The Two Waves of Virtual Reality in Artistic Practice

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Abstract
As the title of this article suggests there appears to be two distinct waves of artistic engagement with Virtual Reality (VR) in artistic practice, the first during the initial technological development in the 1990s that enabled VR to become accessible to artists such as Char Davies and Toni Dove among others, and the current second wave that has been based on a much greater accessibility of immersive headsets for artists and a wider general public, driven by market forces and technological development (Slater and Sanchez-Vives in Kozel et. al 2018). The term ‘Virtual Reality’ has been interchangeably used to mean virtual environments and virtual worlds but here the aim is to solely examine the use of VR in artistic practices where the intention is for the participant to largely experience virtual space through total immersion, reserving the analysis of the mixed use of VR within mixed reality environments to another study. The article begins with a brief history of the development of VR and an analysis of key works created in what can be termed the first wave, before discussing the current use of VR in contemporary practices through the notion of affect in VR (Kozel, Gibson, and Martelli 2018).

Key Terms: VR, First wave VR, Second wave VR, Affect, Char Davies, Banff Centre, Lumen Prize

Introduction

The medium of immersive space is not merely a conceptual space but, paradoxically, a physical space in the sense of being extended, three dimensional and enveloping. As such it is an entirely new kind of space that is without precedent (Char Davies 1998: 69).

As we, like the proverbial angels keep being blown backwards by rapid winds into the future, how can we be sure where we are going? (Jacquelyn Ford Morie 2007)

Writing in 2016 Brenda Laurel, author of the influential book Computers as Theatre (1991), commented that ‘Virtual Reality is everywhere again – and that’s a problem [...] when the term is appropriated its meaning disintegrates’ (Laurel 2016). Neuroscientists Mel Slater and Maria Sanchez-Vives note that the resurgence of interest in VR in recent years can be attributed, at least in part, to a combination of market forces and technological development (Slater and Sanchez-Vives in Kozel 2018: 3). As the title of this article suggests there appears to be two distinct waves of artistic engagement with VR, the first during the initial technological development that enabled Virtual Reality to become accessible to some artists and the second wave, as Slater and Sanchez-Vives suggest, has been based on a much greater accessibility of immersive headsets for artists and a wider general public. This article will discuss works that are entirely immersive using a HMD or similar device to experience an immersive environment with a view to distinguishing this from other hybrid experiences. As Slater notes ‘VR must be used as a medium in its own right,
with its own conventions, allowing people to realise experiences that can only be done in VR’ (Slater in Kozel 2018: 4). The term virtual reality has been interchangeably used to mean virtual environments and virtual worlds amongst others but here the intention is to solely examine the use of VR in artistic practices (where the intention is for the participant to largely experience virtual space through total immersion), reserving the analysis of the mixed use of VR within mixed reality environments to another study.

**Brief history of the development of VR**

There are various claims for the first use of the term ‘virtual reality’ but it was Jaron Lanier who is attributed to have first coined the term in the 1980s to distinguish between being wholly immersed in a virtual environment rather than simply looking at a virtual environment (Dixon 2006: 26-27). However, Steve Dixon suggests that it was in fact the theatre theorist Antonin Artaud that first coined the term ‘virtual reality’ in 1938 describing how theatre’s own reality develops in a dreamlike and alchemical way (Artaud in Dixon 2006: 24). While the term ‘virtual reality’, is considered to be an oxymoron by philosopher Elizabeth Grosz (2001: 80), Ken Pimental & Kevin Teixeira assert that ‘virtual reality is all about illusion. It’s about computer graphics in the theatre of the mind. It’s about the use of technology to convince yourself you’re in another reality’ (Pimental & Teixeira in Dixon 2006: 26). Oliver Grau likens virtual reality to earlier panoramas or what he terms ‘the specific media of an epoch’ (Grau 2003: 5) and explains that:

> The idea of installing an observer in a hermetically closed-off image space of illusion did not make its first appearance with the technical invention of computer-aided virtual realities. On the contrary […] the idea goes back at least as far as the classical world, and it now reappears in the immersion strategies of present-day virtual art (Grau 2003: 4-5).

Writing of the ontology of virtual reality in the early 1990s, Howard Rheingold defined it using three interrelated aspects: ‘one is immersion, being surrounded by a 3D world; another is the ability to walk around in that world, choose your own point of view; and the third axis is manipulation, being able to reach in and manipulate the 3D world’ (Rheingold 1991: 34). What Rheingold terms ‘the third axis’ will be discussed later in this section as it is a key feature of the attempts of the first wave of VR development to bring about a sense of embodiment in virtual space. One of the features of this is the development of the data glove, which allows one to see a visual representation of ourselves in the virtual space through a virtual hand controlled by the data glove that affords interactions within the immersive space.

