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FINDING SHIMMER: IMMERSIVE NONFICTION MEDIA AND ENTANGLEMENTS IN VIRTUAL NATURE

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Abstract: *In this article I explore how immersive nonfiction media works may offer a scaffold for an ecological imagination that entangles us, humans, within the environment, rather than othering nature and conceiving of it as something ‘out there’. Taking as a frame the intersection of documentary studies and emerging creative media technologies, and connecting this frame with Barad’s (2007) concept of entanglement and Zunino Harper’s (2016) construction of naturecultures, I examine discourses of nature in digital media representation. Immersive and experiential media forms offer a number of particular affordances which are reviewed here – including generating a sense of presence, use of embodiment and layering and scaling of environments. A number of non-fiction immersive media works are presented as case studies, in which I explore their use of these affordances and their engagement with ecological narratives. Using immersion to engender awe at nature is considered, and while studies seem to show that this is indeed possible, I suggest that there are contingent risks of othering nature. Instead, a development of a sense of bewilderment or shimmer – incorporating complexity, ritual, wonder, humanity and ecology – seems a more likely route to re-minding us of our nature entanglements. Similarly, there are parallels in othering nature and in crafting contained virtual worlds for participants to step into and out of. I argue, building on Speakman’s (2019) writing and creative practice, that an approach that further embeds us within and augments our existing reality, may be more effective in maintaining a sense of entanglement. There are certainly a multitude of rich creative routes to further explore this, and thus practice-led approaches are offered as a vital prong in the work to address climate and ecological crisis.*

Introduction

The video begins as a virtual (computer generated) jungle shivers in a breeze. Birds call, and the tracking shot moves slowly deeper into the three-dimensional animated trees, as if seeking something. A voice-over points out that the smooth camera motion suggests the lack of human presence; there are no bodies in this jungle. But wait – the shot zooms into the forest floor, on which lies a smartphone. The motion changes, we hear the muffled bumps of a mic being wrestled with, and the shot becomes explicitly mediated by a human. The voice-over notes that the various jungle plants can be purchased from game designers, or, ‘this branch has been stolen from a torrent website’. The camera pulls out, and the ‘jungle’ is revealed to be only a few trees wide; a finite space designed in Unity, the games engine software programme. As the shot pans sideways a living room appears in the jungle, with chic furniture and indoor potted plants throughout. The voice-over continues, ‘The distinction between human and nature is a manmade construct that created an outside and an inside world ... the concept of wilderness is itself part of the problem.’

This is Not the Amazon (2019), a video essay by Jean-Baptiste Castel and Astrid Feringa, explores the complicated act of creating virtual nature, and the risks of distancing these environments from ourselves. Available on YouTube, the video finishes on the same frame as it begins and so is designed to loop continuously, repeating its eternal journey through a fictional jungle. *This is Not*

the Amazon focuses attention on uncritical virtual world designs, questioning the validity of approaches that hold nature up as virgin landscape.

I saw *This is Not the Amazon* presented at the International Documentary Film Festival Amsterdam's (IDFA) DocLab event, at the end of two years spent surveying immersive media experiences on show at film festivals. The work presented at IDFA DocLab is broadly encapsulated as new documentary forms created with emerging media technologies. They range across interactive documentary experienced on a browser, to 360 degree or virtual reality (VR) documentaries experienced within a head-mounted display, to mixed and augmented reality works that combine physical reality with additional virtual layers, to large installations that include technological and performative elements. Immersive media has become something of a catch-all term that incorporates many of these forms (although not all), and which offers a useful starting point for this piece. Rose usefully describes immersion as 'forms in which a lone audience member moves from being a viewer to become an active participant or player in the story world' (Rose 2018a: 134). This definition might include, for instance, immersive theatre, but for my purposes (and in the manner it is generally used in such events and festivals as discussed here) I further narrow the category to projects that in some way use creative media technologies as well.

Immersive creative media (and in particular virtual reality) has seen a rapid increase in scholarly study, however, there is still minimal engagement from the documentary studies field. A special issue in 2018 of the journal *Studies in Documentary Film* offered some much-needed attention, including particularly relevant articles by Rose, McRoberts and Nash. Rose's (2018a) article refers to the 'immersive turn' in documentary, suggesting it has developed broadly in tandem with emerging technologies, but is most strongly seen in the intersection with VR. Furthermore, a soon-to-complete research project on nonfiction VR¹ will offer further insight once formal publications are available.

In my survey, I examined many projects that fit within this developing immersive nonfiction field, and over time I began to notice some similarities between many of the works. Across the (primarily) VR works I saw, dark, monochromatic backdrops were common. Computer generated environments abounded in which many of the objects either glowed gently or were loudly neon. A shiny, metallic aesthetic evoked futuristic styles even when projects were not set in the future. There were exceptions, of course, but I did come away from many of these projects with a sense of incompleteness. A texture was missing, a sense of flesh, perhaps an earthiness. A sense of mess. Later, I did an online image search for the term 'nature'. A completely different set of images was presented. When observed as an image gallery, there was an overwhelming emanation of green, of abundant leafiness, and of vast, seemingly untouched natural landscapes. Mountains and forests featured strongly, backed by clear skies. There were no people or even animals visible. So, while different, there was still something missing from these images. The search engine (guided by collective human input) had determined nature as something other, as something 'out there', away from civilisation and people.

