PROSPECTUS

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Master of Fine Arts Degree in Documentary Production and Studies
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Title: Visceral Data

Genre: Educational expository documentary

Duration: 30 minutes

Mediums: 5K, linear, interactive, stereoscopic, digital 360 cinema, and conventional two-dimensional format

Target Audience: Scientists, science educators, science enthusiasts, artists and composers working in digital mediums

Abstract

Visceral Data is a short documentary formatted for virtual reality (VR) that will explore the intersection of art and science, and how aesthetically creative treatments of raw data are an engaging way to interpret complex information. This documentary will place current innovations in data visualization into a historical context, so that parallels can be drawn providing insight into potential directions and outcomes for developing digital arts, sciences, and technologies. Supported by interviews with scientists and artists, the film will emphasize how interpreting data imaginatively can lead to a more scientifically literate population by reaching people on an intuitive level and appealing to our visual and aural senses rather than intellect alone.

I. Preproduction Research

Introduction

From prehistoric cave paintings and sculptures of mythological creatures imbued with symbolism to postmodern inter- and multimedia works, art has conveyed meaning to human senses, speaking directly to our instinctual perception so we may recognize

and interpret the world around us. Similarly, science provides a means to which we might discover truths about the laws of nature that exceed our subjective interpretation. Scientific methods of measurement produce raw data. Through varied processes of illustration, qualitive and quantitative data can be categorized, abstracted, and translated into representations that inform our intellectual and sensual perceptions, opening new terrain for epistemological conception.[1] Data can be treated in ways that yield visual and/or aural products that can be experienced and analyzed, a process commonly referred to as 'data visualization,' 'sonification,' and 'audification.' Because we interpret meaning through our senses, the manner in which data is displayed can affect impact and comprehension, and the aesthetic skills of artists can help translate data in ways that not only inform but intrigue us as well. For example, data visualization can be as simple as a graph, chart, map, table or diagram or as elaborate as the AlloSphere (discussed more in a moment).

Data can be experienced solely as audio. For instance, the Sonification for Solar Harmonics Project (SoSH) is an open-source tool that enables one to hear the Sun. Our Sun is reverberating with acoustical energy which manifests in waves that sweep across its surface. Dopplergrams (data) are a series of images that measure the velocity of these waves. With the applied mathematics of spherical harmonics, it is possible to infer the internal dynamics of the Sun, and the SoSH tool allows us to hear what these sound like.[2]

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[1] Helen Kennedy and Martin Engebretsen, *Data Visualization in Society* (Amsterdam, NL: Amsterdam University Press, 2020), 20-21.

[2] Tim Larson, "*SoSH Project: Sonification of Solar Harmonics*," last modified June 1st, 2019, accessed October 1st, 2020, http://solar-center.stanford.edu/SoSH/.

Subject Matter Research, People, and Locations

As the title of the film, *Visceral Data*, suggests, creative data visualization is a primary focus for the film, falling within the purview of the integration of art and science. Therefore, it will be useful to frame the subjects discussed in the film within this context. One of the most prominent global resources for the dissemination of interdisciplinary works of art and science is Leonardo: The International Society for the Arts, Sciences and Technology. Established in 1968, it is a nonprofit organization that publishes scholarly journals and books through The MIT Press, and curates workshops and events.[3] One of the interviewees for the documentary, Roger Malina, is the Executive Editor of Leonardo, and serves on its Governing Board of Directors. He is also a Distinguished Professor of Arts and Technology with a dual appointment as Professor of Physics at University of Texas at Dallas (UT Dallas).[4] If produced on location, his interview can take place in a sunlit computer lab on the campus of UT Dallas. If produced remotely, we can have him projected as a flat panel on a proscenium stage in a virtual environment.

Malina can provide information on the paralleled histories of science and art in an attempt to underscore the commonality of processes such as the necessity to make distinctions between patterns, form, and noise. He could also present the idea that intuition is a key common practice as scientists often employ intuition to postulate causality of a natural phenomenon, and artists often intuit their aesthetic senses.[5] As much of his work has focused on science and 'hard humanities,' "the … disciplines

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[3] "About," Leonardo, last modified 2021, February 23, 2021, https://www.leonardo.info/about.

[4] University of Texas at Dallas, ATEC. "Roger Malina," University of Texas at Dallas, accessed October 1st, 2020, https://atec.utdallas.edu/content/malina-roger/.

