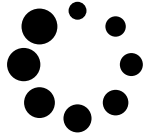


AN-ICON



Adventures beyond
anthropocentrism

in virtual reality art

by Philippe Bédard Virtual Reality

Illusion

Anthropocentrism

Umwelt

AN-ICON
Studies in

Environmental
Images

Issue №2 Year 2022

→ Just an illusion? Between simulation,
emulation, and hyper-realism

Edited by Pietro Conte
and Lambert Wiesing

Adventures beyond anthropocentrism in virtual reality art



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<https://doi.org/10.54103/ai/18458>

“Imagine an eye unruled by man-made laws of perspective, an eye unprejudiced by compositional logic, an eye which does not respond to the name of everything but which must know each object encountered in life through an adventure of perception”¹

Abstract

In the following essay, I consider if and how VR’s uncanny ability to create an illusion of presence and generate a sense of body ownership might be used to go beyond our anthropocentric perspective, towards non-human experiences. By adventuring outside the domain of human experience, my goal is to address the affordances and limitations of VR’s illusionistic potential. Knowing full well that certain economic pressures preclude artists from pursuing the kinds of provocations I describe in this essay, I nevertheless invite readers to follow along as I explore alternative potentialities of contemporary VR. Specifically, I approach VR here in the hopes of finding ways of engaging with different bodies, spaces, and realities, even if illusorily.

Keywords [Virtual reality](#) [Illusion](#) [Anthropocentrism](#) [Umwelt](#)

To quote this essay: P. Bédard, “Adventures beyond anthropocentrism in virtual reality art,” *AN-ICON. Studies in Environmental Images* [ISSN 2785-7433] 2 (2022): 89-112, <https://doi.org/10.54103/ai/18458>

¹ S. Brakhage, “From *Metaphors on Vision*,” in P.A. Sitney, ed., *The Avant-Garde Film: A Reader of Theory and Criticism* (New York: Anthology Film Archives, 1978): 120.

Introduction

Many things have changed between the original heyday of virtual reality (VR) in the 1980–1990s and the current revival of the technology since the early 2010s. But while today VR might benefit from the leaps and bounds computers and graphic technologies have witnessed in the intervening decades, and while it might enjoy greater commercial success than ever before, I often feel our imagination around the kinds of experiences enabled by VR has suffered somewhat. We are far removed today from Meredith Bricken’s suggestion that in VR: “You can be the mad hatter or you can be the teapot; you can move back and forth to the rhythm of a song. You can be a tiny droplet in the rain or in the river.”² Likewise, we seem to have strayed from Jaron Lanier’s proposition that in virtual reality, “you can visit the world of the dinosaur, then become a Tyrannosaurus. Not only can you see DNA, you can experience what it’s like to be a molecule.”³ While Jay David Bolter and Richard Grusin use these two quotes to highlight the illusion of “perceptual immediacy”⁴ of immersive virtual reality experiences, I see in these statements something else entirely more interesting: the idea that VR might give us experiences that far exceed the limits of human understanding.

In the following essay, I consider if and how VR’s uncanny ability to create an illusion of presence and generate a sense of body ownership might be used to go beyond our anthropocentric perspective, towards non-human experiences. By adventuring outside the domain of human experience, my goal is to address the affordances

2 M. Bricken, “Virtual worlds: no interface to design,” in M. Benedikt, ed., *Cyberspace: First Steps* (Cambridge MA: MIT Press, 1991): 363-382, 372.

3 S. Ditlea, “False starts aside, virtual reality finds new roles,” *New York Times* (March 23, 1998): 97.

4 J. Bolter, R. Grusin, *Remediation: Understanding New Media* (Cambridge MA: MIT Press, 2000): 22.

and limitations of VR's illusionistic potential. In so doing, I also aim to explore how VR might be thought of as more than a means to foster empathy for other human beings, whatever the purpose for that endeavour might be.⁵ This allows me to discuss immersive technologies and experiences in a context devoid of the problems typically associated with discourses around the concept of "empathy machine."

I begin this essay by addressing the illusion of presence in VR, specifically as it relates to our experience of body-space relations in physical reality. I start by addressing what I argue to be the fundamental anthropocentrism of VR's dominant mode of experience. This crucial detour has me discussing whether VR is capable of representing non-human modes of being in the world. Necessarily, this also means addressing earlier thought experiments in the field of psychology, biology, and philosophy that sought to question "what it is like to be" something other than human. Having done so, I then consider whether VR might have the ability to give us access to non-human realities, or whether it is limited by a fundamental anthropocentrism. Finally, I

5 On the issue of empathy in VR, see J.H. Murray, "Not a film and not an empathy machine," *Immerse* (October 6, 2016): <https://immerse.news/not-a-film-and-not-an-empathy-machine-48b63b0eda93>, accessed January 10, 2023; S. Gregory, "Immersive witnessing: from empathy and outrage to action," *WITNESS* blog (2016), <https://blog.witness.org/2016/08/immersive-witnessing-from-empathy-and-outrage-to-action/>, accessed January 10, 2023; G. Bollmer, "Empathy machines," *Media International Australia* 165, no. 1 (2017): 63-76, <https://doi.org/10.1177/1329878X17726794>; R. Yang, "If you walk in someone else's shoes, then you've taken their shoes: empathy machines as appropriation machines," *Radiator Blog* (April 5, 2017), <https://www.blog.radiator.debaclle.us/2017/04/if-you-walk-in-someone-elses-shoes-then.html>, accessed January 10, 2023; H. Farmer, "A broken empathy machine," *Immerse* (September 30, 2019), <https://immerse.news/a-broken-empathy-machine-can-virtual-reality-increase-pro-social-behaviour-and-reduce-prejudice-cbcefb30525b>, accessed January 10, 2023; P. Roquet, "Empathy for the game master: how virtual reality creates empathy for those seen to be creating VR," *Journal of Visual Culture* 19, no. 1 (2020): 65-80, <https://doi.org/10.1177/1470412920906260>; L. Nakamura, "Feeling good about feeling bad: virtuous virtual reality and the automation of racial empathy," *Journal of Visual Culture* 19, no. 1 (2020): 47-64, <https://doi.org/10.1177/1470412920906259>; G. Bollmer and K. Guinness, "Empathy and nausea: virtual reality and Jordan Wolfson's *Real Violence*," *Journal of Visual Culture* 19, no. 1 (2020): 28-46, <https://doi.org/10.1177/1470412920906261>.

look at experiments relating to illusions of body ownership in VR, specifically as they relate to non-human bodies.