¹ Information on the research project is available here <http://vrdocumentaryencounters.co.uk/>

So how do we connect these disparate sets of images? And where do people (and bodies) figure? Or in other words, can we develop immersive nonfiction media works that explore environmental concepts and narratives, while avoiding constructing notions of nature within virtual worlds that distance it from civilisation? In this article I will explore briefly this construction of nature as a separate and bounded entity, examine nature representations in immersive media and the relevant affordances of the technology, and discuss a number of case studies of immersive nonfiction media experiences. Throughout, I consider how an ecological imagination that recognises the need for environmental action might be developed and supported, through using the possibilities of the media form to better highlight humans' entanglements with nature.

Re-entangling us with nature

There is a long history of scholarship criticising the notion that nature exists 'out there', away from civilisation and separately from humans. Edward O. Wilson's influential book *Biophilia* (1984) popularised the term of the title, defining biophilia as the 'innate tendency [in humans] to focus on life and life-like processes' (p1). It could be said that the emergent and cross-disciplinary field of environmental humanities has coalesced around arguing for this recognition (for recent examples see Lakoff 2010, Alberro 2019). Building on shared work with Döring (Döring & Zunino 2014) and earlier work across the discipline of ecolinguistics, Zunino Harper (2016) proposes 'naturecultures' as a relevant and vital paradigm. Drawing on Haraway's (2008) 'web of life' and Latour's (2004) 'assemblages', she asserts that 'The interface of what Western thought has been separately calling 'nature' ... and 'culture' ... is in fact a single dimension of inextricable, bidirectional connections' (Zunino Harper 2016: 95).

Entanglement is a term that has come into increased usage in naturecultures and environmental humanities discourses, as it offers a useful framing for the relationship between humans and nature. Entanglement comes originally from Karen Barad (2007), particle physicist and feminist philosopher, in her explorations of the relationships between subatomic particles, time, matter, systems of thought and beyond. She states,

To be entangled is not simply to be intertwined with another, as in the joining of separate entities, but to lack an independent, self-contained existence. Existence is not an individual affair. Individuals do not pre-exist their interactions; rather, individuals emerge through and as part of their entangled intra-relating. (Barad 2007: ix).

It is no less than this level of utter entanglement that we need to consider when exploring human and nature relationships, and the project of encouraging an environmental understanding of all matter as entangled requires an ongoing re-stitching of humans into their habitats. Wilson explicitly drew connections with the notion of biophilia and the deep need for a more powerful ethic of conservation (1993); taking further steps beyond understanding and towards action, Alberro (2019) argues that re-entangling ourselves with nature is vital in the fight against climate change.

The nature/civilisation oppositional construction persists, however, and is reinforced by certain forms of media and cultural products, from Thoreau's *Walden* to current 'wellness' guides that

exhort digital detoxes and walks in a forest. This is not to suggest that interaction with nature is not vital to humans – indeed, there is a growing body of research recognising that it is. A review by Natural England (2016) found that there is strong evidence to support the theory that human beings require interaction with the natural world for their mental and physical health. So in the first instance, there are significant individual-level arguments for collapsing this divide and normalising interaction with nature, making it a regular and expected part of life. Bethelmy and Corraliza (2019) explored nature’s capacity to engender transcendent emotions, and devised the phrase ‘sublime emotion in nature (SEN).’ They proposed SEN as encapsulating awe and inspiring energy, and quite wonderfully found that these two factors ‘feed the emotional bond with nature’ (Bethelmy & Corraliza 2019: 10). An underlying question driving this article is, what might we do with this emotional bond?

Moving from the individual to the community scale, Didur and Fan (2018) explore ‘urban wilds’, which they explain as informal green spaces at the edge of urban environments where nature has reasserted itself. They frame these spaces as sites of engagement, tension and awareness for local residents, having developed a locative app to support ‘learning through encounter’ within and around them. Informal green spaces and urban wilds are some of the more frequently experienced versions of nature in the UK (Natural England 2019), given lower barriers to access. A pertinent question is whether local, regular engagement with urban wilds could also ‘feed the emotional bond with nature’, or is it required that an environment elicits SEN to encourage a feeling of connection?

In either case, might it be that immersive media experiences could bolster individuals’ experiences of ‘real world’ nature by offer additional virtual encounters, thus strengthening the notion of nature as something we are entangled with rather than something we visit occasionally? Virtual nature could perhaps even be seen as another kind of informal green space, allowing increased access for some who have rare or limited nature interactions.

Bewilderment and the natural world

In early 2019 I published a manifesto for immersive media (Scott-Stevenson 2019a), based on the first part of the survey of immersive works I had conducted. The manifesto posed the question: that if humans can see a way forward to a desirable future, might they be better able to feel some agency over the path to get there? Perhaps, if audiences can see/hear/touch the world that they *want* to create (as distinct from dystopian futures), they may be able to envisage and craft a way towards it. The manifesto offered five points of consideration for the development of immersive media that looks towards preferred futures,² and the second point introduced the notion of engendering bewilderment in such works. Here I will build on this concept, as I think it may offer a connection between awe and the quotidian in nature narratives.