[5] Martin Kemp, "Kemp's Conclusions," *Nature* 392, 6679 (30 April 1998): 875.

essential to the cultural transformation necessary within the next two generations" he can explain how through works that engage the visual and aural senses, scientific concepts can become accessible to a general public.[6] He will be the most appropriate interviewee to discuss how a scientifically literate public benefits society in a number of ways that he can articulate.

Malina will provide the framework to discuss current collaborative efforts between scientists and artists, or creative scientists who produce artistic works informed by their scientific inquiries. There are six other interviewees who have agreed to participate in the production of *Visceral Data*. However, due to various logistical constraints of the pandemic, it might not be feasible to capture all of them in a reasonable amount of time as they are geographically spread out across three different states. This will be discussed in further detail in Section IV, but first, the other potential subjects must be introduced, starting with two professors who are located at University of North Texas.

Ruth West is a Professor in the College of Visual Arts and Design and director of the xREZ Art + Science Lab at University of North Texas (UNT). She describes herself as "a creative technologist bridging big data, visualization, sonification, virtual and augmented reality … with domains such as neuroscience, genomics, [and] astronomy" among many other scientific disciplines. At xREZ, she has recently directed the *One Antarctic Night* instrument, a VR experience that facilitates interaction with big data of starlight from the Large Magellanic Cloud received from robotic telescopes in Antarctica.[7] (See Figure 1.1.) Pending approval, it is possible that segments of such interactions could be captured as a 360 file and featured in *Visceral Data* to give

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[6] Roger Malina, "Intimate Science and Hard Humanities," *Leonardo* 42, no. 3 (2009): 184.
[7] xREZ Art + Science Lab, "Experience IOAN!," accessed May 16th, 2020, http://oneantarcticnight.com.

audiences an idea of *One Antarctic Night* as an immersive work. This will also help underscore the impact of VR as a powerful, heuristic tool while supporting the choice of 360-cinema as a documentary format for this production.

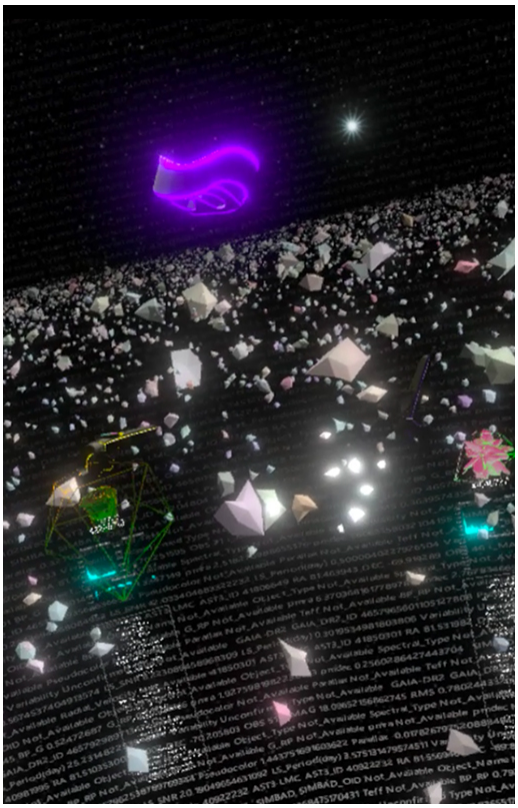

Figure 1.1: Image from One Antarctic Night.[8]

The work of Dr. Marco Buongiorno Nardelli exemplifies the amalgamation of science and art, as he is an accomplished artist, composer, and physicist and has been producing works that bring the disciplines together. As a Distinguished Research Professor in the Department of Physics at UNT, he specializes in theoretical and computational materials physics.[9] He is also a skilled flautist and composer whose

[8] "One Antarctic Night" (still image capture), One Antarctic Night, accessed February 23, 2021, http://oneantarcticnight.com/wp-content/uploads/2018/08/GRAPHIC_1_IOAN_4_CROP-v2.jpg.

[9] University of North Texas, College of Science, Department of Physics, "Marco Buongiorno Nardelli, Ph.D," accessed May 16th, 2020, https://physics.unt.edu/people/marco-buongiorno-nardelli-phd.

compositions are frequently "data-driven."[10] In 2017, he became a faculty member for Center for Experimental Music and Intermedia (CEMI), and in 2019 became an Affiliated Faculty member in the Composition Division, both appointments through the College of Music. He also recently curated and presented an event entitled *Complexity and Structure in Music* at the prestigious Santa Fe Institute. His contribution would not just lend itself well for providing interesting audio components, his professional presentations have visually stunning images as well. Recently, he produced *Unknown, a journey*, which features an interactive physical installation where small bean bags are tossed onto square structured sensors on the floor that respond with calculated audio samples.