As will become abundantly clear over the course of this essay, my goal is speculative—perhaps even provocative—rather than earnest. I write this text as an exercise in exploring what I perceive to be a bias towards anthropocentrism in VR, a medium which has so often been lauded for its ability to simulate otherwise impossible realities.⁶ Readers may also see this as a call to action to VR designers and consumers to open their minds to the possibilities offered by contemporary immersive technologies beyond those practices that currently dominate the market. Knowing full well that certain economic pressures preclude artists from pursuing the kinds of provocations I describe in this essay, I nevertheless invite readers to follow along as I explore alternative potentialities of contemporary VR.⁷ Specifically, I approach VR here in the hopes of finding ways of engaging with different bodies, spaces, and realities, even if illusorily.

Virtual reality environments: immediacy and presence

It has become something of a truism to recognize that VR is able to foster a sense of presence, that is, the impression of “being there” in a virtual environment distinct from the physical environment that one’s body is also occupying. Or, as Mathew Lombard *et al.* put it, presence

6 I maintain that VR is currently driven by profoundly anthropocentric forces, despite the “anti-anthropocentric drive which,” according to Andrea Pinotti, “currently characterises not only the VR world but contemporary visual culture, in various mediums, more generally.” A. Pinotti, “What is it like to be a hawk?,” in Y. Hadjinicolaou, ed., *Visual Engagements: Image Practices and Falconry* (Berlin: De Gruyter, 2020): 30-47, 44, <https://doi.org/10.1515/9783110618587-003>. See also R. Grusin, *The Nonhuman Turn* (Minneapolis: University of Minnesota Press, 2015).

7 I also want to recognize that there are the effects of VR are not currently fully known and that much more work must be done to ensure current VR technologies are accessible and ethical. These pressing issues certainly deserve more attention before we can move towards more elaborate explorations of the outer limits of VR.

describes, “the perceptual illusion of non-mediation.”⁸ In this context, the perceived lack of mediation is predicated on VR’s ability to foster a convincing illusion of a space that reproduces the way we see the world in our daily lives: as a three-dimensional volume in which our bodies can move and act. And while on their own the affordances of head-mounted displays (HMD) could be used to create any number of effects and illusions, the dominant practice of contemporary immersive media has been to reproduce our habitual modes of (visual) perception: looking ahead from an upright position through a pair of eyes which we can move around (either in their orbits, by moving our head, or our body) to see the surrounding environment.

In an earlier essay, I described VR as inherently subjective, following Jonathan Crary’s incisive discussion of “subjective vision.”⁹ By extension, I would also argue its default mode of experience—that for which it was designed and that which is dominant to this day—is also intrinsically *anthropocentric*. This is because “subjective,” in this context, refers to the idiosyncrasies of human vision.¹⁰ By the same token, I describe an apparatus which relies on these unique and fallible qualities of perception as subjective. In the case of VR, the HMD hinges upon the following subjective qualities of human vision: its binocularity, its “egocentric” perspective, and the individual’s ability to move their point of view on the world through six degrees of freedom of movement along three dimensions. Here, egocentrism describes an approach to body-space relations

8 M. Lombard, T. Ditton, “At the heart of it all: the concept of presence,” *Journal of Computer-Mediated Communication* 3, no. 2 (1997), <https://doi.org/10.1111/j.1083-6101.1997.tb00072.x>.

9 P. Bédard, “La machine subjective? Les appropriations cinématographiques des dispositifs immersifs contemporains,” *Canadian Journal of Film Studies* 28, no. 1 (2019): 66-92, 74, <https://doi.org/10.3138/cjfs.28.1.2019-0012>; J. Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge MA: MIT Press, 1992).

10 See again J. Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*.

which take the individual as a point of reference.¹¹ In other words, the egocentric perspective considers the human body as a “pivot around which the three dimensions of spatial extension arrange themselves and from which they ultimately proceed.”¹² This could just as easily be called *anthropocentric*.

I continue to subscribe to the idea that VR’s apparatus and the default mode of experience it proposes are subjective, egocentric, and anthropocentric. That is because in most cases, the illusion of presence fostered by immersive virtual environments plays off this characteristic centrality of our body in our perception of space. Head-mounted displays become viewports into different and often completely fantastical realities, but these spaces are still explored from an egocentric perspective, with the body as invariable centre of gravity. If we assume the goal of most virtual reality experiences is to create a satisfying illusion of presence in a virtual environment—whatever the purpose for that may be—it makes perfect sense why this strategy has remained so dominant. However, this is not the only avenue. As an example, a slew of recent (flat) video games have embraced the affordances of their medium’s monocular perspective to create fascinating optical illusions and truly impossible body-space relations. The worlds explored in *Antichamber* (Demruth, 2013), *Superliminal* (Pillow Castle Games, 2019), *Manifold Garden* (William Chyr, 2019), *Spaceflux* (Colin Ardelean, 2020), *Hyperbolica* (CodeParade, 2022), and *Parallelia* (SincArt Studio, 2022) exceed our natural conception of space by presenting all manner of physically impossible environments: non-Euclidean, hyperbolic, fractal, etc. In so doing, they draw more inspiration from M.C. Escher’s depictions of space than

11 W.R. Sherman, A.B. Craig, *Understanding Virtual Reality: Interface, Application, and Design* (San Francisco: Morgan Kaufman Publishers, 2003): 296.

12 E.S. Casey, *The Fate of Place: A Philosophical History* (Berkeley: University of California Press, 1997): 208. Emphasis added.

from what we find in Leon Battista Alberti's theorization of renaissance perspective. What if VR were to also stray from the beaten path and indulge in such perspectival fancies?

