Edited by Tully Barnett, Jason Bevan, Cameron Mackness and Zoë Wallin

ROUTLEDGE

Beyond Virtual Production

Integrating Production Technologies

A Focal Press Book

BEYOND VIRTUAL PRODUCTION

Beyond Virtual Production brings together a range of creative practice research projects that have been undertaken in The Void, an early-adopter university-based virtual production studio at Flinders University in South Australia.

From a cross-disciplinary short virtual production film, to a VR simulation of the last 100 seconds of life of earth, to the live performance of the virtual band Big Sands, to augmented and extended reality, to archaeological projects, this collection captures the potential applications of virtual production technology and provides a framework for cross-disciplinary work and industry collaborations both in a university context and beyond. It offers insight into the development of virtual production courses and encompasses research into theories of performance, liveness, methods for co-creation, gender in virtual production careers, and object digitization and its representation while highlighting significant pathways of industry partnerships alongside experimental art practices.

Creative technology and interdisciplinary practitioners, researchers, students, and teachers will find inspiration and practical guidance in these chapters.

Tully Barnett is Associate Professor of Creative Industries at Flinders University in South Australia, where she serves as Director of Assemblage Centre for Creative Arts. As an interdisciplinary scholar, her research considers digitisation and its impact on cultural experience and cultural work, as well as cultural policy and value.

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FOREWORD BY NOAH KADNER

Virtual production may be a new term for many readers of this book; but if you consider how virtual production works, it becomes clear that this field is not actually new at all. When you look back at filmmakers who were painting pieces of glass and hanging them in front of a camera, or building miniaturised sets with forced perspectives to try to make them appear more grand than they could afford or safely stage, virtual production and its in-camera visual effects is simply the continuation of this mise-en-shot tradition.

At the same time, it is undeniable that the rapid pace of change in technologies is transforming this space. We're trying to bring things in front of the camera because it not only results in better image quality, but it is also more engaging to the audience, and this allows filmmakers to get closer to their vision. It's far more exciting to look through the viewfinder and see a finished shot than to see actors standing in front of a green screen.

Virtual production is essentially the suite of technologies, techniques, and workflows that enable filmmakers to get closer to their creative vision and this is a desire that connects today's filmmakers with the very first practitioners of the art. As virtual production facilities pop up all over the world from massive movie studios to garage DIY filmmaking, we are all watching new technologies and workflows develop.

The Void at Flinders University in South Australia is one such example. This book presents the stories of people who came into this facility, saw what the possibilities were, and let their imaginations run wild. Rather than being concerned about constraints, limitations, technical flaws, you can be creative, and anything becomes possible. These stories are from people who were pioneers, in a sense, as they have taken elements like LED screens, real-time game engines, integrated DMX lighting, and tracking technologies, and

melded them into a new practice. But at the same time, the idea of combining different tech into one finished shot in the camera is something we've always been aiming for.

What you'll get out of reading this book is an understanding that anything is possible. It's less about overcoming technical limitations and more about dreaming something that may seem difficult to accomplish, but is actually just a question of breaking down the workflows. And in order to do that, you need people who are passionate advocates for believing anything can be created with the right teams. This allows practitioners to go beyond filmmaking and take virtual production to immersive art experiences, and digital archaeology, among other examples. That should be what it is all about – using your imagination to conjure up something never seen before. All these technologies do is make that conjuring more clear, accessible, fun, and engaging.

Any effort to make that happen anywhere in the world, using these virtual production technologies, should be celebrated and encouraged. And the people creating facilities that allow others to do it are the real heroes because it was perceived as foolish until visionary people made it standard. To have been working in this space for years shows a big leap of faith. And I think that kind of leap should be rewarded.

These case studies show a range of different perspectives, art forms, and workflows that have been brought together to produce what was once deemed to be unachievable. Tomorrow it will be standard practice. Today it is the scattered facilities like The Void and their people who are building the future of filmmaking.

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The editors and authors acknowledge that this book was developed on the unceded lands of the Kaurna people and pay respects to Elders past and present.

This book is the result of the work, energy, creative labour, and care of many people. The Void – Flinders University's virtual production studio – is home to numerous academic and professional staff members, industry partners, and collaborating artists, and diverse disciplines and creative visions. Their energy and expertise are fundamental to the work and successes of The Void.

The chapters in this book represent the work of just a small part of the artists, companies, and productions that have been involved with the creation of The Void. We would like to thank all those that have stepped through our doors and welcome those yet to come.

The Assemblage Centre for Creative Arts at Flinders University has supported the development of this book and many of the projects that are discussed within it. Assemblage and The Void are supported by the College of Humanities, Arts and Social Sciences and by the Deputy Vice Chancellor (Research) of Flinders University. We specifically recognise the vision and support of Professor Robert Saint, former DVC (Research) at Flinders for believing in the work the creative arts contributes to research. We thank the incoming DVC (Research) Professor Raymond Chan who has already shown strong support for creative practice and virtual production at the university.

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copyeditor and project manager extraordinaire, for her careful guidance and attention to detail.

Finally, Creative and Performing Arts disciplines at Flinders University have a long history, a vibrant present and an exciting future in strong creative practice; this book is testament to and builds on the work, collegiality, expertise, and brilliance of all the people who have been a part of those disciplines over the decades. Here's to you.

VIRTUAL PRODUCTION STUDIO ENVIRONMENTS FOR TEACHING, RESEARCH, AND CREATIVE PRACTICE

An Introduction

Tully Barnett, Zoë Wallin, Jason Bevan, and Cameron Mackness

The field of virtual production (VP) in practice, in theory, in education and research continues to shift and change. We don't yet know what ways of thinking and doing will stick, and what will fall away to be replaced by new technologies and new workflows. That's what makes this field so exciting.

This book tells the story of the journey to integrated virtual production (IVP) in research, practice, and pedagogy across a range of Creative Arts disciplines at Flinders University in Adelaide, South Australia. The VP studio, The Void, was developed towards the end of 2019 and then through the pandemic lockdown years of 2020 and 2021. From the outset, it was an interdisciplinary space with functionality for drama studies and acting training as well as filmmaking and visual effects. Very quickly its affordances for visual arts, archaeology, history, museum installations, and space studies were also explored. This book has collected a number of chapters that reveal different aspects of the VP facility, from staff members approaching The Void from different disciplines and practices, to Artists-in-Residence supported by Assemblage Centre for Creative Arts, Flinders University's flagship Creative Arts research centre, who have used the capabilities of The Void in their artistic practice, to teaching programs that use The Void a little or a lot. The chapters also highlight different forms of collaboration and pedagogical practices, some of which are unique to VP environments and some of which have long histories in other disciplines. Universities offer a space for creative experimentation that can be difficult to replicate in industry settings. Research centres and artist-in-residence schemes extend this experimentation further.

The field of VP, its practice and pedagogy, its concepts, and even terminology are in flux, and in some cases contested. We use the terms 'virtual

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production' and 'integrated virtual production' (IVP) here after much careful consideration.

'Virtual production' is, as Noah Kadner states, 'a broad term referring to a spectrum of computer-aided production and visualisation filmmaking methods' (2019, p. 3). In the introduction to *The VES Handbook of Virtual Production*, Miles Perkins writes that 'virtual production is any filmmaking process or workflow that removes the barrier between the virtual and physical' (2024, p. 1). For Perkins the innovation is the way 'virtual production delivers cinematic visual effects with the spontaneity and collaborative nature of live-action production' (2024, p. 4). Among the components of visualisation systems are, according to Willment and Swords (2023), 'real time game engine technology, … virtual and augmented reality systems, motion capture …, camera tracking, dynamic lighting, green or blue screen, LED screens and in-camera visual effects' (pp. 4–5). Current discussions of VP in industry publications tend to loosely apply the term if one or more of these elements are present, such as the general use of an LED volume (Giardina, 2022; Tangcay, 2022). Yet there is a need to further clarify understandings of the term in order to apply it more accurately. This book proposes to use the term VP technologies, which Bevan and Mackness define in this volume as a suite of diverse practices that go beyond simply using game engine technology to provide in-camera video effects, towards a set of practices, workflows, and technologies that integrate unique real-time pipelines separated in terms of skillsets, departments, and production timelines into one space generating immersive experiences of production and audience.

As illustrated in the diverse chapters included here, different elements of VP technologies can produce multiple forms, including the creation of virtual reality experiences, use in film production and set design, livestreaming of theatrical and musical performances, visual and experimental art, and three-dimensional modelling of digital archaeological scans.

The elements that comprise VP technologies, such as special effects, virtual reality, game engines, and film production, and now machine learning and artificial intelligence, each have their own extensive histories, and it is beyond the scope of this book to provide a comprehensive account of their convergence into virtual production. Rather, by illustrating how these component parts came together in The Void, a small studio in a university with a long tradition in cutting edge Creative Arts, we hope to illuminate a varied range of practices, processes, and outcomes that have emerged through the collaborative practices of our group of staff members, postgraduate researchers, and artists. As these elements are increasingly assimilated into tertiary teaching programs, clarifying and developing a model of VP technologies with consistent and shared vocabulary is significant.

As the presence of VP studios grows in Australia and globally, we become more aware of the idiosyncratic nature of tertiary-based studios. The growth

of such VP studios in Australia is assessed by Kavakli and Cremoa (2022) as part of a broader process of industrialisation and collaboration. The partnering of VP studios with educational institutions has, they argue, created new hybrid structures. They point to the accelerating development of university-based VP studios as spaces to teach and train students, alongside use by local industry, as having led to partnerships both for training industry professionals and students, and for researching and developing technology and practices. Kavakli and Cremoa (2022) focus on 'the training and education of industry professionals, and the development of R&D, technology and analysis of practices' (p. 33) while in this book we focus on what a university-based VP studio can do, with strong ties to industry locally, nationally, and internationally. This edited collection hopes to extend this discussion through case studies that illustrate a range of technologically, pedagogically, and aesthetically innovative developments that demonstrate contemporary uses of VP technologies in an academic context, while foregrounding current research and creative practice in this emerging field.

By centring this collection on The Void and the various projects that have intersected with this infrastructure, the complexities and possibilities of the VP ecosystem are elucidated. The Void represents a unique locus through which academics and practitioners have generated research and provides a significant model for academic institutions that are developing their own VP studios at a rapid rate. By explicating The Void's varied projects, this book also provides a framework for practice that can be applied beyond the specificities of VP technologies. The internal cross-disciplinary collaborations illustrate the benefits of using emerging technology for projects that work across different university departments. Additionally, external partnerships developed between the university and the creative industries demonstrate a range of beneficial relationships that can support VP facilities in higher education. This volume aims, therefore, to develop a framework for the way VP technologies can operate as part of university infrastructure to enable students to develop knowledge and skills, for academics to use as part of their own pedagogy and research practice, and as a way for a university to build partnerships and collaborations with external organisations in a range of fields.