I take bewilderment from a conversation between Berger (2018) and Richard Powers, writer of *The Overstory*, among other novels. In their conversation, Powers refers to another writer Lewis Thomas’s assertion that bewilderment, in essence, means partaking in a state of being wild (Berger,

² The five points are: 1) stage an encounter, 2) be wild: bewilderment is powerful, 3) move from being to doing, 4) embody the future, and 5) care: the participants matter (Scott-Stevenson 2019a).

2018). So rather than the more common usage of perhaps a feeling of confusion or bamboozlement, he reads it as a reminder of our animal state and our existence within a vast and complex system. The Online Etymology Dictionary (n.d.) identifies bewilder as made up of ‘be-’ which means ‘thoroughly’ and the archaic term wilder which means ‘lead astray, lure into the wilds,’ which neatly connects both Thomas’ construction of the word and its more common sense of being lost or confused.

In the manifesto, I wondered if immersive work that bewilders or re-wilds us – in other words, gives us a sense of awe, joy or connection with something bigger than ourselves – might help to connect us to (and position us within) the natural world in a distinct way. Could it lure us back to our wild existence? Could it, indeed, assist in developing and strengthening the ‘emotional bond with nature’ (Bethelmy & Corraliza 2019: 10)? Now, given further research into environmental and immersive media, I also consider whether it can scaffold more regular interactions with nature, and assist in developing a clearer understanding of entanglement.

Experiential media practice and encouraging ecological action

Returning to my framing within the discipline of documentary studies, it is important to note the history of traditional screen documentary engaging with climate narratives. *An Inconvenient Truth* (2006), *The Age of Stupid* (2009) and *2040* (2019) are all examples of documentary feature films that have engaged with the issue and taken an activist stance. They are also all films that move beyond awareness-raising, and were developed alongside sophisticated impact campaigns. Penhryn Jones (2019) supports the suggestion that climate communications can and must go beyond simple ‘messaging’, and discusses the importance of creative practice in providing a way to both research and understand environmental narratives. She also, however, notes her frustration at what she sees as the tendency for academic analyses to lump different creative and media practices together, and calls for more nuanced attention to processes and connections between theory and practice.

It is certainly difficult to identify clear boundaries around what forms of creative media are relevant to a discussion of improving nature connection and consequent action, within a single analysis. Immersive media offers one reasonably broad yet bounded category, encompassing projects created with emerging digital media technologies that offer the participant a feeling of immersion within a story or experience. So, using the documentary tradition as a foundation, and with an eye on future creative practice explorations, I focus here on nonfiction projects that offer connections between ecological narratives and experience.

A useful framing for the forms of media practice I am proposing to explore is what Dovey and Speakman (2018) describe as an ‘experiential approach’ to developing an understanding of climate change. They argue that this approach ‘affords the opportunity to enact modes of attention necessary to embracing ecological complexity’ (Dovey & Speakman 2018: 33); and in particular, they offer the opportunity to present different time-scales as a key part of how to embrace and understand this complexity. So, rather than comparing creative media interpretations of nature with ‘the real thing’, they suggest that an experiential approach is compared with other more traditional ways of communicating climate science, such as written articles. This framing both

avoids accusations that a media work is attempting to simply create a virtual facsimile of the natural world, and addresses Penhryn Jones's concern that too many creative forms are often collapsed together in broad analyses.

There are a number of affordances of immersive media forms that drive forward the possibilities for engaging with climate and ecological narratives, which I will explore. Might the development of immersive media works that place us *within* natural environments (or rather, create a feeling of presence within those environments), offer new cultural products that highlight our entanglements with complex systems? Might the opportunity to bodily interact with these environments also enable our progress towards an embedding of natureculture narratives? To go further, could these cultural products encourage in participants a feeling of agency within these systems, and enable behaviour change relating to ecological emergency?³

The discipline of digital games studies also offers significant scholarship around ecological narratives and immersion, with a number of similar affordances to other forms of immersive media. Chang (2019), in her monograph on ecology in video games, identifies some of this overlap:

Games and digital media more broadly leverage unique affordances that enable often abstract information and otherwise distant threats of ecological calamity to take very real and even operable form, combating the twin hazards of apathy on the one hand... and paralysis on the other... But most important, computer and video games present a rich limit-case for the claims of environmental scholarship—ontologically and epistemologically speaking, they are a place where the natural and the digital collide and prompt careful reexamination of our assumptions about nature, realism, and the virtual.

This natural and digital collide is particularly relevant across the case studies explored below. Given, however, the focus here on nonfiction projects, an exploration of how game mechanics might have impact on ecological understandings is beyond the scope of this article (yet of significant value in future research). Instead I will focus on the experiential dimension of nonfiction immersive media – the variety of ways that these emergent media forms can engage participants – and how their novel affordances of presence and embodiment have a role to play in representing our entanglement in nature.