Figure 1.2: *Unknown, a journey,* Merrill Ellis Intermedia Theater, UNT

Mentioned earlier, the AlloSphere, created and directed by Dr. JoAnn Kuchera-Morin and housed in the California NanoSystems Institute building at University of California at Santa Barbara, demonstrates one of the world's most sophisticated

[10] Marco Buongiorno Nardelli, "MaterialsSoundMusic: Music, Science and Data-driven Composition," accessed May 16th, 2020, https://www.materialssoundmusic.com.

technologies for data visualization. It is a five-meter-radius sphere within a three-story near-anechoic cube with a bridge walkway stretching across the center that can support up to thirty people simultaneously. Equipped with stereoscopic projectors and a multichannel loudspeaker system connected to supercomputers, the AlloSphere "immerse[s] researchers in scientific simulations, data visualizations, and artistic content." It "enable[s] experts to use their intuition and experience to examine and interact with complex data to identify patterns, [and] suggest and test theories in an integrated loop of discovery."[11]

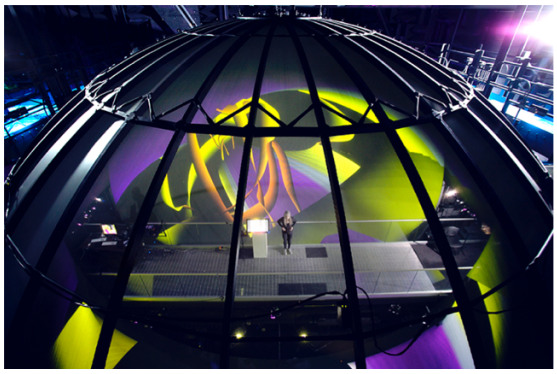

Figure 1.3: Dr. Kuchera-Morin standing on the bridge of the AlloSphere.[12]

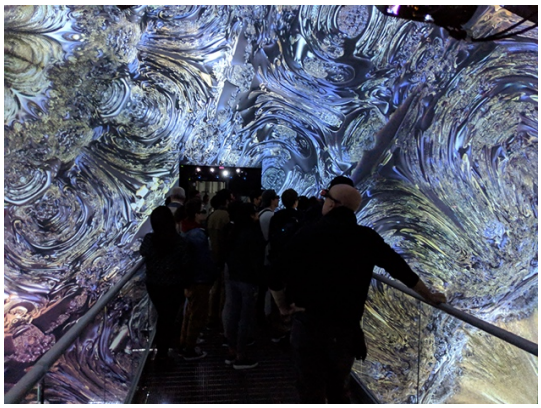

Figure 1.4: Multiple people standing on the bridge of the AlloSphere.[13]

[11] "What we do," The AlloSphere Research Facility, last modified 2020, accessed February 23, 2021, https://allosphere.ucsb.edu.

[12] "About," The Allosphere Research Facility, last modified 2020, accessed February 23, 2021, https://allosphere.ucsb.edu/about/.

[13] "What we do," The AlloSphere Research Facility, last modified 2020, accessed February 23, 2021, https://allosphere.ucsb.edu.

Kuchera-Morin will be able to discuss the various scientific disciplines that her collaborations have included and the discoveries that her AlloSphere has facilitated. Her contributions to *Visceral Data* could provide powerfully stunning examples of data visualization and sonification. For example, she has recently produced a piece called *MYRIOI*, “an interactive, immersive, shared narrative” for head-mounted display (HMD) users across the planet. Based on the research of designing the AlloSphere, it allows people to immerse and interact “with myriads of particles that create currents, becoming waveforms, to understand and to really experience viscerally, the quantum, sharing and interacting with this narrative. A shared experience that will allow a group of users to see themselves and each other and to passively experience or interact with the world of the quantum: waveforms, light, the pure essence of form and shape.”