According to Morie, in tracing the roots of the development of virtual reality, it was Ivan Sutherland, a young doctoral student at MIT who, in 1963, invented the forerunner of all interactive computer systems, the Sketchpad (Morie 2007: 15). The user could draw lines, circles and other geometric shapes that could also be manipulated. Computers of the time generally outputted data onto paper. However in Sketchpad this was the first time a computer had a visual output device, which was a radical departure for the time. Two years later in his article The Ultimate Display

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1 Sketchpad utilized an uncommon visual display that had heretofore been used primarily for air traffic radar consoles. Putting this display on a computer was a radical departure for the time.
Sutherland defined the concept of a computer mediated virtual worlds, ‘if the task of the [computer] display is to serve as a looking glass into [a] wonderland constructed in computer memory, it should serve as many senses as possible’ (Sutherland in Morie 2007: 16). In his work for DARPA\(^2\) he created the first Head Mounted Display, or HMD, as it became known.

Morie notes that the DARPA scientists were not alone in their visions of simulated worlds. Artists, scientists, writers, and what she terms ‘entertainment visionaries’ were also engaged in similar pursuits and ‘out of their imaginations came conceptually different ideas about creating the world as a simulation’ (Morie 2007: 16). Out of the field of literature came William Gibson’s novels *Burning Chrome* (1982) and *Neuromancer* coining the term ‘cyberspace’ and from the field of film American cinematographer and inventor, Morton Heilig built a multi-sensory entertainment system called the *Sensorama* in the early 1960s, and it is considered to be one of the first attempts at creating an immersive, multi-sensory experience using technology. One of the five 3D films Heilig made for the *Sensorama* enabled the participant to feel like they were driving through the streets of New York City, with the wind in their hair and strategically released smells in line with the shops they were passing (Morie 2007: 6-7).

Artist and scientist Myron Krueger created *Videoplace* that was a pioneering creation of full-body interactivity and virtual environments containing 25 different environments in which people could engage. Developed in the mid-1970s through to the late 1980s *Videoplace* was a form of virtual reality-simulator, which was made up of projectors, cameras, and a screen. Participants in one lab interacted with shadows of a participant in another lab using coloured shadows super-imposed on each other. Even though there was no direct tactile response from the other shadow, participants would pull away from it to avoid overlapping. This response suggests a feeling of virtual space, an environment with a different body altogether. He coined the term ‘Artificial Reality’ to describe what he was striving to create. According to Morie it was Jaron Lanier who started the first company in the early 1980s to commercialise personalised versions of virtual reality technology (Morie 2007: 18). The “Reality Built for Two” system used full body data suits to capture the users’ movements that were transferred to the graphical model of the human represented in the virtual space (Morie 2007: 18). In the late 1980s Lanier developed the *EyePhone* system utilising a data glove that will be discussed later in the article. Finally, the invention of the CAVE (Cave Automatic Virtual Environment) by Carolina Cruz-Neira and her colleagues at the University of Illinois (USA) in 1992 consists of an immersive virtual projected environment where the participant stands in the centre wearing stereoscopic glasses surrounded by between 3 to 6 walls where virtual imagery is rear projected (Morie 2007: 18). So, it was both new concepts that emerged and at the same time the coming together of a number of new technologies enabled VR to be created and experienced in this way through this first wave of VR.

**First wave of artists engaged in Virtual Reality**

The earliest account of an artist gaining access to virtual reality was, according to Morie (2007: 23), the French artist Nicole Stenger by way of the Human Interface Technology Lab (HITLab) at the University of Washington in 1989. The result was