Presence

Presence is oft-discussed in relation to immersive media, in terms of how much a participant feels physically 'present' within the experience. Slater (2003) defines immersion as a measurable quantity relating to the technology of immersion, in contrast to presence, which he defines as a subjective feeling that is context dependent and that participants can self-report. This has also been described as spatial presence, or elsewhere by Slater and Sanchez-Vives (2016) as 'place illusion'. In a discussion of nonfiction VR, McRoberts (2018) identifies four elements that can influence

³ By behaviour change, I mean to encapsulate not just individual actions to reduce carbon emissions, but also actions that include activism and democratic participation, encouraging carbon emission reduction on a much greater scale.

presence – immersion (defined similarly to Slater), positionality of the user, interactivity and narrative agency.

Slater & Sanchez-Vives (2016: 37) argue that presence does not exist in the real world, it is ‘the feeling of being transported to another place’. They assert that we do not notice or comment upon our existence in ‘real’ physical space, ‘*except, for example, as a way of expressing good fortune at being in a fabulous place*’ (Slater & Sanchez-Vives 2016: 38, emphasis added). This is an intriguing point, offering a possible pathway between eliciting a sense of awe or bewilderment in the virtual or digital world and the physical world. There are a few research projects emanating from psychology that explore the practice of developing presence within virtual nature: Ahn et al (2016) examined how embodying virtual animals increased individuals’ sense of involvement in nature, and Calogiuri et al (2018) designed and studied participants’ responses to a simulated nature walk.

Other studies have explored the eliciting of awe or similar feelings through immersive representations of nature. Chirico et al (2018) performed a lab study on engendering awe in VR works, based on previous research framing awe as a combination of vastness (a sense of scale or grandness) and need for accommodation (‘the urge to adjust mental frames according to new incoming information’ (Chirico et al 2018: 2)). They found that they were able to create VR environments that did indeed elicit awe in the viewers. Mountain scenes elicited the most awe of the conditions presented, but the other two conditions – tall trees in a forest, and the earth as viewed from space – also elicited significantly more awe than the neutral landscape condition.

Rivera et al (2020) conducted a study that explored the engendering of awe through flat screen media depictions of expansive nature scenes and found that feelings of meaning in life could be improved through doing so. However, they also found that one element of awe is the generation of feelings of smallness or insignificance, which has a negative impact on meaning. It would be interesting to conduct a similar study on meaning using VR representations, and examine whether presence has an effect on the interplay of these competing elements of awe. The Chirico et al (2018) study did note the existence of research showing that awe is better induced in immersive media over flat-screen media.

A unique affordance of VR hinted at by these studies, related to presence, is an ability to both represent and alter scale – an affordance that is also particularly useful in engendering bewilderment. For instance, a viewer can be virtually placed as a human-sized avatar in a vast landscape, but they can also be positioned as a giant, or shrunk down in size. For instance, *In the Eyes of the Animal* (2015) is a VR work that allows the participant to experience a forest from the perspective and scale of a dragonfly, while animated fiction VR story *Allumette* (2016) places the viewer as larger than a whole village (and enables them to move around it and peer in from above). This flexibility of scale offers the potential for greater communication of the complexity of natural systems, allowing participants to experience multiple perspectives. In other words, bewilderment – a revelation of complexity and entanglement – becomes possible.

Embodiment

In 360 degree headset-based VR pieces, the viewer is fixed in a particular location and cannot move through the scene. I, the viewer, become a ‘conscious dot’ – expected to immerse my eyes and ears, while the rest of my body remains excluded. While viewing many 360 degree pieces at festivals over recent years, I was often particularly aware of this dual consciousness that seemed to split body and vision. Perhaps the chair I was sitting in would squeak, or maybe I was conscious of the feeling of my bag resting against my leg, or maybe I could smell the coffee of the person next to me, and all of that would serve to pull me out of the experience.⁴ Equally, if the scene was enticing or in some way encouraged exploration, the lack of ability to move around within it would be frustrating.⁵ In room-scale, six-degrees-of-freedom (6DOF) VR pieces, tracking allows the participant to move some way around the space.

A multitude of room scale VR works I experienced (including some in the case studies below) involved the body to greater or lesser extents; many of the pieces seemed to be playing with the possibilities, experimenting with the connections between action and consciousness, or action and engagement. Pieces that reduced the user to a ‘conscious dot’, a holder of only eyes and ears, seemed less effective at drawing me in. Bodies are our points of connection to the world,⁶ through all of the bodily senses. We act with our whole bodies, or with differing parts of them at different times. We take in knowledge and make decisions with our heads or brains, certainly, but we also come to know things with our hearts, and with our guts. In seeing immersion as something that happens only within the head, we may lose these other, vital points of connection to the world.

Rose (2018b) charts a useful course through embodiment in VR, tracing from the work of Char Davies in the 1990s during second wave VR. Rose (2018b), too, identifies the conscious dot problem:

As a realm ruled by mind, virtual reality – as conventionally constructed – is the epitome of Cartesian desire, in that it enables the construction of artificial worlds where there is the illusion of total control, where ageing mortal flesh is absent, and where, to paraphrase Laurie Anderson, there is no ‘dirt.’ I believe such desire to escape the confines of the body and the physical world is symptomatic of an almost pathological denial of our embodied embeddedness in the living world.