In the contemporary immersive media landscape, precious few experiments with non-anthropocentric spaces have surfaced—at least to my knowledge.¹³ In mid-2020, Diego Montoya shared Spacetime, which he described as a “special relativity VR simulation.” The experiment allows users to explore a room where the speed of light is much slower than usual: “You can experience space contraction, time dilation and light Doppler effects as you move”¹⁴ (Fig. 1a and 1b). Among various physical distortions the experience enables—all of which are impossible to encapsulate in written form—the designer explains that “[t]he world feels very ‘wobbly’ when moving very close to the speed of light, almost liquid.” While space remains



Fig. 1a

13 I discuss the limits of any analysis of contemporary virtual reality in P. Bédard, “La machine subjective? Les appropriations cinématographiques des dispositifs immersifs contemporains.”

14 D. Montoya (@diego_montoya_), “I built a special #relativity VR simulation for @oculus Quest, where the speed of light c is much lower than usual. You can experience space contraction, time dilation and light Doppler effect as you move. $1/n$,” Tweet, August 7, 2020, https://twitter.com/diego_montoya_/status/1291745102700765184, accessed January 10, 2023.

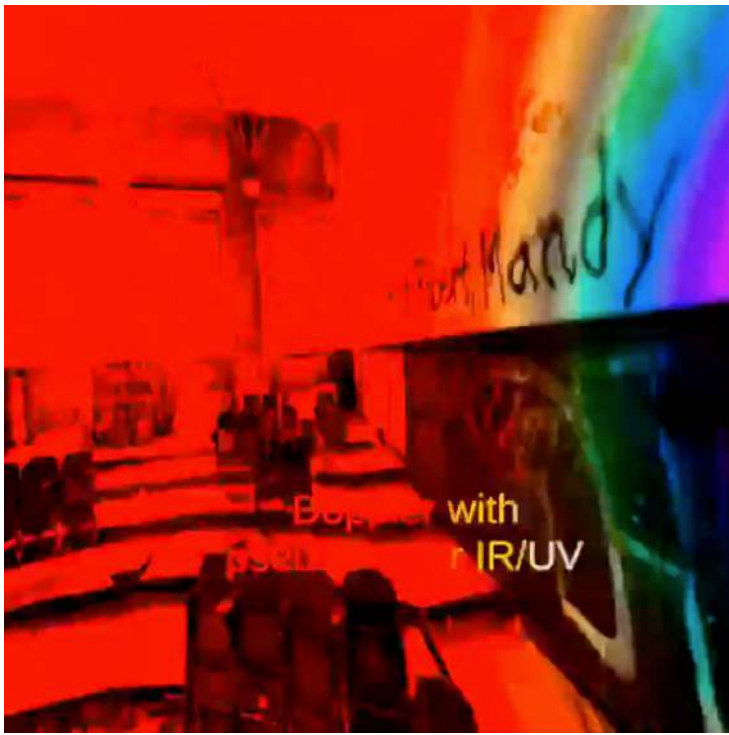


Fig. 1b

Fig. 1a and 1b. Diego Montoya,
Spacetime, 2020

three-dimensional in *Spacetime*, the user's relations to that space far exceed the limits of our habitual modes of perception. With that said, I would hesitate to say that they exceed anthropocentrism, since the transformations that space undergoes throughout the experiment result from the user's movements. Space is not transformed. Our perception of it is.

As with the earlier quoted videogames, Montoya's project is the exception rather than the norm. Indeed, I still believe that as long as VR remains tied to the three or six degrees of freedom model of spatial engagement which takes the body as its centre, there is little it can do to avoid this egocentric mode of experience. With that said, nothing is keeping VR designers from creating virtual environments which are abstract rather than representational.¹⁵ In other words, perhaps the solution to exceeding anthropocentric perspectives in VR might be to reject the notion of "perspective" altogether. However, doing so might

¹⁵ An example I recently encountered would merit further attention in this regard. In *Lockdown Dreamscape* (Nicolas Gebbe, 2022), an innovative visual process was used to distort the image such that objects seemed to meld into one another. A slow movement through the distorted space led me to discover novel spatial relations. The experience was at once nauseating and thrilling.

require more nuanced explorations of the affordances of virtual bodies. It might also ask that we question “what it is like to be” non-human, and whether VR is at all capable to furnish an answer to that question.

What it is like to be []

Whether it has been asked about animals, insects, or “things” in general, the question of “what it is like to be” this or that—whatever it may be—recognizes that our perspective as human animals is limited and distinct enough from other forms of being to preclude us from knowing or even understanding them.¹⁶ The reality behind this seemingly impassable chasm between ourselves and others is made clear through the concept of *Umwelt*, as theorized by Jakob von Uexküll. While it is true that all things (living or otherwise) occupy the same physical reality, Von Uexküll introduces the notion of *Umwelt* to suggest that all beings do not necessarily share the same environment or *world*.¹⁷ The sensorial attunement of different animals varies to such a degree that the very meaning of “world” differs from one creature to another.

The word *Umwelt* can be translated as “self-centred world.” This suggests the inherently subjective or egocentric nature of a given entity’s particular version of, and relation to, a world. This interpretation of *Umwelt* as “self-centred” or “subjectively-perceived” world is made even more evident when looking at the notion of subjectivity itself, understood here as that which is exclusive to a given

16 This has far-reaching implications within debates on the notion of empathy in virtual reality.

17 J. von Uexküll, *A Foray into the Worlds of Animals and Humans with A Theory of Meaning* (1934), trans. J.D. O’Neil (Minneapolis: University of Minnesota Press, 2010). The ties between von Uexküll’s *Umwelt* and VR have been highlighted by Andrea Pinotti in an illuminating chapter. See Pinotti, “What is it like to be a hawk?”

individual (i.e., subject).¹⁸ Indeed, as Maike Sarah Reinerth and Jan-Noël Thon define it, “subjectivity” designates that to which an individual has privileged access. While this definition of subjectivity does satisfyingly describe the exclusive character of *Umwelt*, the parallel breaks down when we realize subjectivity is most often discussed in terms of the unique way in which a given subject “sees” things. The reason for this breakdown has far-reaching implications, specifically when it comes to the non-anthropocentric aims of this essay.