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\(^2\) The US department of Defense’s Advanced Research Project Agency is based in Arlington, Virginia.
the first ‘virtual reality movie’ entitled *Angels* (1992) and was shown at the Biennale des Arts Electroniques in 1993 in Paris (Popper in Morie 2007: 23). However, it was also in the early 1990s that a series of projects were undertaken at the Banff Centre, Canada, and subsequently documented in *Immersed in Technology: Art and Virtual Environments* (Moser 1996). In the preface to the book, Douglas Macleod, the Project Director, likens this ‘moment of virtual reality’ to a similar moment in time when Vertov’s *Man with the Movie Camera* was released in 1929, cataloguing the potential of the film medium (Macleod in Moser 1996: ix). Morie notes that the importance of the Canadian government’s support for this ‘fledgling medium cannot be overstated’ (Morie 2001: 23). A total of nine artworks were developed through the overarching *Art and Virtual Environments Project* at Banff between 1991 and 1994. Of particular note were three works: Brenda Laurel and Rachel Strickland’s *Placeholder* (1993), *The Archaeology of the Mother Tongue* (1993) by Toni Dove and Michael Mackenzie, and the virtual reality performance, *Dancing with the Virtual Dervish: Virtual Bodies* (1994), by Diane Gromala and Yacov Sharir; each will be discussed further below. These projects were particularly innovative in their exploration of virtual reality environments in an art context.

*Placeholder* (1993), explains Laurel, ‘explored a new paradigm for narrative action in virtual environments’ (Laurel, Strickland and Tow 1994: 118). The project took inspiration from three actual locations near to the Banff National Park: a cave, a waterfall and a river valley, and the subsequent VR system was intended for two players wearing HMDs who were networked together in the virtual space. They could each physically move within a 10 feet circular stage whilst wearing display helmets and body sensors. Each experient\(^3\) could take on the persona of a spirit animal: a snake, a spider, a raven, or a fish. Strickland notes that this was in part inspired by the German word *Umwelt*, a term used by naturalist Jakob van Uexkull to mean the unique point of view any creature has depending upon their particular sensory or cognitive apparatus. The strategy of enabling the experient to take on the persona of an animal as a form of ‘smart costume’ in the space, was further inspired by the traditions and spiritual practices through ancient stories and myths (Laurel, Strickland and Tow 1994: 118). Laurel explains that:

> The experience of VR hinges on human action and the environment’s response. This is true in both perceptual and emotional terms. In VR, one is not *done unto*, but *doing* […] One comes to know a place with all one’s senses and by virtue of the actions that one performs there, from an embodied and situated point of view (Laurel, Strickland and Tow 1994: 118).

A further strategy to give a sense of place was the inclusion of ‘Voicemarks’, a device where people could mark the virtual environment with their vocal presence. (Laurel, Strickland and Tow 1994: 122). Of note is Laurel’s reflection at that time of how a key aspect of creating for VR was determined by embodied experience:

> Working on this piece has demonstrated to me that the art of designing in VR is really the art of creating spaces with qualities that call forth active imagination. The VR artist does not bathe the participant in content; she invites the

\(^3\)Jacquelyn Ford Morie coined this term in her PhD thesis (see under lexicon, 2007). Morie considered a VR session is an experience and therefore the term experient seemed logical.
participant to produce content by constructed meanings, to experience the pleasure of embodied imagination (Laurel, Strickland and Tow 1994: 123).

In *Archaeology of the Mother Tongue* (1993), a work by Toni Dove and Michael McKenzie, described by Dove as a ‘virtual reality murder mystery’, the participants see the virtual world through a camera. The mystery is focused around the murder of a child and features a coroner and a pathologist. It takes 40 minutes to experience the whole narrative through three environments that takes the experient through a dream, a ribcage, and a geometric structure of a hand and skull, both of which are full of memories. Dixon notes that the project is exquisitely designed and contains ‘breathtakingly beautiful digital imagery’ (Dixon 2006: 26). The authoring tools for virtual reality were at such an early stage of development in the early 1990s that Dove explains that ‘we had to build the piano in order to write the symphony’ (Dove in Moser 1996: 277). The participants wore a data glove and saw ‘a disembodied virtual representation of their own hand that allowed both navigation and interaction with objects’ (Morie 2007: 25).

*Dancing with the Virtual Dervish: Virtual Bodies* (1994), by artist Diane Gromala and choreographer Yacov Sharir, resulted in ‘several dance performances where the dancer and the audience members performed and interacted with a virtual environment in real-time’ (Gromala and Sharir 1995: 49). The focus of the project, developed during a two years residency at the Banff Centre, was to explore ‘concepts and experiences of the body on many levels. Visually, sonically, and behaviourally, it was created to provoke reminiscences of the body, of skin, of materiality, growth and decay’ (Gromala and Sharir 1995: 50). Gromala describes the structure of the performances and programming as ‘a constellation of if-then scenarios’ (Gromala and Sharir 1995: 50). Of the use of the body they describe:

> These organs can be ‘entered’ to reveal otherworldly chambers. The virtual body thus becomes an immersive, non-linear book, a text to be read, an architecture to be inhabited (Gromala and Sharir in Dixon 2006: 36).