Working with artists in The Void brings new questions, new possibilities, and new ways of thinking to the functionality of the VP studio. Artists bring unique qualities to this creative and technological experimentation. We invited artists who have created work in The Void to explore their experiences in this book to give first-hand accounts of creating in a university-based studio. There are complexities for artists working with universities. The massive workloads of staff in the higher education sector and changing KPIs for research and industry engagement can make it hard for universities to be good partners, putting pressure on the relationships between university staff and the arts, cultural, and creative industries sector. At Flinders University, we have worked

hard to balance the opportunities and workloads while keeping on top of new developments in VP and contributing new knowledge.

Conceptual and Historical Background of IVP

As VP technologies draw together developments from a range of fields, including visual effects, game engines, and filmmaking, current histories of VP tend to hold a specific disciplinary focus. For example, Pires, Silva, and Raposo (2022) locate VP as the culmination of the development of visual effects compositing technologies for film. They trace the history of these from the physical composites and travelling mattes of the first decades of cinema to computer assisted techniques including green screens, rotoscoping, and motion capture. For Pires et al., VP emerges when the previously time-consuming process of rendering in postproduction is replaced by real-time rendering that can 'be done on set while capturing actors' performances' (2022, p. 22) through the processing power of game engines.

Following a different path to understand the convergence of VP technologies, Harwood and Grussi (2021) explore the influence of the machinima network of the early 2000s in developing such game mechanics as 'the knowhow to manipulate digital assets in virtual environments in real time' (p. 183). Harwood and Grussi argue that integration with film production occurred when technological advancements were made with performance capture that enabled the real-time control of virtual assets, leading to a model of VP.

A further perspective is provided by Li, Lo, Smith, and Yu's study (2022) of the development of VP in Hollywood feature films, which traces it to the milestone use of Simulcam technology in *Avatar* (2009), and saw subsequent films, including *The Jungle Book* (2016) and *Ready Player One* (2018), each employing elements of VP technology such as previsualisation and 3D modelling tools. For Li, the most critical development is the virtual world created for the filming of *The Lion King* (2019). Li sees this as a move towards 'movie gamification', and references director Jon Favreau's description of the 'multiplayer VR filmmaking game' created for the film production (Favreau as cited in Li et al., 2022, p. 225).

While these scholars have varied perspectives on what they consider to be significant moments in the historical development of VP technologies, a more recent key turning point for VP and the establishment of VP studios is identified by Kavkli and Cremona (2022) as the 2019 conference of the Association for Computing Machinery's Special Interest Group on Computer Graphics and Interactive Techniques (ACM SIGGRAPH), when Epic Games exhibited the first integrated LED VP studios with Unreal Engine, and made 'ICVFX integrating live action a reality' (p. 30). This real-time CGI rendering and display on LED screens through Simulcam is seen by Kavkli and Cremona as the 'game changer' that led to the proliferation of VP studios.

This collection seeks to draw on and extend current research on VP towards something that might be called integrated VP, which falls into three main areas: the industrial implications of VP technologies; theoretical conceptions of virtual aesthetics and experiences; and the development of education programs for VP technologies. Recent strands of research consider the consequences of these technologies for the screen industry and screen practitioners. For example, Hendricks' (2022) unpublished PhD thesis, which takes a psychological approach to the adoption of VP camera systems, uncovers the perceived benefits and barriers of VP for filmmakers. The promise of VP, Hendricks argues, is the reduction of barriers to entry and apparent democratisation presented by reduced production costs and the ready skill acquisition, while the difficulties filmmakers face include the need for advanced assets, complex technical challenges, access, time, and complex definitions of authorship. Furthermore, Hendricks suggests that changes in workflow may lead to the loss of technical and creative positions in the industry. Following a similar industrial focus, Mangematin, Sapsed, and Schüßler's article (2014) presents a broader exploration of digital technology and the creative industries and raise pertinent questions around shifting industry dynamics and disruptions to the core business model of extracting value from intellectual property rights, with new entrants to the industry often able to exploit new technologies and develop different skill sets. Finally, Bédard's article (2022) on the place of the camera in VP applies Pierre Levy's concept of 'visualisation' to explore how virtual cameras and substitute cameras have been used as stand-ins that replicate traditional cameras. Bédard argues that this has implications for the industry in that it can feed into a particular narrative focus on performance and director authorship that obscures the labour of animators and technicians, particularly as former boundaries between separate aspects of the filmmaking process are being eroded by new workflows. These questions are further explored in this book, both in terms of changes to workflows in the chapters by Bevan and Mackness, and in a consideration of gender imbalance and workplace cultures within the screen industry in the chapters by Grbich, and Erhart et al.

In contrast to the scholarship that examines the technical and industrial consequences of VP technologies is a range of articles that explore different theoretical questions about new conceptions of time, space, and performance in the virtual world. For example, Ilmaranta's conference paper (2020) considers an 'enactive' approach to immersion in the film experience, arguing that the tools of VP can enable a greater exploration of imaginary spaces and the body's interaction with these environments. Drawing on a phenomenological approach, Joel Bennett's unpublished PhD thesis (2020) also explores the impact of VP on performance, through practice-based research that seeks to develop strategies to alleviate the limited perceptual experience for actors in such productions. In following a wider conception of VP, Baía Reis and Ashmore's paper (2022) reflects upon the emergence of live performance

and theatre in the Metaverse and the questions it raises around spatial immersion, participation, and 'unlimitedness', using an autoethnographic performative writing methodology. In this book, theoretical potential of virtual representations in VP technologies is also the subject of Matthews et al.'s chapter on Derridean theory, while the use of IVP to present new forms of live performance is explored in S. Coleman and Cabe's chapters on the Big Sand project.

In considering the pedagogical implications and university context of technology associated with VP, such as motion capture (MoCap), Carter et al.'s conference paper (2013) details the collaboration between dance choreography and MoCap at Queensland's University of Technology, which resulted in new ideas about performance and visual abstraction, as well as technical developments for the hardware of capture suits. Carter et al. aim to provide a model of research and best practice that could be transferred to different institutional spaces. In a similar exploration of VP development in a university setting, Bennett and Kruse's paper (2015) on virtual storytelling is useful for the pedagogical framework it develops based on Auckland University of Technology's visual effects and MoCap program. The article details a practical foundation lesson taught to students that compliment theoretical topics by allowing for explorations in an immersive environment. Finally, Collin and Thomas's paper (2022) explores how virtual video production (VVP) can be used for an immersive learning experience. Their autoethnographic reflections are based on case study student presentations developed through VVP and augmented reality (AR) apps, with the aim of uncovering the opportunities and limitations of this technology and its future uses in educational contexts. Similarly, several chapters in this collection explore the use of The Void in developing new teaching methods and as a source of university collaboration, including Bevin et al., and Bevin and Cavanagh's chapter on *Life Savings* (2023), and Musolino's chapter on actor training for MoCap performance.

The Void was established at Flinders as a motion capture facility in the first instance in 2019, when Dan Thorsland advocated for LED screen walls to be housed in the space. The Assemblage Centre for Creative Arts was also inaugurated around that time as a research centre for the Creative Arts in a university with a long history of cutting-edge creative arts practice in performing arts and film, as well as creative writing and digital media. These disciplines come together in Assemblage, in the creative vision, practice, and outputs of The Void, and in the pages of this book.

Given the vast array of applications for VP technologies and the range of disciplines involved, this book takes the approach of case studies that illuminate its reaches within a specific university context. The benefits of such a case study approach, White and Cooper (2022) argue, is the ability to bridge the particular and the generalisable while still recognising the complexity of the context in which they are situated. While many chapters in this collection

uses the VP space of The Void as a starting point, the chapters take many different forms, from more traditional research papers to artist statements, and interviews to proposed projects; as such, they embody the potentials suggested by The Void. Correspondingly, the authors draw on a range of qualitative methodologies within their chapters, including practice-based research, semi-structured interviews, critical reflection, and empirical research.

More specifically, Bevan and Mackness' opening chapter outlines the creation of The Void and its incorporation of emerging production technologies to form a VP volume. In detailing the R&D that took place over a range of production projects, they make a significant contribution to developing the vocabulary of VP technologies and clarifying the new workflows being developed in this emerging space.

The interdisciplinary short film collaboration, *Life Savings* is the focus of the next two chapters. The short film enabled academics and students from different fields to build a community of practice, as discussed by Shane Bevin, Helen Carter, Katie Cavanagh, Nicholas Godfrey, Sarah Peters, Sean Williams, and Tom Young in Chapter 3. The authors explore how The Void was an important means to visualise the film during the collaborative planning process, and highlight how educators and researchers were able to learn from other disciplines while mentoring students and working on their own professional practice. Similarly, in Chapter 3, Shane Bevin and Katie Cavanagh further explore how The Void was used as a resource for developing assets, worldbuilding, and physical prop-making, as staff and students worked together in integrating both the physical and the virtual among the traditional and the new, as part of project-based learning. They extrapolate some of the challenges presented by the constantly changing technology and the constraints of a 12-week teaching semester while maintaining a trans-disciplinary pipeline with parallel processes in play.

In Chapter 4, Bevan and Mackness further unpack the relationship between VP technologies and the Metaverse by exploring the development of game engine technologies through a range of projects in The Void. They describe the R&D that was conducted to meet the needs of a diverse client base and realise their creative visions, while reflecting on the way that each project shaped the capabilities of The Void.

In Chapter 5, musician, and independent artist Sally Coleman provides a critical reflection on her groundbreaking Big Sand project that considers conceptions of 'liveness' in relation to audience engagement through her personal experience. Weaving her reflections among a considered account of recent experiments with 'live' musical performances and conceptual debates around 'liveness', Coleman unpacks key components of 'liveness' in relation to integrated VP. L. Nicol Cabe's chapter sits in conversation with Coleman's, as she considers Coleman's Big Sand performance in terms of emerging forms of hybrid live performance in the Metaverse. Cabe examines how ontological

debates around 'liveness' are complicated by the digital spaces of the Metaverse and argues that Coleman's performance is significant in reintegrating methods of audience engagement in this space.

Opening with a discussion of a significant historical moment in Adelaide's experimental art scene that highlights discourses around gender parity in experimental art and technology, Sasha Grbich's chapter provides an incisive look at gender diversity in art and technology in relation to The Void. Through conversations with experimental artists held in The Void, Grbich explores the roles to which artists can be relegated within a capitalistic context and desire to foster industry relationships, and questions whether potential restrictions for access might work to replicate patterns of gender exclusion.

