critique is not motivated by the pursuit of ‘exactness’ in de-extinct animals for exactness’s sake – and indeed, this is not necessarily what de-extinction scientists are pursuing (see, for example, Shapiro, 205). Rather, I am seeking to place animal agency at the centre of de-extinction discourses, including with regard to questions about whether these technologies should be pursued at all. While Novak’s focus on birds’ appearances might be because these are easier to modify than other characteristics, this prioritisation of visibility

mirrors other de-extinction discourses, and imposes an anthropocentric sensory hierarchy onto passenger pigeons which disregards their subjectivity and the complexity of their inner lives.

Indeed, to some extent, humans routinely neglect complexities in their own sensory perceptions. Certain cultural phenomena such as museums, art, aesthetics, and horticulture reinscribe entrenched hierarchies of legitimacy when it comes to different forms of sensory information, and while these hierarchies can vary a little between cultures, vision and sound tend to be preserved and canonised to a far greater degree than those such as touch, taste and smell. Already, these anthropocentric sensory hierarchies are affecting other species: commercially-bred flowers, while exhibiting a panoply of different colours and forms, now often lack scent in a way that their earlier cultivars did not. As Natalia Dudareva and Eran Pichersky note, '[t]raits such as colour, visual attractiveness, and long shelf life have been targeted, without any attention to whether the selected lines are still scented' (70). Similarly, philosophers of aesthetics have examined the Eurocentric conceit that 'high art' pertains primarily to music and visual art – as Carolyn Korsmeyer has explained, '[i]t has long been a commonplace in the field of aesthetics to speak of the eyes and the ears as the “aesthetic” senses. Objects of the other senses, it is generally agreed, are not properly called “beautiful”, nor are they the raw material out of which a “fine art” can be developed' (67). While plenty of thinkers dispute this and the assumptions that underlie it, this notion has proved stubborn, not least because it was shaping cultural canons for a long time before it received critical scrutiny.

Technologies of preservation, reproduction, and communication also shape – and are likely shaped by – these aesthetic sensory hierarchies. Museums, both in terms of what they collect, and how taxonomies are devised, are overwhelmingly optical spaces, and typically encourage visitors to consume exhibitions visually rather than, say, through touch. As archives of histories – social, cultural, natural (constructed categories which of course overlap) – museums engineer both large-scale remembering,¹⁴ as well as mass forgetting. The forgetting occurs both when things have not been selected for collection – either through their being overlooked, or because they pose practical difficulties for storing or exhibiting – and when attributes of things collected are treated as incidental. The way objects in museum collections smell, for example, is not typically the kind of thing that is actively preserved or for which there

is a designated field within a museum database's cataloguing system; as Constance Classen, David Howes and Anthony Synnott note, 'smell is probably the most undervalued sense in the modern West' (2-3), and Akira Mizuta Lippit observes the archival foundations of this: 'The inability to record and sustain the impressions of scent, their ephemerality, form the grounds for their dismissal' (123). Museums purport to retain information, and allow for it to be accessed, recreated or transmitted, but in order to do this the information in question must be in a stable – or stabilisable – form. This has affected the relative prominence of different senses within epistemologies and archives, even as these priorities have undoubtedly contributed towards uneven advances within preservation (and reproduction) technologies.¹⁵ Indeed, continuity can be observed between the long-standing privileging of sight and sound within notions of 'high art' and museums, and the capacities of everyday digital technologies, such as smartphones. While impressive in their ability to communicate visual and sonic information remotely, so far there has been little mainstream demand to accelerate the technological advances that might enable them to do this for taste, touch and smell (though experimental forays into these fields have been happening).¹⁶ However, in a hypothetical world where dogs (say) were to design museums or smartphones for their own use, the sensory modes informing the didactic and communicative capacities of these technologies would be considerably different to those that humans are accustomed to.¹⁷ Here whimsical thinking might be a strategy for highlighting multispecies phenomenologies. While these by definition remain perpetually beyond the reach of any embodied subject, acknowledging their existence precipitates a critique of anthropocentric assumptions and hermeneutical overreach, and reserves space within discourses for an accepted but unstable zone of unknown experience. Arguably an empirical vacuum rather than a more typical epistemological gap, this is likely to resist the erosions of standard research, and it further troubles the ethics and politics of de-extinction. Popular de-extinction discourses' apparent assumptions of broad perceptual commonality across species are all the more striking in the context of research exploring differing sensory emphases, including Freud's attempt to demarcate humans from other animals to a significant extent *on account* of their predisposition to rely on sight rather than smell (Freud 1961, 47; also see Lippit, 123). Whatever the failings or otherwise of this theory, at the least it foregrounds how species vary in their sensory experiences. If proponents of de-extinction *are* in fact considering species' sensory differences –

actual and potential, and both in terms of emphasis and differing experiences within the same sense – then these should feature prominently in their public-facing discussions of approaches and obstacles to de-extinction. Existing within what Eben Kirksey, Craig Schuetze and Stefan Helmreich have termed ‘biocultural borderlands’ (13), de-extinction raises many ambiguities which should not be ignored, even if by their very nature many of them cannot be solved.