Artists such as Char Davies moved from painting to exploring virtual space in virtual environments and virtual reality in the early 1990s, resulting in the works *Osmose* (1995) and *Ephémère* (1998), describing them in 2006 as the ‘most talked about experience in the short history of VR art’ (Dixon 2006: 31). According to Dixon the revolutionary aspect of *Osmose* was the use of body sensors in tandem with the use of an HMD creating an, ‘advanced sense of fully embodied immersion’ (Dixon 2006: 31). The interface ‘reads’ the body from the waist up and in addition monitored the user’s breathing. The single user, or ‘immersant’, must concentrate on their breath as a device to navigate vertically through the spaces represented. Standing in a small private chamber that faces the audience’s space, the immersant journeys through forests, clearings, sky and earth. The audience can see two screens, one presenting the live VR point-of-view of the immersant, the other reveals the shadow of the immersant. This becomes a theme later in the second wave of VR, observing the participant (see Tree VR (2017) and Nothing Happens VR (2017) later in the article. Many immersants explain their experience in similar terms to that of Mark Hansen:
You are floating inside an abstract lattice [...] you have no visible body at all in front of you, but hear a soundscape of human voices swirling around you as you navigate forward and backward by leaning your body accordingly [...] Exhaling deeply causes you to sink down through the soil as you follow a stream of tiny lights illuminating the roots of the oak tree (Hansen 2006: 107-108).

Mark Jones expresses it in another way, ‘I look all around me and the grid extends to infinity in all directions. I inhale and gradually begin to rise; if I lean forward I move forward. Lean back and I move backwards. I’m flying. I am an enigma, I have no physical form, yet I am whole. I am an ‘immersant’ (Jones in Dixon 2006: 32). Davies notes that the reliance on breath as a mechanism to navigate through the space ‘depends on the body’s most essential living act [...] - not only to navigate, but more importantly – to attain a particular state-of-being within the virtual world’ (Davies in Thwaites 2003: 150)⁴.

In Landscape, Earth, Body, Being, Space, and Time in the Immersive Virtual Environments Osmose and Ephémère (2003), Davies (2003: 1) says that ‘within this spatiality, there is no split between the observer and the observed’. She argues that this is not tied to a Cartesian paradigm, but rather allows ‘another way of sensing to come forward, one in which the body feels the space very much like that of a body immersed in the sea’ (Davies 2003: 1). In this private virtual space, by: ‘leaving the space of one’s usual sensibilities, one enters into communication with a space that is psychically innovating [...] for we do not change place, we change our nature’ (Bachelard [original 1966] in Davies 1997: 3). Davies notes that:

I think of immersive visual space as a spatio-temporal area, wherein mental models or abstract constructs of the world can be given virtual embodiment in three dimensions and then kinaesthetically, synaesthetically explored through full-body immersion and interaction. No other space allows this, no other medium of human expression (Davies 1998: 69).

Dixon notes that Placeholder, Osmose, and Dancing with the Virtual Dervish: Virtual Bodies all share an anti-Cartesian concern and each want to ‘excite an “embodied” experience (Dixon 2006: 36). Further, Morie notes that it is sometimes the technology that adds something to the experience that may not have been intended by the artists⁵ and in particular in Osmose, ‘the text of the code, green on black, becomes one of the ethereal visions floating past the immersant’s space as if she were seeing through the machine’s eyes’ (Morie 2007: 84). Other notable uses of VR in the first wave is Desert Rain (1999) a collaboration between Blast Theory and the Computer Research Group at Nottingham University, UK, combining video gaming with a performance installation with each participate undertaking a mission in a virtual world; Agnes Hegedus’s Memory Theater VR ⁶ (1997) and Monika Fleischmann and Wolfgang Strauss’s Home of the Brain (1992) featuring ‘houses of philosophers represented as buildings of thought [exploring] their opposing positions

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⁴ This was inspired by Davies’s love of SCUBA diving.
⁵ This is similar to the ‘serendipity’ that happens when working with new technological forms, as described by the curator of the acclaimed exhibition Cybernetic Serendipity Jasia Reichardt in 1968.
⁶ I include this work given the title and aspiration of the piece, although the project does not use an HMD and does not give a fully realized CAVE experience.
on digital culture’ (Fleischmann & Strauss 2019: 111). In her thesis Morie extensively surveyed what she termed ‘artistic virtual environments’ clarifying that this meant by her own definition works that used ‘an HMD at best, and a CAVE at least’ (Morie 2007: 355), documenting over 90 artworks that were created between 1991 and 2006.