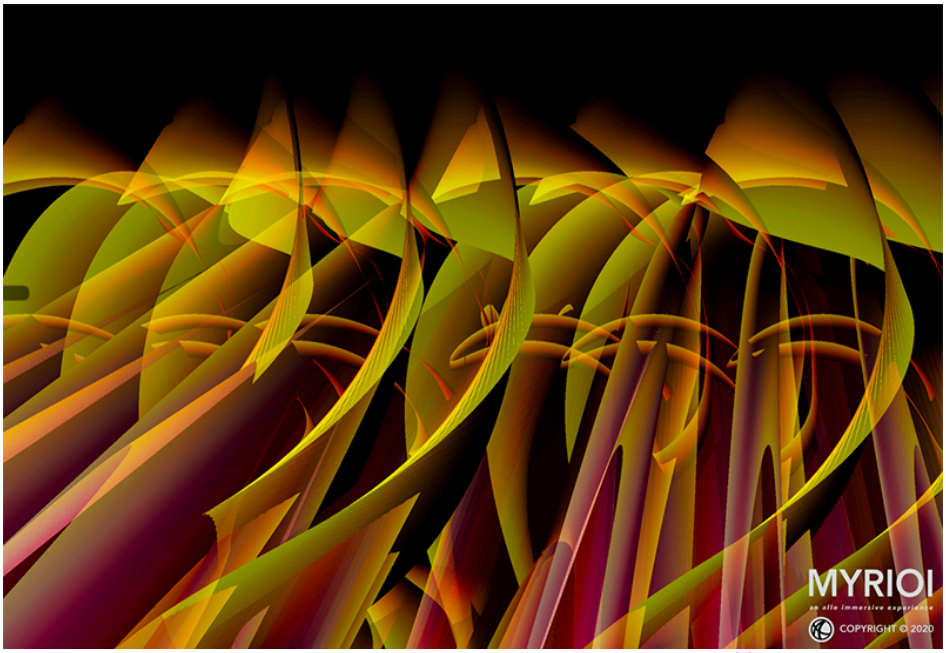

Figure 1.5: Still image from MYRIOI.[14]

[14] “MYRIOI,” The AlloSphere Research Facility, last modified 2020, accessed February 23, 2021, https://allosphere.ucsb.edu/research/quantum_exhibitions_MYRIOI/.

Kuchera-Morin has stated that she can provide 360 content of this piece for *Visceral Data.* In addition to *One Antarctic Night*, this will lend powerfully stunning exemplary content for the 360-edit of this documentary. It is possible that she might be able to provide additional examples and content, but that is to be determined with more correspondence. Capturing her discussing her work on the bridge of the AlloSphere is possible during the pandemic and will provide a visually intriguing place for a 360 cinematic interview. However, she and her team are currently working on a project funded by the National Science Foundation and have extremely strict safety protocol in place and are only allowing authorized individuals in the facility at this time. Therefore, she has agreed to set up any equipment provided to her to capture her own interview.

The three remaining subjects who have agreed to participate are located in Denver, Colorado. Laleh Mehran, Chris Coleman, and Tim Weaver are professors at University of Denver's Emergent Digital Practices (EDP). If shot on location, their facilities include large configurable performance spaces, workspaces, and computer laboratories that can provide an ambience of the versatile and creative technology they utilize. For example, they have a space called the Hypercube that can be equipped with up to eight projectors. If interviews are conducted here, they can discuss their work while images from various installations are projected onto these screens. Depending on the available light or using lighting techniques that are specific to 360 cinematic production, this can either be done live or in post. Other possible interview spaces at the EDP facilities include The Cloud, another large configurable space with lounge furniture and rolling tables and chairs, the Leo Block Lab where they have multiple Mac

computers, and The Lab, an open workspace for a variety of digital technologies, including 3D printing.

Figure 1.6: The Hypercube.[15]

Figure 1.7: The Cloud.[16]

[15] "The C-Cubed Studios," University of Denver, College of Arts, Humanities & Social Sciences, Emergent Digital Practices, last modified 2021, accessed February 24, 2021, https://www.du.edu/ahss/edp/spaces.html.

[16] Ibid.

Figure 1.8: Leo Block Lab.[17]

Figure 1.9: The Lab.[18]

[17] "The C-Cubed Studios," University of Denver, College of Arts, Humanities & Social Sciences, Emergent Digital Practices, last modified 2021, accessed February 24, 2021, https://www.du.edu/ahss/edp/spaces.html.

[18] Ibid.

Professor Tim Weaver can discuss his current collaboration with other artists and a team of marine biologists on the SoniDOME project (Sonification Interactions with Deep Ocean Microbial Ecology). Through interactive data display, the public can access open-source software toolkits to engage with data of dynamic structures of remote microbial communities. The goal is to produce "an ecological narrative as a sound composition framework for sonified genome & protein sequences from a deep ocean microbial extremophile species," and to produce the results at an international scientific conference. Ultimately, these collaborative efforts will inform scholarly discourse and propel environmental scientific theory while actively engaging the public.[19]

SoniDOME is one of three research endeavors of the Ocean Memory Project (OM). Funded by the National Academies Keck Futures Initiatives (NAKFI), the OM is a four-year cross-disciplinary mission to explore the question: "Does the ocean have memory, and what form does it take?"[20] Weaver is involved with OM as a conference and workshop host, in addition to being a seed grant collaborator for both the SoniDOME and the Deep Sea Memory extended projects. If granted permission, *Visceral Data* can display a panel screen in the 360 space to play as Weaver discusses an example of creative output from OM such as *The Whalefall*, a 23-minute multimedia/electroacoustic live cinema performance utilizing "sonification/sonic and transcoding of biomolecular sequences from the succession of the evolving afterlife of the great whales."[21]

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[19] Sonidome Project, "Sonidome Project: Investigators/Collaborators," accessed September 27th, 2020, https://www.sonidome.org/sample-page/.