In Chapter 8, Liam Somerville provides a detailed account of the virtual reality projects completed in his artist residency in The Void. His first project uses VR and digital animation to present colonisation in an engaging and thought-provoking way, suitable for a festival exhibition context. Somerville's second VR work realises his vision of the end of the world, with the incorporation of powerful visual metaphors linked to philosophical conceptions of the posthuman world. His explanations of his processes further illustrate the refinement of digital workflows as part of VP technologies.

Tully Barnett's interview with digital artist Rosina Possingham in Chapter 9 discusses another project that grew out of Assemblage's Artist-in-Residence program, the extended reality work *Herding Caterpillars*. Possingham's description of the genesis of the project, her collaborators, funding opportunities, and the reception of her work, is a valuable account for artists seeking to develop their own VP projects, as well as the organisations that provide the infrastructure to support them. Chapter 10 also takes the form of an interview with Flinders University Drama lecturer Tiffany Knight. Knight recounts her use of The Void to create a hybrid digital and analogue live-streamed undergraduate student theatrical production. Her discussion of her directorial decisions in response to VP technologies and the adaption of drama students' performance styles illustrate the teaching benefits of the experience and foreground future uses for university drama productions.

Refuting the notion that acting for MoCap requires less skill and training, in Chapter 11 Renato Musolino unpacks how actor training programs that draw on Labanian theory can be adapted for MoCap performance. Musolino's case study centres on drama students' MoCap performances for the Lost Theatres project, which embodies the Labanian theories of Body, Effort, Shape and Space, and Movement Psychology.

Julia Erhart, Kath Dooley, and Tully Barnett's chapter follows a similar line of inquiry to Grbich, exploring the impacts of VP on workplace cultures in relation to women and gender-diverse people. Drawing on semi-structured interviews conducted with a range of VP educators, they uncover significant

patterns of gender imbalance which suggest that the promise of VP technologies as an industry 'equaliser' is yet to be realised.

A conceptual exploration of IVP's representational potentialities is provided in the chapter by Amy T. Matthews, Kendrea Rhodes, Melanie Ross, and Kathleen Stanley. Drawing on creative praxis and new technologies as a means to explore a language-less medium. This chapter considers how Derrida's ideas can be applied to photography, and theorises the potential application of these ideas of digital embodiment in The Void. For Matthews et al., The Void represents a potent incubator for extending the possibilities of meaning beyond language.

Jarrad Kowlessar, Tully Barnett, Anna M. Kotarba-Morley, Heather Burke, Ian Moffatt, and Penny Edmonds' chapter provides insight into the way VP technologies can be used in significant research outside of screen and media. The authors detail the geophysics and photogrammetry process used to digitise the historical Martindale Hall site, and the process of rendering the space into a photorealistic immersive environment in The Void using Unreal Engine. This process is valuable in illustrating how abstract geophysical data can be strengthened when viewed in an immersive digital space, and in providing a model for informal archaeological reconstructions of the past which increase engagement with heritage and cultural landscape.

In Chapter 15, Kristen Coleman investigates the aesthetic potentialities of game engines, such as Unreal, through an account of her development of a cinematic virtual reality (CVR) film, *SONNY*, in The Void. Coleman also provides a detailed overview of the development of game engines. Such game engines, Coleman argues, are significant for offering a means for independent practitioners to create work without needed, detailed programming knowledge to develop work at a low cost.

Finally, Lauren Woolbright's chapter outlines her proposed development of a virtual reality game based on an interactive immersive experience in Plato's Cave. Woolbright outlines the way in which her game is informed by current research on virtual technologies and mental health, as well as the concept of solastalgia and eco trauma brought about by a growing awareness of the impacts of climate change. Designed to build empathy and community for those suffering from environmental grief; the game centres on the player communicating their knowledge and experience of the world to persuade prisoners to escape the Cave's restricted perception. For Woolbright, The Void offers a valuable arena for testing, exhibition and demonstration, as well as a space to facilitate collaborations with experts in AI technology and MoCap performers.

Together, these chapters highlight the interdisciplinary and collaborative collegiality afforded by a university-based VP studio such as The Void. They highlight different instances of the creative industries collaborating in VP in pursuit of creative and cultural outcomes, experimentation and risk, and

creative and industry-focused learning. Working together, industry and higher education creatives can bring about new and enhanced workflows, technologies, skillsets, and visions to forge new approaches to immersive storytelling and visualisation for research and practice in every discipline and genre.

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1

FROM VIRTUAL PRODUCTION TO 'INTEGRATED PRODUCTION TECHNOLOGIES'

The Development of The Void

Jason Bevan and Cameron Mackness

Introduction

What is virtual production? As we go to press, when we hear the term being used to describe the relatively new method of filmmaking, it is immediately followed with reference to the Disney + series, *The Mandalorian* (Favreau et al., 2019), which hit our screens in 2019. Virtual production in reference to *The Mandalorian* has a comparable significance to computer animation in relation to *Jurassic Park* (Spielberg, 1993). As acknowledged by Ian Failes (Failes, 2016) both works showcased and referenced the method of production as much as the film and television series itself, highlighting the importance of the technological milestone to production. The film *Terminator 2* (Cameron, 1991) highlighted the possibilities of this new technology, but in the years that followed *Jurassic Park*, we saw the exponential growth of the computer animation industry in film production as the new normal (Failes, 2016); the same significant influence and publicity of new technology, namely virtual production, is influencing and changing film production methods (Snow, 2023) on a similar scale, and changing the landscape of the entire industry (Hodge, 2023; Bennett et al., 2023). Virtual production (VP) can and does take many forms. VP is an overarching term to describe the convergence of digital production and traditional filmmaking production techniques. The term harnesses game engine technology to create screen content. It allows filmmakers to visualise, plan, and shoot complex scenes with virtual elements in real time, providing opportunities for more creative control and an ability to create cost-effective production processes, for example, a reduction in the need to travel, and scheduling changes and lost shooting days due to inclement weather. In addition, the ability to view final pixel or imagery during filming

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provides increased efficiency by allowing filmmakers to make choices live on set which can reduce the overall cost of production, in particular, the need to fix it in post, lowering expensive post-production costs. The process may be live composited filmed imagery over computer-generated backgrounds. It may also refer to using a physically tracked 'real' camera to replicate traditional cinematography techniques entirely within a digital world. The most complex and sought-after process uses computer generated (CG) environments on large light emitting diode (LED) displays to stand in for locations and physical sets. This process is now most often referred to as in-camera visual effects (ICVFX), a term which directly references the cinematic past and the techniques of 1950s rear projection which was used to expand visual worlds, as seen in Alfred Hitchcock's *North by North West* (Hitchcock, 1959) and pre-digital filmmaking when all elements of visual effects were achieved in-camera (Rickitt, 2007). Actors are filmed and lit by LED wall and ceiling panels as if standing in a real environment. Compared to other techniques, such as green screen, the advantage is that integrating live actors and props with the background happens 'in-camera' and may not require as much additional post-production work. Actors can now see and react to the environments and elements they are performing with and against, giving them a greater sense of immersion and replication of filming on location. Another advantage is that the emissive light from the panels reflects accurately against reflective surfaces, seen effectively in *The Mandalorian*'s (Favreau et al., 2019) chrome helmet, but also used successfully in *The Batman* (Reeves, 2022) where scenes shot at dusk with Gotham bathed in beautiful orange hues can have a sunset last as long as it needs to get it right, since virtual sets can maintain a sunset for an extended period of time (Hodge, 2023). Using camera tracking systems, the cinematographer can synchronise the virtual world with the physical camera, ensuring that the virtual elements align correctly with the live-action footage, providing accurate perspective shifts. Producers can benefit from potential cost savings by utilising the same assets produced for the final virtual sets to pre-visualise complex scenes, allowing for better planning and coordination before the shoot. Noah Kadner stated in *The virtual production field guide* (Kadner, 2019), that a real-time engine has the potential to eliminate many of the bottlenecks of budgeting, scheduling, and development time. The integrated technologies help streamline the production process and can reduce the need for extensive post-production work.

The Birth of The Void

The Void, Flinders University's VP studio, is now entering its fourth year of motion capture. Each project has provided a unique insight into possible uses of the technology to solve workflow problems and offers standard methodologies that benefit many users.

We are two creative practitioners working in the university sector. Jason Bevan is a practitioner in visual effects, post-production, animation, and film-related courses, who joined Flinders University as senior lecturer in 2020 to teach Visual Effects and Entertainment Design. Cameron Mackness is a cinematographer who has been working at Flinders University as the lead audiovisual technician for the Drama Centre since 2007. We are joined by Dan Thorsland, the Creative Arts business development manager for the College of Humanities, Arts and Social Sciences at Flinders University. The combination of these backgrounds provided us with a unique skillset to work across diverse disciplines to bring together the necessary technology and teaching expertise to create The Void.

The Void was born from a research infrastructure grant in 2019 for a motion capture system (MoCap) to help facilitate the 'Lost Theatres' project (Tompkins et al., 2022). MoCap was initially intended to be a standalone system occupying its own space. Due to availability issues, it was decided to integrate the system into the existing television studio within Flinders Drama Centre. This serendipitous choice of location began the pathway towards what has become the core business of The Void, that is, the integration of emerging production technologies to create new functionalities by co-location and integration.

In January 2020, the first boxes of equipment for the MoCap system arrived, and the challenge of installing the system in a traditional television studio began. MoCap is an optical passive system from Vicon. Optical passive systems use infrared cameras to track retroreflective passive markers to track motion. This highly flexible and commonly used method can produce sub-millimetre tracking accuracy. The Void is equipped with a 20-camera system using Vicon Vantage V8 cameras. At the time, these were state-of-the-art cameras with a resolution of up to 8 megapixels (3328 × 2432) and a capture speed of 260 frames per second.

The initial steps were to learn how to set up a capture session and get clean tracking data from performance. Time was spent learning the correct placement of markers on actors to achieve a character boot, which is the process the Vicon Shogun tracking software utilises to transform a collection of marker dots into a humanoid tracking skeleton. Time was also spent learning how to track non-human objects such as props and cameras, and post-processing and exporting MoCap data for use in other software.

During this first exploration and learning phase, we were introduced to Epic Games' Unreal Engine as an interface for real-time live streaming of MoCap data. This is traditionally used in an offline post-production workflow where the MoCap data is created in a capture session and then post-processed, including a clean-up phase where missing and uneven data is smoothed and dropped frames replaced to provide a complete motion track of the capture data. This is then imported into a 3D computer animation program such as Autodesk

Maya, where the motion tracking data is applied to a rigged animation model and rendered as a final animation. However, by utilising Unreal's real-time game engine rendering, it is possible to stream motion capture data directly from Vicon Shogun via Live Link to animate a character or object in real time, including tracking a virtual camera from the movements of a real camera. With Unreal Engine 4.24 (UE), as it was then a core piece of our pipeline, we began to experiment with the creation of simple scenes with actors performing as distinctive styles of performance and types of characters. Using a simple video out capture of the UE scene, we could record and playback simple scenes.