**Extending the Senses: Touch and Smell and the sense of ‘being there’**

A particular challenge, and interest of many of the artists in the first wave of VR, was how to further develop a sense of ‘being there’ in the works that they made. Extending the senses of the person beyond the visual and aural was primarily explored through haptic gadgets and also in some experiments in ‘virtual smell’. The EyePhone system used special goggles and a data glove that allowed them to see and move objects around in a computer created environment developed by VPL Research, Jaron Lanier’s company in the late 1980s. However, according to Dixon the performative possibilities of VR took a quantum leap when Lanier developed the full body version of the data glove, the data suit (Dixon 2006: 27).

The use of ‘virtual smell’ had already been utilised in Heilig’s *Sensorama*, and this concept was taken up and explored again in the 1990s and into the early 2000s by Jacquelyn Ford Morie amongst others. The scientist James Knox Millen’s study on the sense of smell claims that ‘only the olfactory nerves are directly connected to the more primitive and earlier centres of the brain […] the original brain is a smelling-organ’ (Millen in Morie 2007: 71). Morie notes that ‘this makes smell capable of generating strong affective emotions’ (Morie 2007: 72). In fact, a pioneer in VR during the first wave, artist and scientist Morie developed a scent collar to facilitate the use of smells within virtual environments. Writing in 2007 Morie explains that in her scent collar there were four chambers, each holding a unique scent:

In the prototype, chambers are triggered individually to release a specific smell when the wearer enters a specifically marked location in the virtual terrain. Because of the proximity of the collar to the wearer’s nose, only miniscule amounts of scent are required (Morie 2007: 32).

Further techniques to add to the sense of being there was a vibrating floor developed for the virtual artwork *DarkCon* (2001) by Morie. Whilst artworks did continue to be developed for VR between the two waves of VR the second wave can be considered to have begun in 2014 and into 2015 when the availability of Oculus Rift and later HTC Vive became available to buy ‘off the shelf’ at a relatively low cost, and therefore much easier to experiment with by artists engaged in new technologies.

**Second Wave of VR**

The conceptual foundations of interacting with immersive virtual reality environments were already being laid at the end of the previous century through the work of artists engaged during the first wave of artistic practices in VR. More than twenty years on with a whole new generation of accessible technologies such as the VR Oculus Rift, HTC Vive, and other technologies that enable augmented or mixed reality experiences such as wearables and see-through headsets (HoloLens) there is a

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7 One of the issues of using smells in VR was the difficulty in clearing the smells from the physical space of the participant, so the creation of a collar using very small amounts of smell went some way to overcome this.
need to develop the cultural, social, and phenomenal understanding of these new spaces and accessible worlds. However, with a focus on artistic practices the article section begins with a painting by the performance artist Joseph DeLappe from his series of paintings entitles ‘Virtual Paintings 2’ (see Fig. 1.). In 1996 DeLappe created a series of oil paintings portraying people engaged in virtual reality technologies during the first wave, and in his new series, begun in 2018, he has developed a series of watercolour paintings in response to the second wave. DeLappe notes that he ‘remains fascinated by our eager embrace and adaptation to current interface technologies – VR remains awkward, expensive and ungainly to use’ (DeLappe 2018-ongoing). However, reflecting on the observation of another person experiencing VR goes further than this embrace. When we observe an experient (as so many VR artworks encourage us to do) we are observing a disjoint between two experiential realities. Kozel calls it the ‘weird giggle’ and suggests that it:

[…] Reflects the movement of the shimmer, the strange ripple of reality that is pre-reflectively sensed and escapes from the body in a shudder or a jolt. Disorientation and delight converge, together they reflect the appeal and the controversy of VR. For some a longing to return to VR, for some a longing to return to the outside world (Kozel, Gibson, and Martelli 2018: 20).