[20] The Ocean Memory Project, "Who We Are," accessed September 27th, 2020, https://oceanmemoryproject.com/who-we-are/.

[21] Timothy Weaver, *The Whalefall,* live cinema performance, October 31, 2019, CCRMA Stage, Stanford Center for Computer Research in Music and Acoustics, (Vimeo, biotica), accessed September 27th, 2020, https://vimeo.com/377643855.

Figure 1.10: Still from Weaver's *Whalefall.*[22]

Figure 1.11: Still from Weaver's *Whalefall*.[23]

Figure 1.12: Still from Weaver's *Whalefall.*[24]

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[22] "Weaver Premieres 'The Whalefall'," *Ocean Memory Project*, last modified 2020, accessed February 24, 2021, https://oceanmemoryproject.com/oms-timothy-weaver-premieres-the-whalefall/.

[23] Ibid.

[24] Ibid.

Professor Laleh Mehran is the director of EDP. Her art explores the intersections of science, politics, and religion. For example, her recent works include a collaboration with new media artist and EDP colleague, Professor Chris Coleman entitled W3FI (pronounced: wee-fie), a multimedia site-specific installation that utilizes “real-time information gathered from area visitors and the region at large” such as live Twitter feeds to incite discussions about how we might navigate digital space more mindfully and humanely.[25] Pending permission, a panel in virtual space will appear beside her as she explains her work, providing documented visuals from an installation of W3FI taken at Boulder’s Museum of Contemporary Art. Mehran has also mentioned that she has other relevant works she would like to share and that we can discuss this further when we conduct a pre-interview. Mehran and Coleman will be able to provide valuable dialog to expand the scope of discussion by contextualizing the juncture of art and science within humanities studies, making the subject accessible and relevant to a broader audience.

Figure 1.13: W3FI installation.[26]

[25] Laleh Mehran, “W3FI,” accessed September 27th, 2020, https://www.lalehmehran.com/W3FI.
[26] Ibid.

II. Goals of the Production

Persuasive and Ethical Aims

The desired outcome is to demonstrate to scientists, science educators and enthusiasts, composers, and new media artists that inventing novel ways to coalesce each other's talents and skills creates opportunities for all to innovate and discover significant insights into their respective fields. The output from such alliances also promulgates science literacy to the public. This is key to developing a healthier, more prosperous society as scientifically literate individuals can discern wiser choices concerning their health and consumption, pursue careers in STEM (or STEAM) fields, and cast informed votes in civic decision making; all of which ultimately, directly or indirectly, increases the standard of living across society.[27] Increasingly, this has become an important outcome for funded projects. For example, the National Science Foundation requires that funding applicants provide a statement on societal broader impacts in their proposals. These may include, "improved STEM education, […] increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; […] increased economic competitiveness of the U.S.; [and] use of science and technology to inform public policy."[28]

On a more general scale, the goal of this documentary is to address the increasing antagonism in America against and/or ignorance of evidence-based scientific voices in public policy. It is important to promote the idea to scientists and artists alike that by working together, they can make a positive impact on society, helping the public

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[27] Catherine E. Snow and Dibner, Kenne A. ed., *Science Literacy: Concepts, Contexts, and Consequences,* (Washington, DC: National Academies Press, 2016), 22-26.

[28] National Science Foundation: Proposal and Award Policies and Procedures Guide, June 1, 2020, II-11.

connect their own lives to relevant data by making it relatable, understandable, and visceral.

Possible Distribution Outlets and Promotional Tactics

The Science and Entertainment Exchange (aka: The Exchange), a program created by the National Academy of Sciences (NAS) is a resource for entertainment industry professionals to connect to scientists for consultations and fact checking to ensure that depictions of science in media are accurate, powerful (even if subtle), and positive.[29] In their Special Screening and Talk-Back Series, Exchange members and those on their listserv are given access to free screening links to view new films and documentaries, followed by an hour-long interview with the directors, producers, and film subjects. The organizers of this series have recently expressed interest in *Visceral Data* and are open to the idea of supporting my efforts to reach their members as a prime target audience. This would also be advantageous for subjects of the film to promote their work to a wider audience.