In addition to the MoCap setup that had been purchased, we also had a *Faceware Technologies* Mk111 headcam system, which enabled us to do complete performance capture. Performance capture in this context refers to the capture of an actor's facial performance, which then can be applied to a 3D model and combined with MoCap movement, thus creating a full performance capture. This was the technology that Wētā FX, the New Zealand based visual effects company, developed and used so successfully by Peter Jackson to capture the performance of Andy Serkis as Gollum in the *Lord of the Rings* trilogy.

It was from these early experiments with face and body capture that The Void secured its first commercial client. The Void was engaged to provide MoCap with a digital avatar for a mobile app and a short video piece. We ran capture sessions recording body MoCap, separate face capture, and combined face and body capture. Then, we provided the client with the exported data, which they passed on to an animator. This early work pushed our knowledge and pipeline skills to produce work that we now regularly reproduce in a much higher quality and shorter time frame in classes.

As soon as we began to work with Unreal and refined real-time MoCap data streaming, it became apparent that we had most of the components necessary to create ICVFX. We just lacked some LED walls to use as a virtual backdrop. At this time, the world went into lockdown due to the COVID-19 virus. South Australia did not immediately go into complete lockdown like some other jurisdictions. Instead, various levels of restrictions were imposed over time between full lockdowns. This turned out to have enormous benefits for The Void and its creation as a virtual production stage, as we were able to loan some large LED walls from an event company whose primary use for them (live events and concerts) could not continue and this allowed us to begin experimenting with ICVFX. We started by learning the effects of shooting on LED walls through video background plates. We would shoot a 4K video, which we would run on the walls and place live actors in front of them. This allowed us to understand how digital noise patterns, known as Moiré, are visible when looking through a camera lens. These digital noise patterns can be visible when the individual LED elements of a wall are in focus, to the reflectivity of the walls, shutter speeds, camera sync, and many

other implications that become apparent when you point a cinema camera at LED walls.

From these early experiments, we progressed to what is arguably South Australia's first VP shoot with LED walls. We partnered with We Made A Thing Studios to produce a short film called *Coffee and Quasars* (Kelly-Bakker, 2020). Although not running as a complete nDisplay-style project, where multiple computers running Unreal Engine are used to render images to LED screens, it was our first experiment creating a scene in Unreal specifically for virtual production.

Over the next two years, we continued to refine our workflows, and upgrade and increase the equipment in the studio, moving from the loaned walls we had to a permanent install of a 6.5-metre-wide by 3.5-metre-high wall. We have purchased more computers, another headcam, and more MoCap suits and streamlined our processes. Software iterations and releases of updates have been frequent. We have moved from Vicon Shogun 1.5 to 1.9 while moving from UE 4.24 through to UE 5.2, each update giving us improved features and streamlined processes. We now run full-screen nDisplay projects with a tracked camera, and a mixture of live-action and live-streamed virtual characters.

From this experience at Flinders University, we have been fortunate to be one of the first universities in Australia to integrate emerging technology into our film, drama, and visual effects infrastructure, offering commercial

FIGURE 1.1 Actors in MoCap suits in The Void. Photo credit: Nat Rogers

opportunities in addition to our creative research and teaching. For example, we have partnered with the visual effects industry as they are increasingly using VP in their cinematic pipelines, and we are also witnessing an explosion of motion capture usage to simplify CG animation integration in more traditional VFX shots.

Jon and Mary Project

The technological tools we use in filmmaking and production are merely there for the director, artist, or producer to achieve their vision and creation. Approaching a project solely for using a particular piece of technology is challenging, and presents limitations and restrictions to a creative approach. For example, a script may be referencing an outdoor location which is easily accessible, while the visual effects supervisor may insist on a studio shoot to enable the use of LED screens to gain experience with the technology. When researching new technological methods of using new hardware and software, while the step-by-step tutorials from manufacturers' websites are useful, they lack the problem solving and individuality of different studio setups. There is a possibility in this instance for the user to succeed with an outcome; but when applying the knowledge to a more unique circumstance, there is far more focus on investigation and integration of techniques. To put this to the test it was important to throw ourselves in the deep end, using a creative project that did not necessarily anticipate using VP and MoCap as a filming method (see Figure 1.1).

The first major collaborative project in The Void emerged by circumstance and chance that technology could potentially aid the creative to visualise the intended script. The working title, *Jon and Mary* was a short script by Professor Garrabost Jayalakshmi, an award-winning filmmaker at Edinburgh Napier University, based on the work of author Derek Parfit (Parfit, 1986). Parfit asked the reader to imagine entering a 'transporter'. The machine puts you to sleep and then destroys you. It breaks you down into atoms and copies the information. The information is then relayed to Mars at the speed of light. On Mars, another machine uses local stores of carbon, hydrogen, and other elements to re-create you. Each atom is in the same relative position as before. Professor Jayalakshmi's script examined the story of a husband and wife with differing opinions on the ethics of Parfit's scenario. "But it won't be me!" says Jon, the husband, who struggles with the idea of his original self being destroyed.

At a time in history when much of the world was experiencing a global pandemic and film production and travel were minimal, the idea of using VP to visually suggest the different appearances of human characters on screen that would aid the storyline of this film was appealing. The computer-generated versions of characters in the script would act as a visual cue to identify them as humans who had been through a 'transporter', leaving Jon as the sole, real

actor to be portrayed on film. Emerging from online study, lockdowns, and an absence of social activity, a team of staff and student animators, concept artists, filmmakers, and practitioners in visual effects were keen to explore new methods of utilising VP technology on a script that provided opportunities for creativity alongside challenging new film production methodologies to explore. COVID-19 also led to a rapid advancement in tech, creative practice, and human resourcing of VP, so the team were able to draw upon resources that were increasingly growing with help using the *Virtual production glossary* (Kadner et al., 2022). In hindsight, we quickly realised the sheer amount of what is typically considered 'post-production', which enters the pre-production pipeline when working with this new production model. While the process was a huge learning curve and extremely valuable, production as a whole didn't fully embrace the new workflow, as described on Unreal Engine's VP hub (Unreal Engine, 2021). For the prototype there was still a huge focus on many additions in post-production that, given appropriate time, could have been front loaded. Additionally, technological developments were now moving at an astronomical pace, with software versions and tools changing every week. The experience was frustrating and challenging but enriching simultaneously, and laid down the focus of embracing a VP pipeline for future collaborations.

Lost Theatres

The initial research project that instigated the introduction of VP to Flinders University and the subsequent book, *Visualising lost theatres* (Tompkins et al., 2022), is based on virtual reality reconstructions of five significant 'lost theatres' worldwide. The term 'lost' describes where original buildings are no longer standing or only have parts of the structure still standing today. The continuation of this project in The Void allowed for the next stages of populating audience and interior to these now empty spaces. The book authors are international theatre researchers Emeritus Professor Joanne Tompkins (University of Queensland), Emeritus Professor Julie Holledge (Flinders University, University of Oslo), Associate Professor Jonathan Bollen (UNSW), and Associate Professor Liyang Xia (University of Oslo). The Vicon motion capture system installed in The Void allowed Professor Holledge to work with performers to investigate colonial actors' performances on the 1841 opening night of the Queen's Theatre, Adelaide. The project aimed to fill the auditorium with an avatar audience animated to recreate moments from spectators' responses to the opening-night performance. In 2023, the second and technical production stage populated the virtual theatre with these designed avatars and wrote the code to animate them with MoCap files. Professor Holledge explains in her book chapter on the Queen's Theatre in Adelaide that the aim is not to establish a definitive representation of the Queen's audience but to create a function within the model for the

MoCap files to be mixed and matched by users and played through 1,000 avatars in the virtual theatre (Tompkins et al., 2022). The emphasis on an actor's performance and the ability to transfer emotional performance to the digital avatar using *Faceware* was paramount in the MoCap sessions. It again highlighted that the technological tools being used here are developing all the time to enhance that ambition.

Peleda: Behind the Scenes in The Void

In the latter stages of 2020 and following the initial dive into a complete virtual production prototype with staff and students, the local industry in Adelaide, including connections interstate, reached out to collectively prototype a new workflow for a 3D animated series. Luke Jurevicius, director of Vishus Productions and the brainchild of the global hit animation series, utilised Peleda (Jurevicius, 2012) as the foundation for this study. Together with the director of the Adelaide-based VFX company Model Farm, Shane Aherne, Flinders University staff worked with industry professionals to identify a potential motion capture workflow for an animated series that initially would have involved keyframe animated 3D models, fully CG rendered backgrounds, and hours of rendering. Shane identified that in using real-time technology, there is a massive opportunity to drastically decrease the hours needed to render a frame of animation (usually 25 frames per second) from 10 hours to 5 seconds per frame. Producer Bree Whitford-Smith said that an animator usually gets through approximately 3 seconds a day of computer animation.

In contrast, you could reasonably get through about 10 minutes a day in a MoCap environment. She acknowledged that the output quality using MoCap would change in comparison to keyframes animation. However, additions such as handheld cameras bring other opportunities to speed up the workflow. Animation director Luke Jurevicius said he would usually record himself acting out a scene for an animator to follow. Still, in this workflow, he would simply be directing the actor performing his animated characters while viewing the outcome in real time on the screen in the studio. Having back and forth between director and actor in terms of how they can play a scene with different options is an interaction you would never get in a hand-animated environment. The coming together of creatives and industry professionals in Flinders R&D space highlighted the potential of activating The Void in this collective capacity, to solve very real and topical industry-focused challenges.

Australian Dance Theatre

Another project that expanded the capacities and vision of The Void was its collaboration with the Australian Dance Theatre (ADT), Australia's oldest contemporary dance company, based on Kaurna Yerta (Adelaide, South

Australia). With a 20-year association with ADT as the company's longest-serving artistic director, Professor of Creative Arts at Flinders University Garry Stewart brought the ADT performers into The Void in 2022 to push the capabilities and fidelity of the MoCap system. Specifically, the aspirations were to maximise the number of performers capable of utilising the studio's footprint, along with analysing the quality of digital capture, including integration of a multitude of dancers in very close proximity to one another, often interacting and combining to form contemporary dance performances with shared physicality. The outcome of the week-long study was up to six dancers performing multiple contemporary performances to enable visual effects and entertainment design students to visualise multiple creative character outputs for the recorded choreography. In contrast to working with facial and performance actors concentrating on subtle humanistic nuances, the ADT study focus was fluid movement, acrobatics, and purposeful motion to push technological boundaries in the studio and generate multiple stock assets. Suffice to say, the outcomes were high impact, energetic, almost bordering on stunt performances, and considerably widening the potential use of multiple performers in The Void space. The capacity of six performers was chosen by the suits that were available with no drop difference in data quality in comparison to one performer.