Where the concept of *Umwelt* shines and where the questions of “what it is like to be” something other than human come into play is precisely when the human sensorium—of which sight is often taken to be the most privileged example—is no longer sufficient. Von Uexküll with his famous study of the tick, Thomas Nagel with his example of the bat, and Ian Bogost in his *Alien Phenomenology* all focus on the worldly experience of insects, animals and things that are commonly understood as blind—that is, when sight is understood from an anthropocentric perspective.¹⁹ What drives these thinkers, then, is precisely to understand how these creatures sense, navigate and exist in a version of the world that is completely different from that of humans, even though we might inhabit the same spaces at any given time. How does the world of the bat differ from ours when its primary mode of experience is defined by its use of echolocation? How is the tick’s experience of the world influenced by its reliance on sensing the heat, fur, and butyric acid that signify the presence of its main prey, namely mammals? How different is the world for things

18 M.S. Reinerth, J.N. Thon, eds., *Subjectivity Across Media: Interdisciplinary and Transmedial Perspectives* (New York: Routledge, 2017). For a more sustained discussion of subjectivity in VR, see P. Bédard, “La machine subjective? Les appropriations cinématographiques des dispositifs immersifs contemporains.”

19 T. Nagel, “What is it like to be a bat?,” *The Philosophical Review* 83, no. 4 (1974): 435-450, <https://doi.org/10.2307/2183914>; I. Bogost, *Alien Phenomenology, or, What It’s Like to be a Thing* (Minneapolis: University of Minnesota Press, 2012).

whose very mode of existence would even preclude us from describing them has “experiencing” the world?

“When we ask *what it means to be something*,” Bogost summarizes, “we pose a question that exceeds our own grasp of the being of the world.”²⁰ In brief, these ask that we set aside our privileged modes of experience for a moment and engage—even if imaginatively—with other realities parallel and equal to our own. My interest in asking these questions in the context of an essay on virtual reality, then, comes from the fact that I see it as a tool for exploring and perhaps even exceeding the limits of anthropocentric perspectives.²¹ Indeed, while Reinerth and Thon remark upon the impossibility of accessing the subjectivity of others *per se*, the editors also suggest that media of all kinds (from literature, to movies, to games, etc.) can succeed in fostering a sense of *intersubjectivity*. This process could also be called empathy, namely “the ability to share and understand the experiences of others,” or, as Kate Nash defines it, “an affective response grounded in an imaginative engagement with the experience of the other.”²² Whether we call it intersubjectivity or empathy, the belief behind these concepts is that different media can make use of their unique affordances to suggest to users how a given character might subjectively perceive a given event or experience. Can VR overcome its fundamental anthropocentrism and help users imaginatively project themselves in the experiences of others, precisely when these exceed their habitual range of possible experiences?

20 I. Bogost, *Alien Phenomenology, Or, What It's Like to be a Thing*: 30. Original emphasis.

21 Pinotti might say that this desire to exceed anthropocentrism is itself anthropocentric, as it posits humans as having an exceptional capacity to access other modes of being in the world, which other creatures do not possess. See Pinotti, “What is it like to be a hawk?”

22 H. Farmer, “A broken empathy machine,” K. Nash, “Virtual reality witness: exploring the ethics of mediated presence,” *Studies in Documentary Film* 12, no. 2 (2018): 119-131, 124, <https://doi.org/10.1080/17503280.2017.1340796>.

Accessing non-human realities through technology

An initial response to this last question might be that it cannot. Because VR HMDs are (predominantly) audiovisual devices and because they are tuned to the human sensorium, they cannot, by definition, make us see and hear more than what our eyes and ears can perceive normally.²³ As Andrea Pinotti adroitly explains, such attempts to represent non-human realities through technology:

[...] cannot patently hope to escape Nagel's caveat. Since they are visually rendered on a screen, a compound-eye vision, a left-right-eye independent vision or an infrared vision will always be visions processed by a human eye-brain system. Human species-specific organisation operates as a physiological and phenomenological a priori that cannot simply be bypassed. This is, of course, true also for any sort of VR simulation of non-human ways of experiencing the world: they all ultimately have to be processed by such human a priori.²⁴

This makes it seemingly impossible for HMDs to exceed our typical senses of sight and hearing, to say nothing of being able to use it to go beyond our ordinary perceptual habitus and perceive the world as a bat, tick, or other creature might. But does it mean VR cannot help us *imagine* what the world might look like to a different being?

The fact is that we already use tools in our daily lives that make visible to us phenomena to which our eyes and ears are not sensitive. The clock makes visible

23 To that effect, “[David] Eagleman has noted that the part of the electromagnetic spectrum that is visible to humans is less than a ten-trillionth of the electromagnetic field, and therefore much goes undetected in our lives apart from a ‘shockingly small fraction of the surrounding reality.” L. Jarvis, “Body-swapping: self-attribution and body transfer illusions (BTIs),” in *Immersive Embodiment: Theatres of Mislocalized Sensation* (Cham: Springer International Publishing, 2019): 99-154, 113. See also D. Eagleman, “The Umwelt,” in J. Brockman, ed., *This Will Make You Smarter* (London: Doubleday, 2012): 143-145.

24 A. Pinotti, “What is it like to be a hawk?:” 46.

the passage of time, while other instruments transform a range of different extrasensory stimuli into visible data (e.g., spectrometer, barometer, Geiger counter, Magnetic Resonance Imaging scanner, etc.). Through these tools, we can gain access to phenomena that are strictly speaking “invisible,” yet which become visible all the same thanks to the appropriate apparatus. Having been made visible, these phenomena are not necessarily *legible* to all. As Don Ihde explains, the relation with the world in which we enter when using such tools is *hermeneutic*, meaning it requires that we possess the knowledge and skills necessary to *interpret* the data presented to us through these instruments; one must know how to speak the machine’s language, and to *read* the world through it.²⁵

Thinking of VR as a tool to engage hermeneutically with aspects of the world which we cannot naturally perceive is one possible avenue for thinking of it as a way to exceed the anthropocentric perspectives to which it has generally been relegated. We can see traces of this approach at play in several projects by the artist collective Marshmallow Laser Feast (MLF), notably in *In the Eyes of the Animal* (2015), *Treehugger: Wawona* (2016), and *We live in an Ocean of Air* (2018). In each of these projects, the artists use “terrestrial laser scanners” to create what are commonly known as “point clouds.” The density and colour of these clouds can be changed to create more or less detailed pointillist representations of physical spaces. MLF uses these to translate ways of “seeing” or being in the world that are in excess of human understanding. The