Another possible resource for reaching the target audience is through MIT's Open Documentary Lab's lecture series, but this prospect is yet to be explored. Nonetheless, with the participation of Roger Malina and MIT's affiliation with Leonardo Press, it could be a potential option for promotion. They have also recently featured a presentation by Mandy Rose from the University of West England Bristol about the

[29] The Science & Entertainment Exchange, "About," *National Academy of Sciences*, last modified 2016, accessed February 26, 2021, http://scienceandentertainmentexchange.org/about/.

ethics of VR documentary, demonstrating that the organizers understand the relevancy of immersive media formats.[30,31]

III. Integration of Theory and Production

Expository Mode

This documentary will be didactic and expository, but unlike the traditional tropes of expository documentaries, there will be no narration as the subjects will be the sole representatives of their work. Therefore, Roger Malina will be a critically important interview to secure in order to give the film a broader contextualization than the other interviewees could offer. As mentioned earlier, if his interview cannot be captured in person with a 360 camera, he might appear as a flat panel either on a proscenium stage, in a classroom laboratory, or a floating in a virtual environment.

The editors of *Post-Cinema: Theorizing 21st-Century Film* posit that emergent forms of media are on a linear continuum from twentieth-century styles and approaches.[32] Superimposing moving images on a flat screen in a virtual environment is a way of bringing the familiar cinematic scenarios from the past into the new millennium. For example, Oculus TV, an application available within their HMDs to view movies on Netflix, Hulu, or other streaming services, is set in a serene living room setting but with open natural spaces on either side of the viewer. Additionally, some of today's leading 360 filmmakers are coming up with interesting ways to use flat footage such as Felix &

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[30] Mandy Rose, "The Ethics of VR Documentary," *MIT Open Documentary Lab*, accessed February 27, 2021, http://opendoclab.mit.edu/presents/mandy-rose-ethics-vr-documentary/.

[31] Mandy Rose is also a colleague of Dr. David Green, who presented at the MFA Colloquium in October, 2018.

[32] Denson, Shane and Julia Leyda, ed. *Post-Cinema: Theorizing 21st-Century Film*. Falmer: REFRAME Books, 2016.

Paul's *Travelling While Black*. They use overhead projections onto the walls, or superimpose proportionate images on a mirror next to the viewer.

Figure 1.14: Oculus TV virtual environment with floating panel.[33]

Figure 1.15: Felix & Paul's *Travelling While Black* use of mirrors for superimposed moving images.[34]

[33] Adi Robertson, "Oculus' VR television hub launches today on Oculus Go," *The Verge*, June 25, 2018, (1:00pm EDT), accessed February 28, 2021, https://www.theverge.com/2018/6/25/17500614/oculus-tv-vr-television-streaming-hub-launch.

[34] Jose Antunes, "Traveling While Black, a documentary in VR: trading pixels for emotions," *ProVideo Coalition*, January 28, 2019, accessed February 28, 2021, https://www.provideocoalition.com/traveling-while-black-a-documentary-in-vr-trading-pixels-for-emotions/.

The subject matter and VR format are complementary. As VR becomes more utilized in applications besides gaming, and is employed in new media art, the format will likely have appeal for target audiences who are generally interested in nascent technologies. Should interviewees grant permission to use examples of their immersive pieces in the documentary, the VR format will help convey the impact of their work. Furthermore, though the viewer can look around in any direction they choose in a 360 HMD, the immersion contains them within the virtual environment. They will not have typical distractions like their phones. The interviewees (unless appearing in a panel in the virtual environment) will be present from head to toe, making their presence lifelike and personal.[35]

While VR documentary production opens up new ways to impress and engage viewers, it also raises unique challenges and constrictions for production and editing. These distinctive factors require special deliberation for pre-production. For example, for on-location production, the camera should remain stabilized on a tripod to minimize potentially inducing motion sickness for sensitive viewers. Also, the tripod should have a small footprint so when a viewer looks down, they will only see either a discreet graphic or floor rather than three mechanical legs where they would normally perceive their body. There must also be fewer edits per scene than is accorded traditional screens so the viewer can remain suitably oriented. Pragmatically, the interviewees will therefore have to explain their work in a somewhat concise manner to avoid or minimize cuts which are conspicuously awkward in 360 videos. Another important consideration is that to appropriately maintain a natural sense of distance from the people in the film for the

[35] Brad Gill and Thomas Hayden, co-founders of 360 Labs, personal communication.

viewer, all shooting locations must provide ample space for the camera. It is also necessary to position it relative to the points of interest in a manner that will avoid stitch lines (where discrete but adjacent video files are 'stitched' together), another technical issue unique to VR.