The Friday Club

As a part of our ongoing research and education into VP, we began to run a weekly study group session, where we identified a particular aspect of our learning we wanted to focus on. These varied from simple tasks within a particular piece of software to more complex tasks for specific projects we wanted to explore. We quickly opened these sessions up to students, other interested artists, and participants who wished to attend. The logic behind this was that by combining people with diverse backgrounds, we could cover more knowledge bases and thus find quicker solutions to problems. The research days evolved into the Friday club with a revolving group of people attending and contributing ideas and solutions. One of the early visitors was Liam Somerville, who would become the first Artist-in-Residence from Flinders Assemblage Centre to base their work in The Void. In these Friday sessions, information and ideas could be bounced around informally, and ideas could be explored that would form the basis of more structured research along the way.

The sessions also worked as informal teaching and learning, as participants would learn tips and tricks from each other, and the group could solve shared frustrations. It can't be overemphasised: the importance of having people who understand your journey when you begin to work with emerging technologies and cutting-edge software and hardware. The world of virtual production has moved incredibly rapidly, and the requisite knowledge of the systems and

software needed to run it often outstrips the capacity of individuals to retain and keep up to date. The sharing of knowledge among the Friday club enabled individuals to maintain specialist knowledge while advancing their generalist knowledge, highlighting the importance of having these resources open to interdisciplinary learning and exploration in the university sector.

Assemblage Supports The Void

The Assemblage Centre for Creative Arts is Flinders University's research centre for artistic inquiry and art creation. Assemblage embraces new technologies and ambitious collaborations to dissolve perceived barriers between art forms, disciplines, and research areas to uncover boundless possibilities. The initial connection between The Void and the vision of the research centre transpired through the content of the research proposals aligning with the Centre's research themes and, more importantly, the Artist-in-Residence program. Each year Assemblage runs an Artist-in-Residence program resulting from a competitive application process. The two- to three-month residency is designed to benefit the chosen artist, and our students and researchers. Their work is allied to the major research themes of Assemblage. Following a successful application process, Assemblage appointed Liam Somerville as the Artist-in-Residence for 2021 but also identified two other exciting projects from Rosina Possingham and Voxon, a team working on volumetric displays. Voxon has built an advanced 3D volumetric display where objects do not reside on a screen but physically exist with a volume or 3D space (Gavin Smith, 2009). Rosina's project titled *Herding Caterpillars* planned to digitise a play about the symbiotic relationship between the Chequered Copper Butterfly, the native oxalis plant, and the Black Ant using 3D assets, MoCap, and VR resulting in a prototype for a short play of animated characters, viewed using VR goggles. Following the 2021 residency, Assemblage provided the opportunity for further work with Rosina in The Void to implement her vision of her play. It worked with local companies CDW Animation and BEER Labs to create the VR experience and an AR application to host some motion capture content on Android and OS devices.

During the Assemblage Artist-in-Residence program, Liam created a VR experience titled ESCHATECH, which is a simulation of the last 100 seconds of humanity on planet Earth. The player is given no objectives but is free to explore the landscape to discover virtual dance, digital sculptures, and the last remains of human life before their time runs out. The digital landscape illustrates some of the catastrophic environmental devastation humans have inflicted upon our home planet since industrialisation. The project was created using the latest MoCap technology available in The Void. The data from actors and performers was then piped into Unreal Engine to influence particle systems and character models. This world-class tech allows easy and free access

to creatives like Liam to achieve extremely high-fidelity of renditions of human performances that can provide hyper-realistic virtual 3D animation.

We're Going to Need a Bigger Boat – Conclusions from the Early Years

In 2021 we delivered a white paper, identifying the work that took place in The Void in 2020, together with aims and objectives for future investment into the space. This served as an indicator of the collaborations, residencies, artists, and student projects, highlighting the current gap in documented outcomes of setting up and running a VP studio. The knowledge and skills acquired during the first year of operation for The Void contributed to new and improved curricula in VP, MoCap, and Unreal Engine. It also provided an invaluable source of training and expertise for the program staff that could not be acquired elsewhere. The benefits to the industry of having a sandbox of MoCap, virtual and optical screen production technology, where they can experiment at a far reduced cost and risk factor to that which would otherwise occur, allows Flinders and The Void to be at the cutting edge of virtual production. Further details of collaborations with Sally Coleman, Rosina Possingham, and Liam Somerville are all documented within this text. In addition, new projects continue to emerge through networking engagement with current collaborations taking place with the SA Maritime Museum, 7D Games, and Rising Sun Pictures in Adelaide.

In 2023 the first intake of students in the Master's of Virtual Production arrived at Flinders. They meet weekly in The Void to progress their skills in MoCap and VP. With staff and students coming from diverse backgrounds in various fields of expertise, such as cinematography, visual effects, and animation, joined by artists and industry, all R&D in The Void provides a wealth of new knowledge for all stakeholders involved. Every session in The Void has the potential to unlock new workflows, pipelines, and practices. From these sessions, it will have been possible to write a new curriculum for teaching VP – as a whole and in more specific sub-areas to support creative practice projects – to achieve new outcomes and to build new understandings of capabilities of The Void. The language developed in these sessions is one of the major new areas of knowledge. What terminology is correct, and how has VP not been explored previously? A complete pipeline from start to finish for asset usage in The Void will also contribute to VP knowledge. The knowledge of how to reverse engineer pipeline assets for other studios and applications is invaluable. Continued development on working with stakeholders to integrate production technology in The Void on collaborative projects is essential; however, delivering the outcomes and disseminating the results to a wider audience who may be unclear of the potential of this emerging technology

FIGURE 1.2 Cameron Mackness and Jason Bevan conducting creative research in The Void with an industry partner

in their own practice is of significant importance to grow an infrastructure of practitioners in this field.

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2

LIFE SAVINGS

An Interdisciplinary Short Film Collaboration

Shane Bevin, Helen Carter, Katie Cavanagh, Nicholas Godfrey, Sarah Peters, Sean Williams, and Tom Young

Introduction

Life Savings is a 13-minute short narrative film developed through interdisciplinary collaboration within a university context. Shot primarily in The Void, the virtual production (VP) studio at Flinders University, the creative team had two primary goals for this project: to research the strategies employed in an interdisciplinary collaboration across the disciplines of Creative Writing, Drama, Screen, and Visual Effects and Entertainment Design (VEED) of this scale; and to work extensively with VP as a key creative stimulus when worldbuilding in the film. Three strategies emerged across the case study as vital to the project's success: iterative creative play, finding a shared language, and building a community of practice. This chapter outlines each of these strategies, drawing on reflections and thick descriptions by each member of the creative team to illustrate the approach in action and allow readers to 'cognitively and emotively "place" themselves within the research context' (Ponterotto, 2006, p. 543). We conclude with an analysis on how The Void and our set design in this space became the physical nexus of our individual disciplines and areas of expertise, serving as both a tangible manifestation of the film world in VP, and a metaphor for the layers of collaboration required in effective interdisciplinary projects.

Aims and Intentions

Establishing the mutual goal of creating a short narrative film from the outset of the project was a useful focusing device for our collaboration; however, each member of the creative team also brought their own individual aims and

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intentions to the decision to participate in this interdisciplinary project. For Helen (cinematographer), her intent was to "gather together the different creative practices and interests in our college to create a short film project. I took part because I wanted to encourage my colleagues to make a film and to foster a collaborative approach within the college". For Sean (co-writer and composer), it was about "learning new storytelling approaches and skills that take me out of my own head and usual practice". As Enciso et al. (2010) described, 'the process of collaborating involves developing relationships where each other's strengths and resources are combined to create a synergy that is greater than the parts of the whole' (p. 239). This sentiment is captured in Tom's (producer and co-director) reflections as he sought to "bring together an interdisciplinary team of creatives, and to work extensively with VP. I truly embrace filmmaking as a shared experience, where the team can achieve far greater than the individual".

Sarah (co-writer and co-director) was "excited by the possibility of pushing at the boundaries of my creative practice and working in mediums that are new to me, while engaging in a process which sought to prioritise creative exploration, community building, and care". Shane (visual effects supervisor) describes how in our academic context:

> we are surrounded by an amazing group of creative practitioners; however, we very rarely see them in a production environment. As educators we are often teaching techniques and workflow using our own individual production experience and the production experience of larger 'real world' projects … this is a real-world project I could share with my students about present and future, showing the process, discussing workflow and, most importantly, showing the collaborative process in a project I understand.

Katie (graphic design lead) also emphasised a focus on collaboration when reflecting on the purpose for engaging in the project, explaining that there was a "conscious decision to commit to working together as a team", to think through how we could "work in our various areas of expertise together in a pipeline", learning from the expertise of our peers.

Iterative Creative Play

The story of *Life Savings* is set in Sean's pre-established fictional world of 'The Structure' – a sci-fi, futuristic, fantastical place where time works in non-linear ways, and there are worlds within worlds. Sean invited (and trusted) us to play within this preexisting world, where the sci-fi qualities already leant themselves to using VP and The Void within the creative process. To play is to do something for enjoyment. It is intrinsically motivated, and 'an

important form of behaviour that facilitates creativity … playful behaviour and playful thought can generate radically new approaches' (Bateson & Martin, 2013, p. 1). It can encompass experimentation through *playing with* ideas, improvisation through testing and role play, and, as Bendix, Bizer, and Noyes (2017) described, requires the vital precondition of trust in order to be effective – particularly in interdisciplinary projects. We began with a series of writers' rooms, exploring our collective interests, views, and values. For a long time, the formal discussion and allocation of crew roles was put aside, allowing the story, plot, characters, and narrative to develop organically and collectively. As one of the more experienced filmmakers, Tom made suggestions to guide the writing process, primarily around how we might purposefully inform both the worldbuilding and writing process with our goal to film in The Void and use VP.