Rose highlights the uncomfortable relationship between VR as a ‘technology of seeing’ (through its visual presentation of alternate places or worlds) and VR as a ‘technology of corporeality’ (providing space and opportunity to move with one’s body) – the two applications often sit at odds with one another. Now, advancements in 6DOF VR enable a more convincing embeddedness in virtual space, but of course, this is directly contradictory to Rose’s point about escape and denial. But there may be possibilities for using embodiment as a conduit between the virtual and physical world.

⁴ This duality of experience has also been remarked upon by Rose (in Scott-Stevenson 2019b) and McIntosh (2018).

⁵ Moving around within live action 360 degree VR is not currently possible, as the sheer scale of data required to capture a live space volumetrically renders it an untenable proposition for now. Moving through a space is currently limited to computer generated environments, displayed in 6DOF headsets.

⁶ to which the fields of somatics and indeed somatechnics, outside the scope of this article, will attest.

In Slater and Sanchez's review of the myriad applications of VR, they discuss how 'changing the body can change the self' (Slater & Sanchez 2016: 9). They refer to a suite of different studies, including one exploring the 'Proteus effect' by Yee et al (2009), based on self-perception theory and which demonstrates that experiences of a person's digital avatar can influence the subsequent behaviour of the person, both in and out of the virtual environment. There is a deep vein of research in psychology and neuroscience around eliciting a sense of body ownership in VR and how that connects to the physical body or mind, including not only the Proteus effect but also the mirror effect, and various studies in pain relief (see for instance Matamala-Gomez et al 2019). A longer discussion of how a sense of a virtual body affects the development of a narrative story-world and the feeling of being connected to place is beyond the scope of this article, but would offer fruitful future research avenues.

These experiments in creative immersive media are clearly ongoing, and I am interested to see how we might progress connections with bodies across these stories, and in particular, how we might use this sense of embodiment to connect with environmental narratives. It is important to note, though, that the recognition of the role of bodies in understanding the world is not new; indeed, feminism and disability studies have been pointing out for decades that bodies are political and an oft-excluded part of narratives of society, community and publics. Rose (2018b), too, notes a connection with histories of embodiment in VR and feminist-situated investigations of gender, building on Balsamo's *Technologies of the Gendered Body* (1996).

The studies outlined here on presence and embodiment do demonstrate that these affordances exist within immersive media, as distinct from flat screen media and also relating specifically to natural environments. Studies such as these, however, are undertaken in lab conditions and tend to focus purely on the level of response (or otherwise), rather than deeper questions about possible ethical issues of the studies, creative questions around environment design, or consideration of future applications of the results in creative practice. So it seems relevant to continue explorations of how presence and embodiment might support understandings of and feelings of connection with nature, extending beyond the lab and into creative and artistic media production. The challenge in such work will be offering space for the multiple 'modes of attention' that Dovey and Speakman (2018) propose and that are required to garner an understanding of the complexities and entanglements at play.

Immersive media and presence in nature: case studies

During my survey of nonfiction immersive media works, I did experience some that placed the participant in virtual natural environments in ways that foregrounded human impact and highlighted complex relationships. The remainder of this article will critically analyse a number of these projects from my first-person experience, discuss the technical and content-based approaches they use to present immersive environmental narratives in light of the affordances discussed above, and explore the eliciting of bewilderment in the participants.

Songbird (2018) is a VR work produced by The Guardian, about the now-extinct Hawaiian ‘ō‘ō bird (*Mobo braccatus*). This piece places the user in a hand-painted virtual rendering of the Hawaiian forest, with a distinct visual style. The audio track is made up of a narrator’s voiceover, interspersed with recorded narrative from an ornithologist who travelled to Hawaii in the 1970s and saw the ‘ō‘ō. No one had seen an ‘ō‘ō for years, and it was assumed to be extinct – as he explains in voiceover, this ornithologist likely spotted the last surviving member of the species. Inside the VR piece, I shared the sense of awe related by the ornithologist in seeing the bird alight on a nearby branch. As he describes fumbling for a tape recorder to capture the call of the bird, the narrator asked me to look to my hand, where I discovered the visual representation of the VR hand controller had become now a tape recorder. Her voice exhorted me to press the record button quickly, to ensure I too was capturing the call. As I did so, animated bubbles representing the call emanated from the bird and flowed into the tape recorder. As the bird flew away, the narrator then directed me to check that I had correctly captured the bird’s call, as the ornithologist described his own hurried attempts to rewind his tape and confirm whether he too had captured the final ‘ō‘ō’s song. As I hit the play button on my controller, the bird’s call rang out, and I was momentarily relieved, in tandem with the ornithologist who related his own similar relief. But then, of course, the ‘ō‘ō bird returns – it has heard the call, a sound it had presumably not heard for a long time, and believed that a fellow of its species was nearby.

This preceding description of *Songbird* is taken from an updated version of the manifesto for immersive media, published in 2019 (Scott-Stevenson 2019c), and is followed by this analysis:

This is a heartbreaking, climactic moment in the VR work. Suddenly, my simple act of recording and playing back the bird’s call has marked me as complicit in its loss. I have taunted the final, solitary bird, and in doing so I stand in for all humans and our destructive actions that have decimated the bird’s habitat. My finger on the controller connects me in a corporeal way to this narrative of destruction, and highlights that it is human action that is implicated here. (p5).