Figure 1. “Two On Bed, FoST8, NYC”, Copyright Joseph DeLappe, Watercolour on paper 8x8”, 2018, Courtesy of the Artist

Early adopters of the second wave
The artist, composer, and singer Bjork has always been at the forefront of experimenting with new technologies since her first experiments with music videos in the 1990s. Some notable examples are her first video as a solo artist Human Behaviour (1993) with director Michal Gondry and All is Full of Love (1997) directed by Chris Cunningham. However, in 2016 she embarked on her most ambitious engagement and exploration of new virtual technologies in her Bjork Digital Immersive Virtual reality exhibition that toured globally from 2016, opening in Australia as part of the Vivid Sydney Festival, and travelling to a number of cities around the world including Tokyo, London and Mexico City. In London the exhibition was housed at Somerset House in September and October 2016. The exhibition included her first experimentation with virtual reality technologies in 2014 entitled Stonemilker VR, using her first song from her 2015 album Vulnicura and further included an immersive film room showing Black Lake (2015) and a number of immersive virtual reality experiences including NotGet (2016). Of all the works seen in the exhibition, which was a real mix of experimenting with virtual reality technologies (some more successful than others), it was the music video NotGet that has stayed in my memory. As you stand up with your HTC Vive VR headset on you encounter a small digital being while listening to the NotGet music - perhaps half

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8 Future of Storytelling Summit (FoST) is an invitation only Festival held in New York City, USA.
9 This music video won two MTV Video Music awards and is held at the Museum of Modern Art (MoMA) permanent exhibition in New York.
10 Initially billed as an 18 month touring exhibition, at the time of writing, the tour is due to continue following the end of the COVID pandemic.
your own size – made of nothing but light (this is of course the avatar of Bjork). Over the course of the next seven minutes of the music playing this digital being morph’s continually and almost imperceptibly grows until, by the end, it is towering over you. Its presence has never left me: this encounter with a morphing and slowly growing avatar of light was an extraordinary experience with an intensely altered sense of reality, intensified by the sense of immersion and immediacy possible in VR. Bjork writes of her use of VR that it is ‘not only a continuity to the music video but has an even more theatrical potential, ideal for this emotional journey’ (Bjork 2017a). Reflecting upon its application in NotGet and its use in Bjork Digital she notes that it is ‘ideal for the private circus [that] virtual reality is: a theatre able to capture the emotional landscape of it’ (Bjork 2017b).

In 2017, I was keen to develop an understanding of emerging developments in the second wave of VR, and in my role as Principal Editor of the Journal of Virtual Creativity, and with my colleague Lynne Heller the Reviews Editor, we embarked on a survey of the current use of VR in contemporary artistic practices through work presented at ISEA2017, in Manizales, Columbia, with the aim of editing a special issue of the journal outlining the current state of the art. In 2017 there were scant signs of VR engagement in the work presented there. One of the keynote speakers Lance Putnam presented a discussion on space curves and audiovisual composition that was used in his virtual reality work Mutator VR with collaborators William Latham and Stephen Todd, and other work included choreographer Johannes Birringer’s metakimosphere series of theatre/dance/VR installations and further presented in his article ‘Immersive Dance and Virtual Realities’ (2017). In fact, it was in the Lumen Prize projects that the use of VR was being particularly celebrated.

The Lumen Prize for VR
In 2012 the Lumen Prize\textsuperscript{12} was set up as a global competition to celebrate the best art projects created with new technologies initially awarding 1\textsuperscript{st}, 2\textsuperscript{nd} and 3\textsuperscript{rd} prizes. In the following years a number of prizes were created with the Gold Award in 2014 and 2015 saw the first VR/AR award given to Micahel Takeo Magruder for A New Jerusalem (2014), an immersive virtual reality installation that sought to embody the spirit of the new Jerusalem described in the Book of Revelation in the New Testament of the Bible. In 2016 VR/AR award celebrated the project Nature Abstraction cited as ‘an immersive sensory experience that explores the arcane forms of fractals, mathematical visual representation of natural and biological forms’ (Lumen Prize 2016) by Matteo Zamagni, Ben Hur and David Li. This award remained until 2017 and then further differentiated awards were created in XR and further differentiating works in a new category 3D/Interactive from 2018 onwards. In the last year of the VR/AR award in 2017 Michelle and Uri Kranot were recognised for their cinematic virtual reality experience and art installation, Nothing Happens, which was also short listed for the Venice Film Festival’s first ever VR category, explores the role of the spectator as Nothing Happens invites you to participate in an event. In this animated VR short a group of people gather on the outskirts of a town on a cold, wintery day. The artists explain:

\textsuperscript{12}The Lumen Art Projects was founded by Carla Rapoport in 2012 in order to widen the enjoyment, understanding, and appreciation of art created with technology.
VR allows us to choose our perspective, allows us to become absorbed in the unique atmosphere and participate. The project explores a different kind of narrative, a new way of being in a painting, a work of art that is truly comprehensive and immersive. *Nothing Happens* offers a new way of looking (The Lumen Prize 2017).