Each member of the writing team took turns drafting the script post meetings, iteratively working through a conversation-drafting-feedback cycle until the script was complete. This resulted in a collective sense of ownership, where each of the writers has been able, as Sean describes, to "add our own bits and bobs, safe in the knowledge that they're appreciated even if they aren't preserved in the final work … the group mind worked well, and I found being part of it very stimulating and rewarding". As Jaffe et al. (2021) outlined, when people trust each other, have established mutually agreed goals and feel safe to be themselves transparently, creative play can build a space for collaborative potential. It took time for creative play to be embedded in the project. In early drafts, the writers tended towards writing feedback and commentary on the work, annotating the script with offers and ideas. While coming from a place of respect, it had the effect of keeping those ideas at a distance, existing in parallel to the script proper. As our relationships and community of practice developed through playful brainstorming sessions and shared lunches, we were better able to directly write into and with someone else's sentences, and the work became stronger because of this. Jaffe and colleagues described a similar collaborative writing process, reflecting that it was only when they were able to 'directly intervene in the text rather than simply leave margin comments or suggestions' (2021, p. 12) that the work and their collaborative process improved.

Helen reflects that while she:

> attended some script meetings and readings, in hindsight I regret not raising my concerns about lengthy dialogue. I wanted to be encouraging but given my prior experience as a filmmaker, I perhaps should have said something? … [Later in the project] it became obvious that the script was too long and I felt we spent too long filming dialogue that would be cut, at the expense of filming interesting coverage.

Other members of the creative team also reflected on managing this balance between encouraging a supportive and playful space of collaboration with the expertise and insight of wisdom and professional experience. When do you offer critical commentary? When is critical feedback a productively useful skill building exercise and when might it risk interrupting creative flow or confidence? We did not always strike the right balance, especially as the writing occurred in the first phase of the collaborative project when the shared language and relational community of practice were still being developed.

Finding a Shared Language

One of the core strategies which emerged across the project was the way individuals sought to translate their vision/idea/way of working into a mode that was more accessible for the team as a whole. Thomas and McDonagh (2013) have suggested that

> within the process of collaboration, a shared working language should be developed that helps to define and sometimes redefine terms, language and processes to reduce the need for translation. This agreement is helpful in developing a consistent frame of reference for rigorous expectations […] It is most effective when created together by the team.
>
> *(p. 48)*

Borrowing from community-engaged practice's remit to 'move through relationships, not timelines or processes' (Kelly & Coleman, 2019, p. 60), we leant into our relationships in order to find the language which would help support each stage of the project. This sometimes meant creating mood boards, example visual stills, offering briefs and facilitating test shoots. During the writing phase, a wide-angle still photo of The Void was used to visualise some of the elements, including an image on the screen itself, theatre flats to create walls, pillars to hide the edge of the screen, and office furniture for set dressing. This image helped to partially demonstrate how the layering of elements would be utilised, and also informed how the writing team wrote action and interaction into the script.

Rather than dictating what some of the physical design elements (such as the physical hero prop of the Time Scope) might look like, Shane was provided with a brief which was clear enough to offer creative constraints, yet broad enough to leave porosity for possibility, and Shane's own creative experience and imagination. The prop needed to be fabricated, as the actors interact with it in various ways, and it was important that there were opportunities for physical interaction to be built into the design. The practicality of the way the Time Scope is used is described in the script; however, the design language

is not. Shane reflects that his first step was to gather references and create three mood boards filled with examples of science fiction apparatuses. Each mood board needed to communicate three main variables: the overall visual aesthetics of the potential designs, the practicality of how the designs allowed interaction by an actor, and the ease of fabrication. As I knew I was going to be the fabricator of the prop, I needed to make it clear that some designs would make fabrication difficult and potentially expensive in terms of materials and time. My preference was to fabricate a prop taking a 'kit bash' approach using a combination of fabricated parts and, to be honest, junk from my extensive collection of junk! A slick, curvy, and shiny futuristic design would have led to the need for fabrication techniques beyond the scale of the project, and so my preference was a retro science fiction aesthetic with a nod to cyberpunk shape language. My design was approved and so I moved on with the creation of the prop, a combination of gathering old valves from a radio to repurposing a broken virtual reality headset.

Providing creative briefs was also a strategic method used to include students in the project. In one of Katie's graphic design classes, students were given a brief to create production assets, namely a collection of posters which would be hung on the walls of the call centre set constructed in The Void. The posters needed to convey the values of the call centre company as well as meet the aesthetic requirements of production design. Students had the option to respond to the *Life Savings* poster brief as an assignment task, and for Katie this was a great opportunity

> for students to have a brief beyond the classroom and to work on a project where not everything gets used … as the students processed the brief from the directors they asked me questions, and I told them I couldn't answer as this wasn't my project – I was a mentor not a client. This shift turned the classroom into a collaborative design space where students sought advice and problem solved, but had to respond to their understanding of what the client wanted. The students met the directors twice, once at the brief and once at the pitch. They worked with me in-between as mentor. I kept my eye on other assets being made and group discussions in the academic team to ensure that we stayed roughly on track – this became easier when we realised that *we* were creating the track.

Tom and Sarah selected six poster designs for inclusion in the film.

A test shoot is another means through which we were able to find a shared language and problem solve unforeseen challenges of working in The Void, especially when working with so many new variables and collaborators. Tom reflects the "utilisation of virtual production within the project was difficult to quantify early on; all departments needed to know how we were going

to achieve the desired effect so they could provide input and then prepare accordingly". The test involved several key crew and tested elements including: the LED screen, background visuals, midground set construction, foreground actors, lighting, and composition of shots. This test provided the team with confidence and focused our efforts, particularly on improving the background visuals, and the layering of many additional physical items. For Sarah, who had previously worked predominantly in theatre, the test shoot was an opportunity to be immersed in the physical space of The Void, and also in the culture and language of a filmset.

> It meant that I had an embodied understanding of the space we'd be filming in, the words the creative team were using to describe different processes and pieces of equipment, and I could then take that knowledge into my rehearsals with the actors, so that I could describe the layered set design and be able to prepare them successfully for the shoot.

Thomas and McDonagh (2013) explained that finding a shared language can sometimes mean simply explaining a word or approach, and sometimes mean a deeper level of engagement and immersion in a process which over time builds an embodied shared language. The test shoot was a crucial method for our creative team to develop this shared language.

The test shoot also highlighted technical problems while there was still time to solve them. Helen reflects that

> through trial and error, we learned how much light was needed for foreground action, and where best to position lights to expose for key action but not light up the screen. The screen itself was bright enough to be considered its own light source, in some cases, a back or side light.

In preparation for the test shoot, Shane created the 'futuristic city' backdrop to work as a real-time 3D environment in Unreal Engine to take advantage of the full virtual production pipeline; however, he also aimed for a workflow that may lead to a more traditional pre-rendered matte painting outcome, knowing that having a moving city backdrop was still going to be a valuable outcome. Shane reflects that

> the virtual production pipeline is developing so quickly that I would create the city environment in a very different way were I to do it now. Having access to The Void allowed for some testing along the way and it allowed us to try out the options, knowing that once the shoot was underway, it would be too late to pivot.

By the time we came to shoot with all the cast and crew present, the production ran smoothly and without major technical issues, allowing time each day to

further experiment with shots in addition to the required coverage. The test shoot was useful for establishing a common language and process for on-set filming protocols, and meant that we were better able to lead with what Laura Frank describes as a 'creative first' (2023, p. 161) approach to VP, keeping our artistic goal as the primary driver during the shoot, as we had already worked through some of the technological processes. Explicitly discussing a creative-first approach during the writing stage may have assisted us to better balance critical feedback with creative confidence, and this has been a useful lesson for the creative team.

Building a Community of Practice

Embedded in the two previously discussed strategies of iterative creative play and finding a shared language is the recognition that we were developing a community of practice as part of this project. A community of practice requires mutual engagement, a joint enterprise, and a shared repertoire (Wenger, 1998, p. 73) and is 'any group of people who share a focus, interest, goal, or body of work, and who are working together in order to learn about, practice, and then get done whatever it is that they are wanting to do' (Tummons, 2022, p. 2). While there are components of 'shared repertoire' that share qualities with finding a common language, it extends to routines, values, ways of interacting, and of expressing 'belonging and identity' (Smith, 2012, p. 74) within the group and project. Our community of practice was especially evident when students and other artists were brought into the project. The creative team sought opportunities to collaborate with students and alumni through this project with staff working in their capacity as professional practising artists. Helen describes wanting to provide a mentoring experience for students,

> as I have found this benefits my teaching in production topics. My starting point for this was the creation of an artist's book, subsequently named by my student gaffer The Magic Book. We collected sample lighting gels, reference frames from other films and basic information about camera settings. This book turned out to be invaluable as the shoot stretched out over several months.

The Magic Book became a tangible archive of the community of practice and our shared repertoire. As Mercieca (2017) outlined, learning is 'best facilitated within a community of apprentices and more experienced workers' (p. 4); where the project (or joint enterprise) has 'drawn participants together, and community has sustained their fellowship and learning, it is practice that crystallizes these experiences and shared knowledge' (p. 11). In the context of this project, the students can be understood as the community of apprentices, working with and learning from staff and other professional artists and alumni.

We were fortunate in this project to have a small budget to pay graduate Ella Burton in the role of 1st AC (assistant camera). Helen reflects that

> as well as keeping on top of focus and technical issues, Ella's attention to details and proper processes helps me to keep the shoot day moving along at a good pace. I always feel that Ella has my back and will let me know about small but important details such as boom shadow, an over exposed area in the background of the shot or a design element that isn't quite straight. She always takes the time to teach students about what she is doing and how to be an organised camera assistant.

In our community of practice the creative team were sometimes experts, sometimes novices, and sometimes anywhere in-between (see Figure 2.1). Figuring out when to step in and share our expertise, or whether to hold back and let others figure things out themselves, is one of the core skills that we are still refining. In a successful community of practice you 'need to negotiate a level of comfort with uncertainty (turbulence), practice being humble in recognition of all that is yet to be learned and take responsibility (and ownership) for the knowledge being created' (Peters & McDonald, 2019,

FIGURE 2.1 Camera assistants. Photo credit: Tom Young

p. 233). For Katie this was catalysed when tasked with creating a company logo for the film:

> It was refreshing to design from sketch through to completed project with a client who had ideas of what they wanted. For me it reinforced the value of role reversal where suddenly I am the one being given a project and having to do all of the problem solving and production. This both reinforced my knowledge of the processes and it pushed my skills in the software as I needed to work out some complex paths.

A community of practice helps provide a framework for participants to move between the roles of expert and novice, teacher and student, and requires a willingness to embrace the 'vulnerability inherent in opening the door of reflection on the messiness of practice' (Wenger, 2009, p. 5) within a collaborative project.