Conclusion

Visual representations occupy a central but unstable position within de-extinction discourses. While made by and for humans, they intervene within processes wherein inter- and intraspecies interactions of nonhuman animals are the most critical. As well as dominating de-extinction narratives, images also therefore signal a dearth at the heart of what is and can be understood about extinct species, and ‘an impossible translation from the semiology of animals to that of human beings’, to borrow Lippit’s phrase (122). While visual cultures constitute part of a strategy to popularise de-extinction technologies, images are also potentially unruly, and can unmask as well as sanitise accounts of experimentation with animals. Arguments in favour of de-extinction therefore exhibit careful curation, minimising representations that might subvert the optimistic narrative of these technologies and their potential outcomes, and prioritising those that effect guilt at anthropogenic extinctions and wonder at biotechnological futures.

This instrumentalisation of images operates in tandem with the way in which they are treated uncritically in de-extinction discourses. They are not framed as artefacts in their own right, and as such the historical and ideological conditions that shape their representations are overlooked by proponents of de-extinction. Further, the prominence of images within de-extinction discourses inscribes stark disproportionalities among the aspects of candidate species that these discourses engage with. The substantial privileging of visual sources does not simply overlook their deceptions, but leads to undue emphasis on the way de-extinct animals might look as compared to, say, what their scent might be. While this is an unsurprising consequence of the limiting and anthropocentric structures of the archive, it carries new risks in the context of de-extinction. Indeed, de-extinction itself stands to create a sort of anthropocentric archive, wherein species deemed most interesting to humans are brought back, through processes that in

turn focus disproportionate attention on the aspects of these species that seem most knowable, measurable, or comprehensible to humans. However, what is valued by humans about nonhuman animals does not necessarily align with what is important to nonhuman animals about themselves or each other, and what these things are – and the extent to which they can be detected, measured, or archived – is also uncertain. Indeed, archives and representations mark the site of a circular paradox within de-extinction discourses. While some advocates of de-extinction cite what could be learned from resurrected animals as a reason to bring them back, it is this very missing information – behavioural, appearance-wise, what they smelled and sounded like, and so on – that might vex de-extinction efforts. Indeed, if a primary motivation for these species' recovery is to convey information about them as they existed before, then de-extinct animals themselves become representations of sorts.¹⁸

The neglect within de-extinction discourses of these discrepancies between different species' sensory worlds is both facilitated and naturalised by an anthropocentric gaze, which also suppresses the subjectivity of nonhuman animals. Especially in this context, therefore, de-extinction raises the possibility of a troubling reckoning, in which trans-species perceptual differences precipitate devastating incoherence within the sensory economies of a resurrected population. Animal agency might therefore disrupt a key stage of the de-extinction process: even after initial technological difficulties of recreating individuals within a species appear to have been overcome, viable intra- and interspecies interactions might not eventuate. And if de-extinction fails to 'make sense' to the species being restored, then its implications for animal rights are even more problematic.

Whatever the extent to which this transpires, unevenness in the sources pertaining to candidate species, amplified by their selective use within de-extinction discourses, arguably fosters skewed expectations as to what should or might result from experiments in genetic rescue, and this research has raised questions around what constitutes a 'successful' de-extinction, from whose perspective this gets to be assessed, and the extent to which such an outcome is even humanly knowable. Such questions, I have argued, indicate the need for de-extinction discourses to make space for multispecies phenomenologies. However, these should not primarily be viewed as further technical puzzles for the science of de-extinction to attempt to solve, but as respected arenas of animal agency and otherness for which humans – currently at least – lack representational practices and experience.

Notes

¹ For example, eleven pages into *How to Clone a Mammoth*, Shapiro announces that this is not actually possible: ‘We will never create an identical clone of a mammoth. Cloning... requires a preserved *living* cell, and this is something that, for mammoths, will never be found’ (11).

² It should be noted, however, that carvings of mammoths made from their ivory do survive from the last glacial period (commonly referred to as ‘the Ice Age’; see www.bradshawfoundation.com/sculpture/ivory_mammoth.php, accessed 10 January 2017). Regardless of the presumed ‘likeness’ or otherwise of these sculptures, they speak to historical entanglements of representation and interspecies interactions. Their existence also underscores the lengthy provenance of technologies of visual representation that produce lasting artefacts, in contrast with technologies that preserve impressions of sounds or smells.