Figure 2. “Nothing Happens” VR installation at Annecy Festival, France, Copyright Michelle and Uri Kranot, 2017. Courtesy of the Artists.

In 2018 the XR award went to the New Reality Company, based in the United States for their location-based virtual reality experience *Tree*. The artist’s aim was to personalise the effects of global climate change by transforming the participant into a rainforest tree, with arms as branches and the participant’s body as the trunk to experience deforestation first hand:

Unlike passively watching a nature documentary, we wanted to use the full capacity of immersive VR to promote empathy and engage a full emotional experience of becoming the tree [...] To fully immerse you into the experience, it is enhanced with sensory elements such as a scent track13, wind, heat and haptic vibrations to simulate growth’ (Kranot & Kranot in Lumen Prize 2018).

The artists utilised custom scents, heat elements, air movers and bass transducers that are activated at key points in the experience in order to engage both the body and mind into the tree’s narrative. This work holds a number of resonances with Davies’s earlier work *Osmose* (1995) discussed earlier in the article, and the early experiments by Morie into extending the senses into the immersive virtual space.

Two other projects during this period that used VR and were both awarded the Lumen Prize Gold Award in 2015 and in 2016 respectively were *MAN A VR* (2015) by Gibson & Martelli and Fabio Giampietro & Alessio De Vecchi’s *Hyperplanes of Simultaneity*. *MAN A VR* was originally made for the Google Cardboard and was then converted into a VR piece, exploring the figure and ground relationships of a set of dancers in space. Inspired by block universe theory14 Giampietro & Vecchi explore the concept of space-time as an unchanging four-dimensional ‘block’ through a series of three paintings and the use of 3D technology. The final two years of the XR award went to Kristina Buozyte & Vitalijus Zukas for *Trail of Angels* in 2019 and Elyne Legarnissson for *(Un)Balance* in 2020. From 2021 the XR award has become the Immersive Environment awards15.

As discussed above some of the VR pieces attempt to enhance the ‘immersive’ or ‘embodied’ experience through a further stimulation of one or more of the senses. The project *Aerobanquets RMX*, winner of the People’s Choice Award in 2018, is a series of immersive, augmented sensorial experiences focused on taste and

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13 They had a small scent device with 2-3 scents that had to be hand triggered. The final scent – when the trees are burning – was accomplished by a person striking a match near the participant in the HMD

14 According to block universe theory the universe is a block of all things that ever happen at any time and at any place. Therefore past, present, and future all exist at the same time and are equally real.

15 To further enhance the diversity of the awards the Nordic award began in 2020 alongside the Global South award.
perception and are loosely based on the Futurist Cookbook, the (in)famous Italian book of surreal dinners and recipes first published in 1932.

Part-manifesto, part-artistic joke, the Futurist Cookbook is a collection of recipes, experiments, declamations and allegorical tales: here are recipes for ice cream on the moon; candied atmospheric electricities; nocturnal love feasts; sculpted meats [...] The Aerobanquets RMX are multi-sensorial journeys encompassing all of the senses: sight, smell, hearing, taste, and touch (Lumen Prize 2020).

This complex piece uses a range of technologies including 3D modelling, CGI, Augmented reality, VR and motion tracking. Thirteen dishes were created in collaboration with chef Flavio Ghignoni Carestia inspired by the Futurist Cookbook such as ‘Dashi Broth Gelatine with Flourescin’, with a corresponding set of 3D models. These models were used as a virtual counterpart to the food. With some additional components such as virtual utensils the result is a shared virtual, interactive space for the participants with real time hand tracking and natural gesture haptics. The artists were able to assess relative positions between hands and utensils, and the utensils and the mouth of the participant and they explain that ‘we were able to track when the participant would savour the food, and design in a responsive, immersive system focused around the perception of taste’ (Casalegno in Well 2020). Another recent project that incorporates the use of taste (although not incorporating VR) include the Journey of the Tongue, by three Japanese artists Ayako Suwa, Evala, and Yasuaki Kakehi, which was nominated for the STARTS Prize 2019\(^\text{16}\). This multi-sensory sound journey explores the multiple sensations of sound, touch, and flavour.