The Void as Interdisciplinary Nexus

At the outset of the project Tom had challenged the team to push the boundaries of our modest studio space and VP screen. He imagined the large LED screen as a window of a skyscraper, displaying a vista of an alien world. This approach would allow physical set design to be built up around the screen and expand the set beyond the confines of the background image, thereby maximising the floor space available within the studio for set construction. Sean reflects in response to this challenge: "It resulted in some writing possibilities, but just as often, and more usefully in the creative sense, it results in creative constraints that guided the story-building process down particular paths." We had agreed to shoot the majority of the film in The Void, which meant the location needed to meaningfully accommodate a dynamic story where, believably, most of the action and interaction can take place. A single location story, combined with Tom's prompt to think of the LED screen as a window, were useful creative constraints that ultimately led to the call centre which is at the heart of the film. This then had the domino effect of informing the narrative and characters of this world as we explored the power dynamics of a call centre. The Void, and by extension VP, served as the key creative stimulus for worldbuilding.

The Void became the physical meeting place of our interdisciplinary collaboration and areas of expertise. As Katie explains, "production pipelines came together in The Void as a physical and virtual space so it was both a catalyst and a testing ground". Final set design at the time of filming included ten major elements, listed here in order from the back of the studio to the front:

1. LED screen displaying a rendered Unreal Engine 3D sci-fi cityscape
2. Theatre flats, running at a 30-degree angle from the LED screen

FIGURE 2.2 Production still. Photo credit: Tom Young

3. Posters on the flats
4. Pillars to hide the join between the screen and flats
5. Extras walking in the deep background
6. A row of desks with extras sitting
7. A low partition in front of the desks, lit with coloured lighting
8. Extras walking in the midground
9. A closer row of desks with the main character in the centre, featuring the Time Scope
10. Another low partition in front of the desks, lit with coloured lighting

Each layer in this set design is vital to the successful look of the scene onscreen, and combines VP components, digital and physical architectural set design, and live action (see Figure 2.2). The world is created through a combined layering as indicated in the list above, and each component needed to work together to cohesively communicate the world of the film.

Conclusion

The project was truly interdisciplinary in the sense that it involved equal creative contributions from our disciplines of Creative Writing, Drama, Screen, and Visual Effects and Entertainment Design. The creative development and writing process was highly democratic and iterative, with successive script drafts being revised and rewritten by a working group of academics from a range of disciplines. The shoot itself involved academic staff, current students, and recent graduates, which is a model of collaboration and community of

practice we are keen to maintain for future collaborative projects, both within our teaching program, and in creative activity outside of official university business. The strategies which successfully served this project – iterative creative play, finding a shared language, and developing a community of practice – may be useful to a wide variety of collaborative interdisciplinary projects and they are not bound solely to work in VP. However, these strategies create and emphasise space for experimentation and play, actively seek to remove barriers to collaboration, and position relationality as a core value – all qualities which are particularly useful (and perhaps stabilising) in the context of VP's rapidly changing environment.

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3

DIGITAL MEDIA FRONTIERS IN TEACHING AND LEARNING

Using The Void as a Space for Student and Staff Skills Acquisition, Collaboration, and Teambuilding

Shane Bevin and Katie Cavanagh

Introduction

This chapter is written by two teaching-focused lecturers from the Creative Arts discipline, who are both located within Digital Media. At Flinders University, teaching-focused means we are allocated more teaching and less research in our workload. The research that we do undertake has to do with creative practice, in addition to teaching and learning scholarship. We both teach in the Bachelor of Creative Arts (Visual Effects and Entertainment Design/Game Design) and the Bachelor of Creative Industries degrees. As practice-based academics, we have worked on many projects together over the years and have often chosen to co-teach topics. Before becoming an academic, Shane Bevin was a founder and technical lead of an animation studio, while Katie Cavanagh holds an English Major and completed an Advanced Diploma of Applied and Visual Art. As part of our teaching practice, we regularly initiate project-based learning opportunities across a range of media and pipelines. In their professional lives, our students will likely need to be able to work to a brief and make creative decisions both independently and as part of a group.

The Void

The Void is a virtual production facility at Flinders University combining motion capture with in-camera effects technology. It is used for student coursework, research projects, and industry partnerships as it lends itself to a wide range of disciplines and practices. The Void breaks down traditional patterns of rigidity between disciplines as it pushes the technical and storytelling knowledge of both students and lecturers. The physical space requires a greater amount of

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specialist knowledge than any single discipline, and requires vulnerabilities and communication between academics as learners, colleagues, and teachers.

During our time working in The Void production stage, we have been able to use this new resource for different purposes. Shane has experimented with trialling the photogrammetry of model ships with archaeology assets, making 3D game-ready environments that a digital camera can be mapped to, in addition to physical prop-making. Katie has used the space in a more traditional way, by facilitating worldbuilding projects in topics where student-made assets can be used within The Void. Working together as collaborators challenges both the students and lecturers as they progress through new techniques and practices. We have found that collaborative setbacks such as self-interest, or the fear of not being an expert in the classroom, can give way to the needs of the pipeline and the genuine joy in group problem solving in a studio environment. These approaches emerged clearly in our roles in the *Life Savings* short film project.

Life Savings is a 15-minute film which served as a vehicle for an interdisciplinary project, briefly joining the Creative Arts streams at Flinders University in 2021 and 2022. Staff and students in multiple streams joined together to collaborate on a common creative project while also working within their own areas of expertise. In Digital Media, The Void facilitated different aspects of professional and artistic practice for staff and students. For students, this became an opportunity to use cutting-edge industry facilities and project-based learning in our in-house production suite. For staff, our knowledge is interrogated by the new equipment, and our skills are moving forward at the same rapid rate as digital industrial processes.

Although a single project, *Life Savings* was contributed to by multiple disciplines and university classes, providing the academics involved with an opportunity to push individual practices forwards in a modern pipeline. Working in a university with a strong Creative Arts focus, staff are all roughly aware of each other's areas of strength. Within disciplines, this awareness is even more pronounced. Working together on *Life Savings* was a strong teambuilding experience as we learned professionally and socially how to gracefully pass the baton between our areas of expertise. The project required oversight, but each academic and student cohort brought their own strengths. For example, Tom Young, from Film and Television, and Sarah Peters, from Drama, proved deft at utilising process-based management. This included putting into place supportive structures and meetings resulting in an outcome where each discipline had management over their own areas of expertise, while the larger project was also kept on track and communicated clearly. There are examples of student and staff work created for *Life Savings* in the pre-production material as well as the digital and physical props and sets (see Figures 3.1 and 3.2).

FIGURE 3.1 TimeScope and PathCoach graphic design assets. Photo credit: Katie Cavanagh

Some of our physical props in The Void were specifically designed to help the actors embed themselves in this imagined science fiction world. In this chapter, we will discuss the sets, the graphic design for the film's world, the 'window', which uses the LED screen in The Void, and the TimeScope: a physical prop

FIGURE 3.2 TimeScope, graphic design props and virtual set. Photo credit: Shane Bevin

with lights and functions. The relationship between the technology, the performers, and the performance is a critical one.

> Virtual production is meant to aid in the creative process, not replace it […] And part of the challenge is finding that healthy balance. If the pipeline creates an environment that actors do not like working in, then it (virtual production) is not doing its job[.] If any part of the virtual process is limiting, then we try to fix it. It is a supporting tool, not a restricting tool.
> *(Russo, 2020)*

The collaborative nature of the incorporation of new technology is not new to film production but overlays itself onto a complicated, already existing creative process.

Graphic Design and Collaborative Processes

The graphic design processes for the making of the logo, props (including text), written office props, and signage fell within Katie Cavanagh's field of teaching for the *Life Savings* project. Every year I give the graphic design students real-world design briefs to work to, and in this case the project-based learning process was wrapped around the creation of entertainment design assets. The film directors, Tom and Sarah, came into the class as clients to give the students their design brief: they wanted signs for the office set that was to be built in The Void. The students then had to ask them to define what the project was and explicitly what they wanted. This questioning was both practical ('What size will posters be? What files will the printer want?') and form based ('What is the function of the posters in terms of the film? What is the function for the actors? What is the function for the audience?'). The

posters were supposed to represent the culture of the business, which is critical for the story of the film and to help settle the world visually for both audience and actors. These physical props were valuable in The Void as the real-world reflections of the objects from the screens are tricky and time-consuming when done in post-production. The briefing led to productive class and group discussions. The directors and students created mood boards and sketches to get everyone on the same page in terms of aesthetics. Each student made their own version of a poster, and each group presented four posters. The students could bounce questions off one another and as a group they largely made their own decisions. As a lecturer I was there for overall guidance ('Have you left space for the logo? Don't forget the importance of contrast …') but the problems of design and production were largely there for the groups to solve on their own. The project gave the students an excellent opportunity to showcase their skills while also showing their interpretation of the office culture through physical artifacts. Students had six weeks to work on these in groups, while being aware of logistics such as being printed on corflute at A1 size to make them both visible and durable.

The purpose of the motivational posters was to make the office seem authentic for the actors and to help integrate the feel of the space for the film audience. In terms of timing, the graphic design topic was running months before production of *Life Savings* was scheduled. The brief needed assets that could be used at any time: it did not have to be synchronous. One of the interesting challenges of a trans-disciplinary pipeline is that processes must run in parallel that would normally have start-to-finish or start-to-start deadlines. The 12-week semester can be considered a false timeframe in terms of traditional project management scheduling. Shane Bevin was starting work on the TimeScope prop at this stage, and the group decided on 'retro-futurism' as the overall aesthetic. Making and designing all the props so that they existed clearly and coherently in a single world is an important aspect of the production for both actors and audience. Knowing that many of the tables and chairs would be pre-existing assets gave the physical production of other items a chance to shine in terms of anchoring the scene in a unique and believable world. Shane finished the TimeScope prop before the students finished creating the posters for the PathCoach office – it was easy to vectorise the photograph of the TimeScope for use in some of the posters. This helped with worldbuilding and led to discussions, where both staff and students were working together rather than being overseen and directed. At the end of the semester, students pitched their designs to the directors Tom and Sarah. This was very useful for the students as they had to explain their response to the brief in the pitch. This also gave the students a chance to experience client feedback and refinement before printing. A limited number of PathCoach office posters were needed and it was valuable for the students to see that a piece of work can be excellent; but if it does not fit the brief, or the client's

preference, then it is not selected by the client. This real-world interaction can be difficult to teach without the students experiencing such interaction. At the end of the topic we had a debrief that unpacked the nuances of working in a creative team on a physical project for a virtual world.