³ Examples of this third category of visual representation were presented by Isabella Kirkland at the TEDx DeExtinction conference, though she did not highlight the limits and deceptions of images of extinct species.

⁴ Various details and conditions complicate these categories, however, including differences in media and in source materials. For example, representations of a now-extinct species made before it became extinct were not necessarily based on living individuals – John James Audubon killed and positioned the birds that he rendered, while other images, such as those by J. G. Keulemans of endemic New Zealand birds, were principally drawn from skins or taxidermy models. Similarly, photographs could be of living or dead animals, and accompanying descriptions – if these existed – were not always clear about which exactly it was that viewers were looking at. Differences between local and global extinctions further blur all the categories, as do ancient representations of animals (such as the small mammoth carvings), which – while significant for many reasons – did not necessarily play roles in the devising of much later ‘scientific’ visual reconstructions of animals’ forms. Furthermore, the media used across these different types of images are varied, having been affected not only by the differing demands of representing species which still existed versus those already gone, but also by the extinction

dates of the species in question. While moving images are possible in all three categories, which type is used – film; animation; computer-generated imagery – depends upon whether the species being represented is still around or not. Indeed, the lines between these media are by no means clean, just as there are myriad overlaps between media such as painting and photography. In short, images of extinct animals used within discourses of de-extinction embody rich variation, yet tend to be indiscriminately juxtaposed, as if they were passive supporting materials illustrating rather than acting upon the textual narratives.

⁵ This was not necessarily an individual memory, however, as some sources suggest that Martha was born in captivity, in which case she would have been unfamiliar with passenger pigeons' striking flocking behaviours.

⁶ Tracey Heatherington has noted the religious allusions within de-extinction discourses, in particular in relation to the Frozen Ark project: 'Here at the frontier of imaginary futures, the moral and symbolic worlds of the Old Testament, environmentalism, and genomic science awkwardly converge. Will our growing ability to intervene in nonhuman systems of reproduction now offer redemption for the role humans have played in species extinctions?' (40).

⁷ While this term (and related versions, such as 'magical realism') is deployed increasingly broadly, Matthew Strecher's brief summary is useful here: 'In a very simple nutshell, magical realism is what happens when a highly detailed, realistic setting is invaded by something "too strange to believe"' (Strecher, 267). While this description appears in a discussion of literature, it draws on visual allusions, and resonates especially with the photograph of the mammoth diorama.

⁸ These were 'mostly bone, with a bit of tissue and some hair' (Shapiro, 86).

⁹ Indeed, Lorimer has noted a preoccupation with elephantine motifs within the work of the Surrealists (135).

¹⁰ De-extinction science is not, of course, the only field interested in mammoth remains.

¹¹ This is contested, however, suggesting the subjective nature of what the appropriate criteria are for determining that a species has successfully been de-extincted. Shapiro, for example, does not accept that the bucardo should count as a successful de-extinction (142).

¹² Fernández-Arias later noted that the lung defect could have been detected before birth, allowing the team to plan for an immediate emergency operation which might have saved the clone (see Shapiro, 143-144).

¹³ Indeed, it is instructive to note how different Martha's colouration is implied to be by the monochrome photograph discussed earlier, in comparison with the colouration suggested by painted and taxidermy representations of passenger pigeons (which itself varies from example to example).

¹⁴ Indeed, Donald Preziosi speaks of museums 're-membering' histories, as fragments are pieced back together in new configurations which – while frequently producing the illusion of completeness – actually conceal huge gaps (101). This idea of 're-membering' also resonates with the placing of the tusks on the block containing the Jarkov mammoth's remains.

¹⁵ While it is of course profoundly improbable that all sensory information is equal in terms of the complexity of its preservability/reproducibility, scientific advances are uneven in part on account of the political, economic and cultural conditions which fast-track some areas, while neglecting or stymieing others.

¹⁶ For discussions of the relationship between odour and the archive, see Turkel.

¹⁷ These hypothetical museums or smartphones are differentiable from existing examples of exhibitions, devices and applications designed largely *by humans* for canine use, though in some cases these realised projects do have sensory emphases that diverge to some extent from anthropocentric 'norms'. For example, Dominic Wilcox's art exhibition for dogs incorporated scents, consumables and physical activities, as well as more typical gallery displays (see dominicwilcox.com/portfolio/worlds-first-art-exhibition-for-dogs/, accessed 4 April 2017).

¹⁸ However, it is important to note that clear lines between 'representation' and 'reality', whatever that is, are hard to plot and highly subjective.

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