**The Inter/HER Project**

A VR project that was shortlisted for the 3D/Interactive Lumen Prize category in 2021 is artist Camille Baker’s *Inter/HER: Immersive Journey Inside The Female Body* (2019-21). Baker explains that:

> The Inter/HER project comes directly from my own experience in fighting – and winning – against ovarian cancer throughout 2016 and 2017. This intense battle gave me the imperative to make something personal through my art practice; to give something back to other women, based upon my own experiences and journey through the healthcare system (Baker 2020).

In addition to her own experience Baker interviewed a number of women about their own experiences of fighting diseases of the female reproductive system and the response of the health care system to them. This physical and immersive installation gives the participant a sensory and emotional experience within a real dome space into VR space, ‘with a 3D audio soundscape of the voices and stories of real women recounting their experiences, making it an intimate, emotional and possibly haunting experience’ (Baker 2021). In addition the artwork employs the use of a wearable haptic corset that the participant wears when seated inside of the dome that enables ‘a visceral vibration responsive experience on the lower abdomen, where the various

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\(^{16}\) The STARTS Prize is a funded by the European Commission as part of the Horizon 2020 scheme and celebrates projects that work across the fields of Arts, Science, and Technology; each year two prizes are awarded alongside 10 honorary mentions given.
diseases occur’ (Baker 2021). Baker explains that through this transference of physical sensation the participant can ‘share in an experience of the body that may resonate with theirs, or with the experiences of women they know’ (Baker 2021).

Figure 3. Visitor testing of INTER/her installation, May 31st, 2021, photo © Camille Baker

The dome (see Fig. 4) can host up to three people on this immersive journey. Inside the dome each participant sits on a beanbag and can navigate the VR space using a hand held controller (see Fig. 3). The internal experience of the body and the use of haptic techniques echo the space created by earlier VR works with some audience responses suggesting the empathic and affective nature of the work, and Davies’s own reflection on the role of the body in immersive virtual space:

I believe that it is only through the body, through body-centred interfaces (rather than devices manipulated at arm’s length) that we can truly access this space and explore its potential. Such emphasis on the body’s essential role in immersive virtual space may be inherently female (Davies 1998: 65-74)

Figure 4. INTER/her installation exhibiting at The Brewery Tap Project Space, Folkestone, UK June 23rd- July 4th, 2021, photo © Camille Baker

Conclusion
Writing in 2018 Kozel, Gibson, and Martelli note that:

Current work in VR takes the embodiment of affect further than the earlier generation of VR, the wave from the 1990s that caught the imaginations of so many. The cyberpunk influenced rhetoric of that time celebrated leaving the meat of the body behind and escaping into the fluidity of seamless 3D digital cyberspace (Kozel, Gibson & Martelli 2018: 3).

The development of empathy and affect appear to have been present in the first wave of VR in some of the artworks (Davies's Osmose in particular) but further developed, and more of a point of focus, through an enhanced VR language in the second wave examples already discussed such as Nothing Happens VR (2017) Tree (2017), and here in Inter/HER (2020). The experience of immersive virtual environments, or virtual reality offers a very specific set of potential and powerful experiences for participants, even as far as one immersant in Osmose feeling like they had actually experienced a form of death through the experience (Davies 1998). The brief history of the development of VR enables us to understand that the inspiration to become totally immersed in another space using new technologies has been a human endeavour for many decades, and the curiosity of both artists and scientists that created and further developed the medium of VR to its current state of the art in the second decade of the twenty-first century. The work that was produced in the first wave undoubtedly laid the foundations for the refinement of the VR language that is currently being developed in the second wave today.
In the first wave, it is the firsthand accounts that become so useful in understanding the challenges and the successes of the visionary work done at that time (Laurel, Strickland and Tow (1995), Davies (1997, 1998), Gromala and Sharir (1995) and many others). The second wave through the increased access to immersive HMD headsets, have given new audiences this ‘weird giggle’ experience articulated by Kozel, Gibson and Martelli (2018). Though some criticism remains of the use of VR as the latest gimmick, in fact, it gives artists a powerful (though at times awkward) tool to enable a new generation of empathy and affect for the participant in a way that may not still be possible through other new technologies. However, there is no doubt that VR has its own limitations due to its reliance on the immersive interface that is necessarily all encompassing. Written in between the two waves the quote at the start of the article by Morie points towards a glimpse of where new technologies are taking us, and then thrusting us backwards again, limited by the state of the new technology itself. It is unclear as to when the second wave will end (perhaps it already has) but there is most likely to be further waves of VR or the future equivalent of immersive experience where the language of VR will develop further.

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