Despite these issues, there are advantages to formatting the film for 360 as it is an 'experiential medium.' [36] Viewers will be immersed in the working environments of those who are the vanguard of art and science integration and be able to feel as though they are in the room, just a few feet away from extraordinary people who are doing extraordinary things. It is this immersive quality that makes VR an intriguing format for a number of documentary filmmakers who have been experimenting with its potential, though it is still in its emergent stages of development. Additionally, a potential feature of immersive media is the application of ambisonics, meaning that the audio contains properties of directionality, making a signal's origin detectable to a specific location and in tandem with head movement. This adds a novel orientating dimensionality for vision-impaired audiences that is not found in conventional media formats. Pending permissions, examples of 360 work by the interviewees will exemplify and justify the use of VR as the documentary's format. However, this specialized platform will limit the exposure to the widest possible audience as the technology for distribution is still in its inchoate stages of development. Therefore, concurrently producing a conventionally formatted rendition will be prudent for disseminating the film through a variety of

[36] Chris Milk, "How virtual reality can create the ultimate empathy machine," TED Conferences, LLC, March 2015, accessed September 29th, 2020, https://www.ted.com/talks/chris_milk_how_virtual_reality_can_create_the_ultimate_empathy_machine/transcript?language=en.

channels. Fortunately, it is possible to generate flatscreen formatted edits using the same footage captured with a 360 camera.

360 Documentaries Trends

Virtual Realities: Immersive Documentary Encounters is a website that features the comprehensive research of a cross-disciplinary team of researchers in the UK who investigate "the production and user experience of nonfiction virtual reality content." The site features various findings of their studies presented in graphs and charts, as well as serves a repository for the ongoing relevant publications by various members of the team. One of the projects most useful outputs is the mediography, an interactive timeline that charts the development of nonfiction VR films from 2012 through 2018. Displayed as a long scrollable page with hyperlinks, it demonstrates the proliferation of VR documentaries, their various platforms of distribution, and the festivals where they debuted. [37]

In a conclusive essay from November of 2019, research associate, Chris Bevan notes that their dataset included over 530 productions that roughly fell into two categories: linear, non-interactive 360 video and computer-generated (CGI) productions with varying degrees of interactivity, where approximately 70% of their dataset fell into the former category. [38] The format of *Visceral Data* would therefore fit into the majority of content. Notably, after a dramatic increase of nonfiction VR pieces from 2012 to

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[37] Chris Bevan and David Green, "VR Non-fiction: A Mediography," *Virtual Realities: Immersive Documentary Encounters Project*, 2018, accessed October 2, 2020, http://vrdocumentaryencounters.co.uk/vrmediography/vrmediography/.

[38] Chris Bevan, "What Can the First Years of VR Nonfiction Tell Us About Its Future?" *Medium: Immerse* News, November 1, 2019, accessed October 2, 2020, https://immerse.news/what-can-the-first-years-of-vr-nonfiction-tell-us-about-its-future-8857f88cb874.

2017, in 2018 there was a considerable decline in the production of new content, though the data also reflect less aggressive research and collecting in the final year of research. Nonetheless, 81% of the directors in the overall study had only released one piece, and only 9% of the directors had gone on to produce more than three. Researchers suggest that this is likely due to a few key events. First, in 2012, Nonny de la Peña premiered a CGI piece *Hunger in Los Angeles* at the Sundance Film Festival, a first of its kind and many international film festivals began to include nonfiction VR in their programs. Soon, Oculus Rift released a "developer kit" as well as other user-friendly technologies that enabled creatives to produce new content. Bevan also notes that the 2015 release of *Clouds Over Sidra*, a 360 film about Syrian refugees garnered significant international attention and director, Chris Milk became an outspoken proponent for the ethical viability for VR to induce empathy. (This has been contested and there are current on-going debates about this claim.)[39]

There are considerable developmental changes happening at the moment in the VR tech-industry as Oculus discontinues its affordable Go headset, Samsung XR discontinues its platform for distribution of content, and Facebook and Oculus make changes in their privacy and terms of agreement that make the immediate future of VR difficult to accurately assess. However, 360 documentary filmmakers continue to develop high-quality content and distribution channels such as VeeR steadily making new content available on a variety of HMD platforms indicates that 360 cinema is a

[39] Chris Bevan, "What Can the First Years of VR Nonfiction Tell Us About Its Future?" *Medium: Immerse* News, November 1, 2019, accessed October 2, 2020, https://immerse.news/what-can-the-first-years-of-vr-nonfiction-tell-us-about-its-future-8857f88cb874.

compelling format with unique qualities for storytelling that make the production of *Visceral Data* a worthwhile endeavor.