25 “Hermeneutic relations,” Evan Selinger explains, “do not amplify or replicate the body’s sensory abilities; instead, they engage our linguistic and interpretative aptitudes. In this context, technologies that facilitate hermeneutic relations are best understood as being ‘text-like’; their effective utilization requires interpretation through the activity of reading.” E. Selinger, *Postphenomenology: A Critical Companion to Ihde* (New York: SUNY Press, 2012): 5. An example that is closer to art and illusion might be anamorphosis. To see the anamorphosis hidden in an image, viewers must know how to position themselves in such a way as to reveal the image. See D.L. Collins, “Anamorphosis and the eccentric observer: inverted perspective and construction of the gaze,” *Leonardo* (1992): 73-82, <https://www.jstor.org/stable/i270958>.

effect lies halfway between scientific imagery and impressionism, as sparse arrays of point clouds leave much to the viewer's imagination. *In the Eyes of the Animal*, for example, puts its viewers in the eyes of four different animals and insects (owl, frog, dragonfly, and mosquito), each with its



Fig. 2a

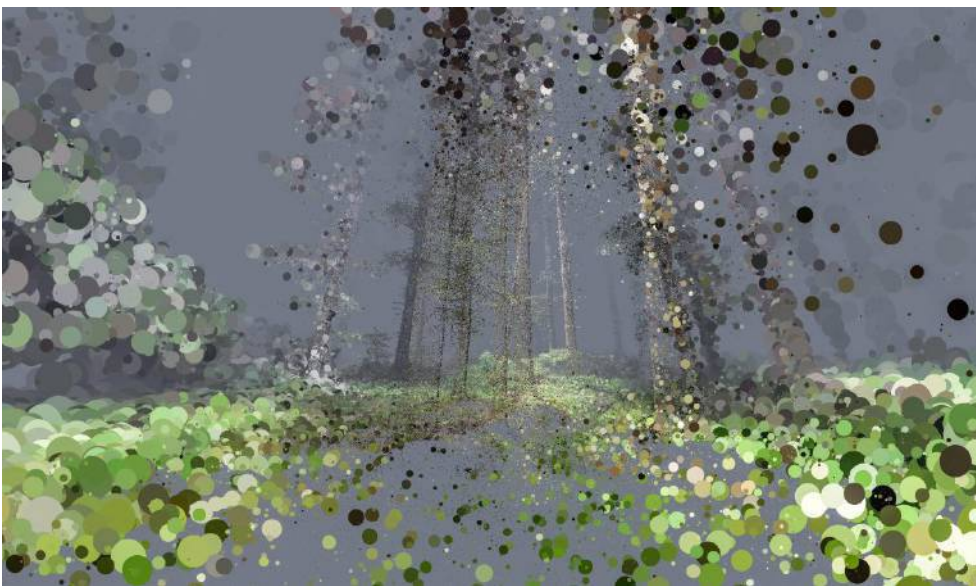


Fig. 2b

Fig. 2a and 2b. Marshmallow Laser Feast, *In the Eyes of the Animal*, 2015

own way of perceiving a forest (Fig. 2a and 2b). Meanwhile, *Treehugger* and *Ocean of Air* each focus on trees and on the scope and time frame of their biological processes. Although all the creatures represented in these projects share the same environments (i.e., the forest), they each have

their own *Umwelt*, which MLF represents through different densities of point clouds and different colour filters.

Some critics may point to the fact that what MLF does in their project may not be called hermeneutical, in that the tools they use do not translate the actual, literal perception of these insects and animals.²⁶ It would also be fair to note that users would not be adequately equipped to interpret the world as perceived through these tools, even if their scientific accuracy was beyond reproach. This would be missing the point. It would be more appropriate to say that what MLF creates are artistic renditions of what the authors imagine the world might look like to different non-human animals. Their projects are best understood, then, as invitations to *imaginatively explore* what the *Umwelt* of a mosquito, dragonfly, frog, owl, or even a tree might be made of.

Recall that for Reinerth and Thon, different media can effectively seek to *simulate* certain aspects of a subjective experience as perceived by a particular individual by appealing to different aesthetic or narrative strategies, as well as the imagination of the user (viewer, reader, player, etc.).²⁷ What we have yet to explore, however, is whether VR is capable of simulating experiences that exceed the boundaries of the human body. And since, as Maurice Merleau-Ponty writes, “I am conscious of the world through the medium of my body,”²⁸ how the body appears and functions in VR has far-reaching implications. So while what MLF (among other artists) creates might *look* different than how we see the world, the question still stands as to if and

26 MLF typically collaborates with scientists in relevant fields to help them translate the data recorded. With that said, Pinotti’s reminder that data represented onscreen for human consumption is not equivalent to the source stimuli still holds true, lessening any claim these artistic experiences might want to make as to their accuracy. See Pinotti, “What is it like to be a hawk?”

27 M.S. Reinerth, J.N. Thon, “Introduction,” in M.S. Reinerth, J.N. Thon, eds., *Subjectivity Across Media: Interdisciplinary and Transmedial Perspectives*: 1-25, 3. Original emphasis.

28 M. Merleau-Ponty, *The Phenomenology of Perception* (New York: Routledge, 2010): 94-95.

how might VR allow users to *act* differently than they can in their own human bodies.

Embodying the non-human

While the illusion of presence is often acknowledged in discussions of VR, the various kinds of embodied illusions the medium offers are just as relevant, readily achievable, and arguably even more fundamental.²⁹ It is not surprising, then, that the body, its representations, and our perception thereof have received much attention from the fields of psychology and neuroscience, especially in recent years. For instance, in their work on the so-called “Proteus effect,” Nick Yee and Jeremy Bailenson have demonstrated how “an individual’s behaviour conforms to their digital self-representation independent of how others perceive them.”³⁰ While most scholarship that invokes this effect focuses on the behavioural aftereffects of inhabiting other kinds of human bodies (e.g., in terms of gender, age, race, ability, etc.), some have explored the effects derived from inhabiting non-human bodies.³¹ These lay the groundwork for the explorations to which this essay aspires, but it is possible to go further still.