By being placed – bodily – within this virtual forest, humans are implicated; we are enmeshed in the story.

Another VR piece that effectively highlights the entanglements of nature, urban spaces and humans is *Biidaaban: First Light* (2018). A computer generated rendering of the city of Toronto is presented, yet it is in a speculative future in which some sort of catastrophic decline or apocalyptic event has occurred. Skyscrapers have collapsed, motorways have crumbled, large holes gaping in the ground provide glimpses of the subterranean universe below. However, this is not presented as a terrifying dystopian vision – enough time appears to have passed that nature has reclaimed its place in the city. In the headset, I look around and see large vines swathe the sides of the yawning skyscrapers. Trees have pushed through into old city squares. Birds chatter, there is calm; the urban wilds have transformed from small pockets within a city to the entirety of what can be seen. At first it seems that people have succumbed to the collapse, but soon there emerge signs of human habitation. My first position as viewer is in a former underground train station, and a canoe floats

on the now inundated tracks which have become a canal. The viewing position then moves to a town square, and a tent is visible – it emanates signs of life, of human habitation.

Biidaaban: First Light is a 6DOF VR work, so I have some limited ability to move my whole body around the virtual space, and approach objects that I want to explore more closely – going some way to encouraging a sensation that my full body is present in the experience. My viewing position finally moves to the top of a tall building, and a feeling of awe emerges as I tentatively shuffle closer to the edge and peer out over a collapsed yet still alive city – reviving in an unexpected way. There is a tent on this roof also – the door sways in a breeze, there is a human-built fire. I do not see the inhabitants but it is clear from *Biidaaban*'s introduction that they are First Nations People, Indigenous to Canada.

The final sense of awe – indeed, bewilderment – on the rooftop is engendered as a combination of the vastness of the scene and the reconfiguring of knowledge about cities and urban space (see above for Chirico et al's (2018) construction of awe). The viewer stands above a grand city that has returned to the wild, and must adapt their knowledge of urbanity, nature and human existence to understand the entanglements of all three.

Perhaps, though, a more evocative and apt term than bewilderment here is 'shimmer' – used by Deborah Bird Rose (2017) – that identifies the sense of awe but broadens it beyond nature. Rose cites anthropologist Howard Morphy, who refers to a northern Australian Yolngu Indigenous term, bir'yun, which translates as brilliance or shimmer. In this construction, shimmer applies to environmental concepts, but also to ritual, art and dance. Rose (2017: G53) explains it is '[o]ne's actual capacity to see and experience ancestral power.' So this concept of shimmer, or bewilderment, can exist at multiple scales, in multiple senses, in a range of materialities and abstractions. It may offer a useful conduit between a concept of awe at the 'natural world' (for want of a better term), and a recognition that humans are imbricated in this natural world.

Shimmer thus pervades *Biidaaban* – in joy at seeing natural flora flourish across decayed urbanity, in observing the existence of Indigenous people with a connection to the natural world that supports their survival, and literally, in magical animated elements that gently glitter around their habitations. Shimmer moves beyond awe or spectacle, to encompass complexity and understanding.

Biomedia and embodiment

The creation of a sense of connection between virtual and physical body has been attempted in a number of ways in creative media projects; some examples include inviting participants to speak, mapping physical objects that can be touched into the virtual world, and building large sets for participants in untethered head-mounted displays (HMD) within which they can move around freely. The use of biomedia or biofeedback is another strategy – incorporating data from the participant's own bodily activity and processes.

We Live in an Ocean of Air (2018), by production studio Marshmallow Laser Feast, uses heartbeats as well as breath to demonstrate connections with nature. I visited the installation at the Saatchi Gallery in London in early 2019, in which six people at once could don untethered HMDs and backpacks, and move through a virtual space together. A computer-generated tree appeared in the centre of the room, with branches reaching out across the space and pulsating. A sensor attached to the HMD detected each participant's breath, and this was then animated through the headset's visual display – I felt like I could see my breath rushing out of me, in clouds of small blue dots. A heart rate monitor fed the participants' pulse rates into the animation of the tree, connecting us to its movements. Body tracking also meant that the other participants were visible within the space through visual representation, so as we moved around we could avoid bumping into each other.

Synchronised VR allows a number of people to experience a piece together, but the participants in *We Live in an Ocean of Air* (and indeed most recent synchronised VR works that I have experienced) are unable to communicate verbally throughout the piece. Indeed, it is not clear which participant is which – I attended the gallery alone, but if I had gone with friends, it would have been difficult to keep track of which other participant I knew. The collective experience does allow, however, for discussion afterwards, and a sharing of responses. (Collective experiences are discussed further below).