IV. Schedule and Equipment

All interviewees have responded and agreed to participate, but not all of them might be feasible to capture within a reasonable timeframe. Therefore, the film might only feature two or three interviewees, and the final edit will need to accommodate whatever story can be produced from what can be captured. Furthermore, since production will be occurring during a pandemic, there are a few pragmatic safety measures to consider as well. Some of the interviews might be conducted via a teleconferencing platform such as Zoom, Facetime or Skype. As mentioned earlier, their two-dimensional image will be edited as a floating panel in either a still image of a laboratory, theater stage, or a fabricated VR environment created in Blender, After Effects, or Reach.[40] In the cases of on-location production, travel to North Texas would only require about three days, including travel. However, Dan Beard and Michael Flanagan have offered to capture the production of these interviews. Travel to Santa Barbara, California from Northern Colorado will require at least five days, four days being necessary for driving. Exact dates for distance travel productions are yet to be scheduled, but will occur between March through May, 2021 thus pushing my thesis defense out into the next academic year. The Denver-based interviews will occur within the same window, accommodating the schedules of the participating professors.

Since this film will require the use of a 360 camera, I will procure my own equipment with the consultation of mentors and advisors at 360 Labs, a 360 production

[40] Emblematic Group, *Reach: The first web platform for creating, remixing, and sharing volumetric VR using real people and places*, 2019, accessed September 23rd, 2020, https://www.reach.love.

company based in Portland, Oregon. For audio capture, I will also purchase my own Zoom H3-VR 360 audio recorder, and all other necessary accessories, including a lavalier kit. Fortunately, technology has advanced enough to make such a production reasonably affordable. Adobe Premiere Pro has the capacity to edit 360 footage and a student rate is available for Mistika VR, a comprehensive stitching software that will be necessary for post-production. Details are listed in the budget below.

The mediography produced by the researchers at Virtual Encounters has an extensive list of festivals that have featured VR documentaries including Sundance, Tribeca, Raindance, and Montreal International Documentary Festival. Other festivals that will accept VR submissions in 2021 are the Midwest Film Festival, Myrtle Beach International Film Festival, Paris Lift-Off Film Festival, and World of Film International Festival. Depending on the direction that the distribution industry takes (such as Oculus, which up until now the Go model has made high-quality content reasonably affordable and accessible), the future distribution of *Visceral Data* will require further investigation to maximize the impact it might have in reaching its target audiences.

Budget

Description	**#**	**Unit**	**Rate**	**In Kind**	**Total**
Pre-Production Research					
Internet Access		Allow	$100	$0	$100
SUBTOTAL PRE-PRODUCTION RESEARCH:				$0	$100
Production					
Director	6	Day	$760	$4,560	$4,560
Sound Recordist	6	Day	$500	$3,000	$3,000

Insta360 Pro 2	1		$5000	$0	$5000
Zoom H3-VR 360 Recorder	1		$380	$0	$380
Sennheiser XSW-D Lavalier Set	1		$214	$0	$214
GVM 800D-RGB LED Studio 2-Video Light Kit	1		$207	$0	$207
Expendables		Allow	$300	$0	$300
Meals (2 Crew x 3 Meals/Day x 6 Days)	60	Meals	$360	$0	$360
Car Rental	9	Day	$50	$0	$450
Gas	9	Day	$20	$0	$180
Hotel	4	Nights	$100	$0	$400
SUBTOTAL PRODUCTION:				$7,560	$15,051
Post-Production					
iMac Pro	1		$5,500	$0	$5,500
Editor: Picture | Sound	10	Week	$600	$6,000	$6,000
Adobe Editing Suite	10	Week	$9	$0	$90
Mistika VR Stitching Software	3	Months	$85	$0	$255
Original Music Composition | Recording		Flat	$500	$500	$500
SUBTOTAL OF POST-PRODUCTION:				$6,500	$8,908
Outreach and Impact					
Festival Entry Fees	10	Festivals	$50	$0	$500
SUBTOTAL OF OUTREACH AND IMPACT					$500
GRAND TOTAL				**$14,060**	**$24,059**

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