A great many studies have been conducted on the topic of the “body ownership illusion,” or the so-called “body transfer illusion.” These illustrate how our body schema is amenable to change when presented with sufficiently

29 I use the term “medium” loosely here, as contemporary VR is more appropriately described as an apparatus which pre-existing media are attempting to adopt. For more on that debate, see my forthcoming “Many births of VR.”

30 N. Yee, J.N. Bailenson, “The Proteus effect: the effect of transformed self-representation on behavior,” *Human Communication Research* 33, no. 3 (2007): 271-290, <https://doi.org/10.1177/0093650208330254>.

31 See S.J. Ahn *et al.*, “Experiencing nature. Embodying animals in immersive virtual environments increases inclusion of nature in self and involvement with nature,” *Journal of Computer-Mediated Communication* 21, no. 6 (2016): 399-419, <https://doi.org/10.1111/jcc4.12173>.

convincing data.³² Importantly, this adaptation also works in cases of illusion, when the brain is tricked into adopting external elements. This process can also be triggered in virtual reality applications. Starting from the now famous rubber hand illusion, studies have detailed different ways in which users can feel ownership of an artificial limb, such that they are deluded into thinking that this foreign object is part of their own body.³³ Others have focussed on body transfer illusions, suggesting that even full-body stand-ins such as mannequins and digital avatars can be absorbed into a user's body schema. VR is a particularly powerful tool for fostering this illusion since, as one notable paper suggests, "in VR, there are near-infinite opportunities for both extending and radically altering our virtual (and hence perceptually real) bodies."³⁴

The notion of "homuncular flexibility" further supports the idea that the mind can adapt to "exotic morphologies, distortions, extensions and reductions" of body

32 See M.R. Lesur *et al.*, "The plasticity of the bodily self: head movements in bodily illusions and their relation to Gallagher's body image and body schema," *Constructivist Foundations* 14, no. 1 (2018): 94-105, <https://doi.org/10.5167/uzh-162795>; S. Seinfeld *et al.*, "User representations in human-computer interaction," *Human-Computer Interaction* 36, no. 5-6 (2021): 400-438, <https://doi.org/10.1080/07370024.2020.1724790>; A. Maselli, M. Slater, "The building blocks of the full body ownership illusion," *Frontiers in Human Neuroscience* 7 (2013): 1-15, <https://doi.org/10.3389/fnhum.2013.00083>; M. Botvinick, J. Cohen, "Rubber hands 'feel' touch that eyes see," *Nature* 391, no. 6669 (1998): 756, <https://doi.org/10.1038/35784>; S. J. Ahn *et al.*, "Experiencing nature. Embodying animals in immersive virtual environments increases inclusion of nature in self and involvement with nature;" N. Yee, J.N. Bailenson, "The difference between being and seeing: the relative contribution of self-perception and priming to behavioral changes via digital self-representation," *Media Psychology* 12, no. 2 (2009): 195-209, <https://doi.org/10.1080/15213260902849943>; H. Farmer, A. Tajadura-Jiménez, M. Tsakiris, "Beyond the colour of my skin: how skin colour affects the sense of body-ownership," *Consciousness and Cognition* 21, no. 3 (2012): 1242-1256, <https://doi.org/10.1016/j.concog.2012.04.011>; H. Farmer, L. Maister, M. Tsakiris, "Change my body, change my mind: the effects of illusory ownership of an outgroup hand on implicit attitudes toward that outgroup," *Frontiers in Psychology* 4, no. 13 (2014), <https://doi.org/10.3389/fpsyg.2013.01016>; H. Farmer, L. Maister, "Putting ourselves in another's skin: using the plasticity of self-perception to enhance empathy and decrease prejudice," *Social Justice Research* 30, no. 4 (2017): 323-354, <https://doi.org/10.1007/s11211-017-0294-1>.

33 M. Botvinick, J. Cohen, "Rubber hands 'feel' touch that eyes see:" 756.

34 W. Steptoe, A. Steed, M. Slater, "Human tails: ownership and control of extended humanoid avatars," *IEEE Transactions on Visualization and Computer Graphics* 19, no. 4 (2013): 583-590, <https://doi.org/10.1109/tvcg.2013.32>. Notably, the authors also suggest that: "Our instinctive ability to rapidly and dexterously incorporate such objects and learn how to use such tools provides a clue to the remarkable plasticity of how the human brain represents the body and encodes space."

configurations.³⁵ It is interesting to note that already between 1989 and 1991, *ad hoc* experiments were being conducted by VR pioneer Jaron Lanier and his team at VPL on an individual's ability to take ownership of "weird avatars that were still usable."³⁶ Avatars with unusual point of view placements (e.g., eyes at hip level), extremely long extremities, and even non-human avatars were experimented with.³⁷ In the latter case, Lanier reminisces about a lobster avatar which was designed by Ann Lasko-Harvill, then Director of Product Design at VPL Research.³⁸ Some of these informal experiments have since been proven by more robust studies. Notably, Andrea Stevenson Won and Jeremy Bailenson teamed up with and Jaron Lanier to test the ability of users to incorporate supernumerary limbs by mapping their controls to "the rotation of a wrist, the flex of an ankle, or some combination of the two."³⁹ This came as a response to the limitation of the human body in regard to the fact that, "[a]s the lobster body includes more limbs than a person, there were not enough parameters measured by the body suit to drive the lobster avatar in a one-to-one map."⁴⁰

An important limitation to the illusion of body ownership or transfer which studies on the topic often

35 Ibid. See also A.S. Won *et al.*, "Homuncular flexibility in virtual reality," *Journal of Computer-Mediated Communication* 20, no. 3 (2015): 241-259, <https://doi.org/10.1111/jcc4.12107>; A.S. Won, J. Bailenson, J. Lanier, "Homuncular flexibility: the human ability to inhabit nonhuman avatars," *Emerging Trends in the Social and Behavioral Sciences: An Interdisciplinary, Searchable, and Linkable Resource* (2015): 1-16.

36 Ibid.: 2.

37 K. Kilteni *et al.*, "Extending body space in immersive virtual reality: a very long arm illusion," *PLoS one* 7, no. 7 (2012): 1-15, <https://doi.org/10.1371/journal.pone.0040867>; S.J. Ahn *et al.*, "Experiencing nature. Embodying animals in immersive virtual environments increases inclusion of nature in self and involvement with nature;" T. Feuchtner, J. Müller, "Extending the body for interaction with reality," *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (2017), <https://doi.org/10.1145/3025453.3025689>.