There were, for me, moments of awe in *We Live in an Ocean of Air*, as I marvelled at the extension of the branches and the flow of small dots through the tree. Perhaps, though, awe has limits in its ability to convey information. The website for *We Live in an Ocean of Air* reads, 'The human cardiovascular system interacts with the mirrored natural networks that unite the forest: capillaries, arteries and mitochondria flow into leaf, phloem and mycelium, placing your every inhale and exhale within a larger reciprocal system.' Reading this supporting information before the experience may have strengthened my understanding during the work. I found the piece beautiful, but having my body rigged into so much gear (backpack, headset, wristbands) had the effect of making me slightly uncomfortable rather than feeling bodily connected. Being accidentally smacked in the head by another participant as I bent down low to examine a root also served to reduce the sense of immersion.

The experience of my body seemed different from, or at least not fully aligned with, the stimulus being fed to my eyes and ears. Perhaps something about the set-up of the experience – attending a gallery, leaving my bag behind the check-in desk, being assisted into the gear in a small ante-room and listening to a fellow participant express concern at being away from her bag which contained her medication... all were signposts to my physical being that I was not really in a forest. I had to actively work to support the belief that I was experiencing a forest. Janet Murray suggests that with immersive media, this is what we do – rather than suspending disbelief, we participate in the active creation of belief (Murray 1997). However, as I write this, I have returned this afternoon from a walk in an actual forest. I felt connected with nature (my muddy boots can attest to this), having run my hand over moss-covered fallen trees, clambered up a hill for an awesome (in the true sense of the word) view across the countryside, and breathed in the air filtered by the surrounding trees. I was fully immersed, embodied in this experience, in a way I could not be while at the Saatchi Gallery wearing a head-mounted display and heart rate monitor. Rose's (2018b) lament above that we seem determined to escape physical reality is apposite here.

Magical interaction, collective experience and augmenting reality

Rather than trying to essentialise nature with this description of my forest walk, what I intend to suggest is that perhaps if immersive media is on the back foot in positioning us within ‘real’ nature, it might offer other ways to immerse us within environmental narratives. One possibility is the use of activities that are otherwise impossible in the physical world (Chirico et al 2018). Slater and Sanchez-Vives (2016) observe that in their review of VR, they have focused primarily on recreating externally existent places and experiences within a virtual environment – for instance to address fear of heights, or racial bias. But in their concluding paragraph they propose, ‘However, maybe there are completely new ways to think about these types of applications that make use of the *amazing power to put people outside of the bounds of reality and have a positive effect*’ (Slater & Sanchez-Vives 2016: 39, existing emphasis). Serafin et al (2016) refer to this kind of VR design as ‘magical interaction’, as opposed to ‘natural interaction’, suggesting that ‘[a] magical interaction is not limited by real-world constraints, such as the laws of physics or human anatomy’ (Serafin et al 2016: 267). *We Live in an Ocean of Air* does, to some extent, incorporate ‘magical interaction’ – I observed my breath displayed visually as flowing blue dots, and I could walk ‘through’ the tree and examine it from within its branches and trunk.

What if, though, such magical interaction could be used to augment ‘actual’ nature, rather than to build on a virtual environment? So rather than attempting to build ever-more elaborate computer-generated worlds, and waiting, for instance, for technology to enable us to move beyond the simple monochromatic backgrounds I mentioned earlier, could we use less technology, or rather technology that is less all-encompassing perceptually, and use it to highlight and bolster our entanglements with the nature already around us? The next section begins this exploration.

Connecting to place, collapsing binaries

Duncan Speakman, an artist who creates augmented audio walks (and co-author with Dovey (2018) of the earlier referenced article on experiential works), has a perspective on what immersion is and can be, that aligns with this idea of embedding us within our ‘real’ environments. He says,

I want to think a little about immersion as something that already exists. Something we live with all the time. Immersion as the way of describing the way we exist deep inside complex tangled ecologies. And around this word, beyond it, underneath it, even woven within it, maybe we'll find agendas of care, of attending to the environments we inhabit. (Speakman 2019a: 5).

His most recent project, *Only Expansion*, won a Special Jury Award for Digital Storytelling at the International Documentary Festival Amsterdam in 2019. In it, the participant wears specially adapted headphones that are affixed with binaural microphones, attached by a cable to a small box containing custom electronics that is carried on a shoulder strap. The surrounding environment’s sound is then processed through the box and fed back through the headphones, atop a recorded track. So, for instance, the sound of a passing motorbike may be received and augmented so it instead sounds like it is being heard underwater. The existing audio track is made up of recordings

of rapid environmental change from around the world, including wildfires in the US, the crumbling of cliffs on the east coast of England, and the rising of seas around Norway; and these sounds blend with the live augmented recording. A voice-over also asks the participant to attend to their existing environment, observe the space around themselves, select directions in which to walk, and consider how the place might alter in a climate affected future – for instance, the participant is asked to walk to a place of high ground when considering sea level rise.

Rather than attempting to immerse a participant in a fully virtual environment, Speakman's work positions the participant firmly in their existing environment. *Only Expansion* calls on the participant to recognise the place they are in as part of a larger environmental system, and to imagine the possible changes or alternative existences in this place. The work actively collapses the binary of 'out there' and 'in here', layering realities and environments atop one another and melding them – revealing naturecultures rather than valorising nature as a separate entity. The participant is *in* the world with their whole body – attending to their surrounds with their eyes and ears and moving through the space physically, stepping out of the way of approaching passers-by, waiting for cars to pass before crossing the road, noticing the smells of a nearby canal or the heat emanating from a department store doorway. These sensations are not distractions, but drawn into and made part of a richly layered world of present and future possibilities. Shimmer is evident; the participant is entangled within a vast and complex system of humans, cityscape, nature and community that is not just in the present, but also exists and changes over an extended time period. Scale is used here in a different way from VR works; rather than presented visually, it is illuminated with audio and also temporally.