38 J. Lanier, "Homuncular flexibility," in 2006: *What is your Dangerous Idea? Edge: The World Question Center* (2006), <https://www.edge.org/response-detail/11182>, accessed January 10, 2023.

39 A.S. Won *et al.*, "Homuncular flexibility in virtual reality:" 242. Interestingly, the authors gesture towards our earlier discussion of "what it is like to be []" when, in the very first line of their article, they ask: "What if you could become a bat." Ibid.: 241.

40 A.S. Won, J. Bailenson, J. Lanier, "Homuncular flexibility: the human ability to inhabit nonhuman avatars:" 2-3.

highlight is the required “realism” of the external object. That is, “the need for an object to preserve precise, informative corporeal structural features in order to be integrable as one’s own body part.”⁴¹ In other words, anthropomorphism is often presented as an important—if not essential—factor in the illusion of body ownership. Does this mean the move beyond human perspectives for which I am advocating in this essay is a nonstarter?

Redemption for this idea might yet be found in more recent approaches to the illusion of body ownership which point to a crucial element that is otherwise overlooked in the earlier quoted studies. Namely, in their meta-analysis of “user representations,” Sofía Seinfeld and colleagues have shown that while “[u]nrealistic visual appearance, such as the visual discontinuity of the artificial body, also reduces the feeling of body ownership,” it is also true that “[b]ody ownership illusions are effectively induced through *congruent multisensory stimulation*.”⁴² Earlier studies focussed on illusions generated by visual stimuli supplemented with synchronous tactile feedback (e.g., the rubber hand is stroked at the same time as the physical hand). Meanwhile, active engagement with the illusory body augmentation has been shown to play an important role in the success of this illusion. For instance, Marte Roel Lesur *et al.* suggest that while “the literature shows that not just any fake body or object can elicit illusory ownership,” at the same time, “in the presence of sensorimotor coherence, there are some examples of illusory ownership over implausible virtual bodies.”⁴³ The redeeming quality of contemporary VR technologies in this regard is precisely their ability to afford their users agency, interactivity, and

41 A. Maselli, M. Slater, “The building blocks of the full body ownership illusion:” 12.

42 S. Seinfeld *et al.*, “User representations in human-computer interaction:” 416-417. Emphasis added.

43 M.R. Lesur *et al.*, “The plasticity of the bodily self: head movements in bodily illusions and their relation to Gallagher’s body image and body schema:” 101

multisensory feedback which work in concert to create many of the contingencies that are known to facilitate such body ownership illusions.

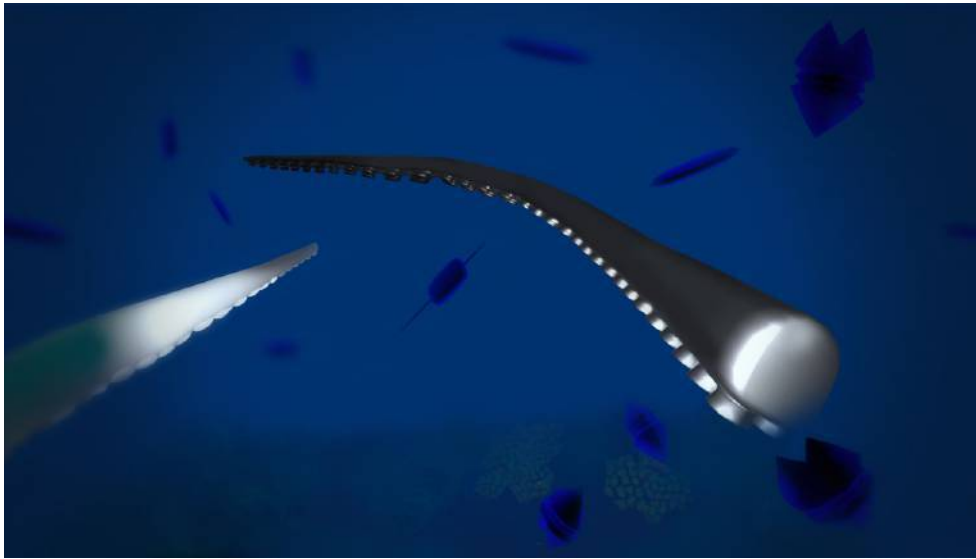


Fig. 3a

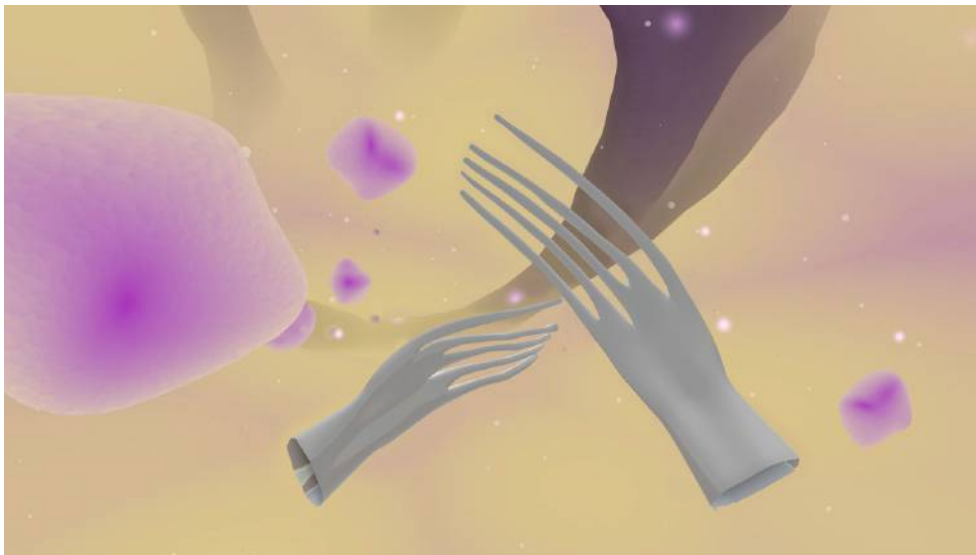


Fig. 3b

Fig. 3a and 3b. Non-human bodies in *Plastisapiens* (Miri Chekhanovich and Édith Jorisch, 2022). Credit: National Film Board of Canada (2022)

True as it might be that most recent VR experiences remain tied to humanoid avatars, some have pushed the boundaries of what counts as realistic body, while others have experimented with bodies that are altogether non-human. One such notable example is the VR experience *Plastisapiens* (Miri Chekhanovich and Édith Jorisch, 2022), a piece of “surrealist ecofiction” which asks viewers to imagine a future where human evolution has been shaped by our exposure to microplastics in the air we

breathe, the water we drink, and the food we ingest; the Anthropocene has here been replaced by what we might call the Plasticene. Throughout its 15–minutes runtime, *Plastisapiens* asks its viewers to adopt a number of new bodies, from a prehistoric betentacled creature to the eponymous human-plastic hybrid, whose hands seem to be made of thin plastic (Fig. 3a and 3b). In both cases, “hands” are the only part of their body users can see, leaving the rest up to their imagination.

Meanwhile, hand tracking is used to manipulate these new alien-looking appendages. The player’s agency is made evident in their ability to move their hands in predictable ways. Here, part of the success for the body ownership illusion is ensured by the synchronous movement of the hand in physical reality and the appearance of the corresponding movement of the alien limb, as seen in the HMD. In my own experience of *Plastisapiens*, I had no issue whatsoever knowing how to manipulate my tentacles to successfully reach the objects in my vicinity, adapting to their limits and affordances within a matter of seconds. Furthermore, the experience employs haptic feedback through the controllers to add a sense of multisensory correspondence between what the eye registers the tentacle having touched, and what the physical (i.e., human) hand feels having touched as well. Agency, interactivity, and multisensory feedback therefore join forces to foster a sense of sensorimotor coherence, thereby facilitating the illusion of body ownership despite the lack of realism of the bodies on offer.⁴⁴

44 See also the oft-cited experience *Birdly* (Somniacs AG, 2015), another good example of agency and synchronous multisensory feedback contributing to successful illusory ownership of non-human animal bodies.

Conclusion

Fascinated as I am by the possibilities opened up by the idea of inhabiting non-human bodies, I cannot help but see the limitations of this kind of *temporary* foray into the world of non-human animals. If VR as it exists today struggles to make us see things from the perspective of another human being, as so many have already demonstrated, can it truly show us what it is like to be an animal, or any other non-human creature for that matter? Further limitations come up when we begin to question VR's efficacy as an illusion. In a recent essay on the myth of total illusion in virtual reality, Janet Murray insists that, more than any medium before:

Interactive environments demand more explicit partnership than just the willing suspension of disbelief; they become real through the "active creation of belief" by inducing and satisfying specific intentional gestures of engagement. As soon as we stop participating, because we are confused or bored or uncomfortably stimulated, the illusion vanishes.⁴⁵

Indeed, Murray is careful to remind us of a fact that is rarely highlighted in studies on illusions in VR, namely that effects such as the body ownership illusion are difficult to achieve and more difficult still to maintain.⁴⁶

On one hand, I want to join Murray in insisting on the important role played by individual users in fostering the kinds of illusions for which I am advocating in this essay. In an earlier paper on empathy in VR, I came to a conclusion that applies just as well to the idea

45 J.H. Murray, "Virtual/reality: how to tell the difference," *Journal of Visual Culture* 19, no. 1 (2020): 11-27 <https://journals.sagepub.com/doi/abs/10.1177/1470412920906253>. Emphasis added. See also J.H. Murray, *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (1997) (Cambridge MA: MIT Press, 2017): 136-139.

46 "The rubber/virtual hand experiment is truly delusional, but it is important to note that it is a fragile and momentary delusion." *Ibid.*: 17.

of imaginatively projecting oneself in the experience of non-human or non-living beings: “users must *know how* and *want to* use this tool.”⁴⁷ The non-anthropocentric effects which I describe in this essay are difficult to achieve for users who do not know how—or much less care—to use VR as a tool to explore spaces and bodies which exceed their natural capabilities. On the other hand, I also want to recognize that the very idea of optical illusion hinges upon the *illusory* nature of the phenomenon. This assumes the automatic and involuntary process by which we can succumb to illusions; optical or otherwise. When the necessary conditions are met, we cannot help but fall victim to illusions. Could VR’s affordances be used to such effect?

I am also keen on suggesting a fruitful avenue might lie in effects that are not quite illusions, but rather something we might call “games of perception,” or even hallucinations.⁴⁸ Further research could be done in this regard to echo Crary’s work on subjective vision as it was utilized in the creation of optical toys in the 18th and 19th centuries. To that effect, we should also consider the scholarship that has been produced on the revelatory potentials of optical technologies used in ways that defy anthropocentric concerns. I am thinking here of Stan Brakhage’s call for a radical exploration of cinema’s visual capabilities, as well as of William Wees’ study of experimental cinema’s ability to “exceed” the limitations of human vision.⁴⁹ In both cases, nonnormative uses of a technology lead to drastic effects, as heretofore dominant modes of representation are swept aside in favour

47 This essay is forthcoming in the *Canadian Journal of Film Studies*.

48 For more on illusions and hallucinations in VR, see C. Paolucci, “Perception, hallucination, virtual reality. From controlled hallucination to *Resident Evil 7: Biohazard*,” *AN-ICON. Studies in Environmental Images*, no. 1 (2022): 112-128, <https://doi.org/10.54103/ai/15443>; P. Montani, “The hallucinatory aspect of virtual reality and the image as a ‘bilderschrift’,” *AN-ICON. Studies in Environmental Images*, no. 1 (2022): 154-172, <https://doi.org/10.54103/ai/15441>.

49 W.C. Wees, *Light Moving in Time: Studies in the Visual Aesthetics of Avant-Garde Film* (Berkeley: University of California Press, 1992).

of more eccentric—or even excessive—ways of engaging with worldly phenomena. And while both examples relate to cinema, there is no reason why VR should not be amenable to such experimental fancies. Where is VR's Brakhage? Its surrealist or Dadaist movement? Its fearless pioneers?

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AN-ICON has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme. Grant agreement No. 834033 AN-ICON.
The project is hosted by the Department of Philosophy "Piero Martinetti" – Department of Excellence at the State University of Milan.