There are a range of possible technological approaches that allow augmenting of the existing physical world with layered material, from visual to audio and other sensory input. Locative mobile games or narrative experiences allow a participant to navigate a specific area and interact through a smart device; projection mapping involves projecting moving images across a non-flat surface, often a building or large structure, allowing collective viewing by a mass public audience; Bose audio sunglasses contain speakers that can transmit binaural sound. Augmented reality headsets, such as the Magic Leap or Microsoft HoloLens, allow layering of moving images onto a section of the existing visual field, although they are still expensive and exclusive and at this stage it seems their technology is primarily destined for enterprise rather than creative uses (Robertson 2020). However, as can be seen here, there are clearly multiple avenues for exploring and providing immersive creative media experiences that keep the participant rooted in their existing perceptual and physical environment.

An additional benefit of augmented reality approaches such as these is that they are better able to accommodate shared experiences – locative games can be played together, audio experiences and AR headsets can be synchronised for multiple participants.⁷ By involving multiple participants in an experience, another avenue for highlighting nature entanglements becomes possible – the connection and potential interaction with other people, also inhabiting the space and undertaking

⁷ While the example above of *We Live in an Ocean of Air* demonstrates the possibilities for shared VR experiences, there are distinct limitations – for instance relating to numbers of possible participants, and restricted ability for participants to communicate with each other.

the experience. Pezzullo (2020: 60) refers to the fostering of a ‘collective imagination’ as one way to address climate change, and discusses shared media experiences (specifically projection mapping) as a possible avenue to achieving this. She also notes an additional benefit: that as projection mapping can reach large public audiences simultaneously, this may include participants who ‘have not self-selected environmental media’ (Pezzullo 2020: 63). The example Pezzullo discusses involved projection mapping of trees onto the Eiffel Tower during the 2015 Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21); the trees pulsed in time with the heartbeats of participants who donated to reforestation initiatives. But future possibilities need not necessarily be so grand; perhaps locally-based initiatives, connecting communities with their urban wilds could offer a beginning.

Conclusion

Perhaps the most compelling element of *This is Not the Amazon* (2019), the YouTube video essay I discussed in the introduction, is its looping form – as the first and final frame match, it could play eternally. The virtual jungle is evergreen; it will not decay, die and regenerate as new flora, it just continues to exist. If the goal in an immersive media work is to present simulated reality – such as in a recreated natural environment – a creator leaves themselves open to criticism when what is represented is not accurate. Equally, any attempt to represent ‘nature’ or ‘the environment’ that offers a separate or othered construction, fails immediately in the work of developing our sense of entanglement with nature.

So, we need to define a clearer and more attainable goal. Might this be engendering awe in immersive media? It is indeed possible to generate awe in virtual environments, as demonstrated by a number of psychology experiments highlighted here; however, it seems that awe and its cousin spectacle may also run the risk of othering nature. If we progress instead from engendering a sense of awe to one of bewilderment and shimmer – incorporating complexity, ritual, wonder, humanity and ecology – we might better re-mind ourselves of our nature entanglements.

There are parallels, too, in othering nature, and in crafting a self-contained virtual world that participants can step into and out of. In contrast, Speakman’s (2019) conception of immersion as a continuing state, and in particular as involving attending to our existing environments, offers a new frame for how we might develop a collective imagination around ecological and environmental narratives. Immersion can thus be seen as a series of layered states, between which humans can progress back and forth at will. The affordances of creative immersive media – the engendering of a sense of presence, the potential for corporeal and experiential interaction, the shifts possible with temporalities and scales – offer ripe avenues for further exploration here. Experimenting with these affordances within augmented and heightened realities, while embedding a sense of shimmer or bewilderment, seems a valuable starting point.

The MENE survey story map (Natural England, n.d.) notes that there are many reasons that people access nature, and identifies from Natural England’s 2017 study a lack of correlation between frequency of visits and concern for the natural environment. They note that ‘*Promoting people’s access to nature should be an aim in itself* (because of benefits it provides to individuals and

society), not necessarily promoted as a means to promoting awareness and behaviour change' (existing emphasis & addition). Access to nature in itself is indeed a worthwhile goal, but promoting access for personal benefits is not incompatible with an additional approach involving awareness and behaviour change. Augmented reality creative media has the potential to go beyond providing *access to* nature, instead revealing that we are *within* nature, and highlighting the beauty and complexity of this understanding.

Penhryn Jones (2019) calls for a greater and more nuanced academic understanding of the connections between theory and creative practice as research; and states that this is vital in crafting resonant climate narratives. The work to conceptually re-entangle humans and nature is ongoing; I hope this article acts as a provocation for more practice and more research, across not just academia but also creative industry and the advocacy sector.

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