The corporation (PathCoach) in *Life Savings* also needed a logo. This was another asset that would help join all the props together; the logo was to be a commonly used asset on all mugs, posters, and binders. While the logo was also given as a possible brief to the students, the client said no to all options. As a lecturer, it was suddenly time to 'walk the talk' and make a logo as it was necessary to have it done before the posters went to print. Tom Young came to my office and gave me a quick brief, and we had a refreshing series of exchanges where we got to see each other work in our respective areas. I teach graphic design but creating a logo required me to challenge my practice as I needed to work out how to create something new, not take my normal path. The project had this effect on all staff members; we were all pushed outside of our normal practice, while in a safe workspace. The Void was a new environment for all of us. Having access to such a high-tech space is very exciting and important for the students. Working with colleagues to create a shared world, literally from the ground up, is a catalyst for all involved to upskill and to gently step into the space together as a group.

I have been to hear the respected Hollywood graphic designer Annie Atkins talk. Her graphic design worldbuilding for screen is one of my favourite aspects of some of Wes Anderson's films. Knowing that document binders were going to be on every desk on set, I decided to make a series of props, binders with logos and realistic text, inspired by her level of visual worldbuilding. Brushing off my page layout skills by creating a fictional full-colour annual report, which could be used if a binder was opened, seemed like a good way to advance my desktop publishing skills while also making a useful object. During rehearsal one of the actors noted that their lines could be included in the faux report binder as this was in the script. Already having the layout of the documents ready, it was a simple matter of copy and paste to include a page of believably formatted script into the physical prop. This worked well on several levels and was an interesting insight for me in terms of how prop-making for The Void can be not only important for the production, but interactive props also prove useful for individual actors in the mixed space.

Collaboration between colleagues was one of the major surprises in regards to long-term value for both individuals and the College. As noted in an article in *The Conversation*, 'research … found that academics recognise that isolation is an important challenge to their well-being' (Sibai, Ferreira, & Bernardo, 2019). Working in The Void brought together several different creative streams while providing a central focal point. Trying to work out why this project felt deeply collegial can be unpacked using *The 5 languages of appreciation in the workplace* (Chapman & White, 2019). Increasingly, 'Town

Hall' meetings for faculty have resulted in limited one-on-one discussions between academics and leadership, and colleagues. Languages of appreciation are a structured approach to different ways of demonstrating appreciation for an individual. The book puts forward five different languages that people can use, and respond to, while demonstrating appreciation:

1. Words of Affirmation
2. Quality Time
3. Acts of Service
4. Tangible Gifts
5. Appropriate Physical Touch.

When an individual feels appreciated, the workplace experience can be much more fulfilling. Working in a dynamic space such as The Void on a cross-disciplinary project allows for all five languages of appreciation to be expressed and received with genuine respect between peers. To unpack this a little further, *Quality Time* was created by making a film together in The Void which facilitated a unique shared experience for both staff and students. For students, as lecturers from different disciplines share subject matter by working on a project for The Void, this provides a thread between different topics interlinking student and staff experiences. As colleagues, we have made a series of touchstones and working processes that we can build on in the future. We have connected on a deeper level though our shared experiences in The Void. *Words of Affirmation* have been a natural part of the interactions woven through these projects. As we cross over into each other's areas of expertise there is a sense of both gratitude, as we are considerate of one another's perceived areas of weakness, and respect for the knowledge and skill of our colleagues. There is interest, genuine compliments, and a dialogue that firms and solidifies our professional and personal relationships. This also fits the concept of *Acts of Service* where people lend a hand to colleagues willingly, without being asked or pressed into service. Picking up where someone else could use help is a friendly act, and it is an integral part of demonstrating your appreciation for a colleague. In terms of *Tangible Gifts*, we have a film that we created – our names in the credits, an object to watch and share. The final language of appreciation is *Appropriate Physical Touch.* This is a slightly more complicated language as COVID-19 has brought in professional distance as habitual. However, leaning over props, the excited arm grab, and the consensual celebratory hug are all important human connections that help to build meaningful and long-term relationships. *Life Savings* in The Void was not only important in terms of building our skills, but more importantly, it brought us together as a willing, engaged working team who bring a unique level of connection and enjoyment to our workplace as we create new collaborative structures around technological opportunities.

One of the challenges of working in The Void is the rapid pace of change within software and hardware environments; ongoing experimentation with hardware and techniques is an important factor in the success of any project. At the inception of The Void as a production space, Shane Bevin collaborated with a variety of colleagues and students in a series of experiments to help define what options were available to teams creating content within the space. We were lucky to have some museum-grade ship models within the Archeology Department and they became a perfect group of test subjects to allow us to compare and contrast the chromakey workflow we were all comfortable with, using the LED screens as a real-time backdrop. We filmed with a variety of devices, including DSLR cameras, mobile phone cameras and even some 'action cameras'. At this stage the technology available to us only allowed for the LED screens to be a backdrop, without the advantages of a true virtual production workflow; however, this gave us the chance to compare this to a chromakey workflow. Using small-scale fully rigged model ships gave us an appreciation for the use of LED screen backdrops in comparison to chromakey. It also became apparent that the backdrop was now 'burned' into the footage, leaving less capacity for change after filming takes place. The collaboration between staff and students gave us fast tracked knowledge of the advantages of the space.

During the *Life Savings* project one of my roles was as the designer and production artist of a science fiction city backdrop. It became clear early on in the process that I needed to create an outcome that would work with both a 'real-time' Unreal Engine scene and a 'pre-rendered' digital matte painting option. The technology available at the time of the shoot, and the needs of the cinematographer, would determine the option we would implement during filming and this decision would not be confirmed until close to the shoot date.

TimeScope and the City Backdrop

The pre-production process involved the creation of mood boards for the city and for the TimeScope – a hero prop for the production. I created a variety of mood boards for the TimeScope, as the initial brief supplied by the director was quite open. TimeScope is a physical prop and as designer and fabricator I knew I had some limitations. The timeline, my teaching workload and the budget all combined to make it obvious that I would need to offer concepts that would allow for an achievable outcome.

My tactic was to offer three mood boards: slick futuristic, industrial, and retro futuristic. Each mood board included a variety of images of existing designs, a breakdown of fabrication difficulty, and a brief statement of how the aesthetic would fit the script and existing pre-production. The director and the rest of the team were most interested in the retro futuristic option and after discussions with the director and cinematographer about materials,

I moved on to fabrication. My fabrication technique was based on 'kitbash', using premade model parts from model kits and 'junkbash', using second-hand parts techniques, with heavy use of 'found objects' rather than scratch built elements

The directors had a clear view that the virtual city needed to have a utopian feel and supplied an image that aligned with a utopian city asset collection we had purchased in the past. The asset collection includes various high-quality buildings, roads, and other urban elements, in formats suitable for Unreal Engine. This gave me a strong starting point for a 'real- time' outcome that could be navigated in Unreal Engine, while also allowing me to create high-quality renders for use in a pre-rendered matte painting if the team decided to go in that direction. The city would always be seen through a faux window and there would be physical elements blocking some of the view; however, because the set would be built on the first day of the shoot and there were no storyboards showing shot selections, I attempted to create something that worked as a standalone piece and would be a flexible element. Each iteration of the city was shared with the team, and I included their feedback wherever possible. An element of the backstory as written, that was difficult to realise, was the need for the city to feel like it was in an enclosed space. After discussions with the writers I included a series of levels, serviced by space elevators. This gave an enclosed feel for viewers who came to the film with prior knowledge of the wider worldbuilding behind the project, while not confusing viewers who did not.

In the days before the shoot, it was decided that the city would be a pre-rendered element, and so I created video matte paintings from a few different angles and added some small spaceships navigating the city. The city was still available within Unreal Engine, but a variety of technical issues meant that the quality was not as strong as the pre-rendered video. The advantage that we did have as a consequence of the workflow is that when a shot needed a new angle, we could easily line up the angles in-camera using the real-time scene in Unreal Engine, render out a high-quality frame, replace the city in the Adobe After Effects file, and then render out the file. This was not a real-time, virtual production workflow. However, any new shot angles could be turned around within about 20 minutes.

Conclusion

Working on *Life Savings* in The Void entails weaving together both traditional and new physical and virtual practices. The world of the film spans both digital and physical realms, making it a rich space demanding the exploration of both old and new production techniques. For example, the futuristic view through the window of an office is a fully digital 3D science fiction space, while the graphic design on binders and props for actors are actual physical objects.

Working across disciplines and project timelines demanded both face-to-face and virtual communication across a number of projects. This design approach is a way to address a studio approach in education of what Lauche et al. (2008) referred to as 'a suitable and realistic environment for practising the relevant skills for virtual teamwork and designer–client communication'. In *Life Savings*, the 12-week semester timeline suddenly dominated project deadlines rather than traditional start-to-finish or critical path project management timelines. We learned important lessons in terms of the need to schedule classes around parallel processes as there is a linear pipeline inherent in large productions. This is perhaps one of the areas where project-based learning becomes problematic: the academic timeline is its own constraint. Processes were segmented and academics needed to jump in unexpectedly with practical skills to complete sections of the project that would have otherwise stopped the flow if the assets weren't created immediately. Working within The Void allows for a range of skills to be explored across industrial and academic processes with cutting edge technology. The Void demands that everyone involved in the production revisit and modernise ways of working which propel both students and academics involved into new pipelines and new ways of thinking about both the medium and the message.

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4

FROM AN UNREAL WORLD TO AN INTEGRATED ONE

Jason Bevan and Cameron Mackness

On 28 October 2021, Facebook, the parent company of digital platforms including Instagram and WhatsApp, recently rebranded as Meta, signified the expanding integration of software and technology in the digital space with a very public statement of intent. CEO Mark Zuckerberg announced in a virtual conference that he wanted Facebook to be seen as a Metaverse company, and he wanted to anchor their work and identity in that direction. He envisages Metaverse as an online world where people can game, work, and communicate in a virtual environment, often using virtual reality (VR) headsets (Thomas, 2021). The rush towards Metaverse has seen major tech corporations position themselves to control the narrative of development in the digital space, highlighted by Microsoft's US$67.8 billion bid to buy gaming giant Activision Blizzard (Hart, 2023). As Microsoft CEO and chairman Satya Nadella said: "Gaming is the most dynamic and exciting category in entertainment across all platforms today and will play a key role in the development of Metaverse platforms" (Quarmby, 2022). The actual realities of how Metaverse will function are still being debated and fought over by the big tech companies such as Microsoft, Meta, Epic Games, or Apple (Cointelegraph, 2022). This investment into gaming companies and technologies drives opportunities for how game engines can both deliver and enable digital content across numerous sectors, from live music performances to interactive and online galleries and museums.

At the heart of this continued digital advancement are Unreal and Unity game engines, which are frequently becoming the core infrastructure behind creative media outcomes. Technology such as Disguise (Plowman, 2021) and Zero Density (Density, 2021) embed Unreal Engine software into their systems, for example. These game engines play a crucial role in shaping not

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only the future potential use of the technology but also in facilitating the current immersive experiences and interactions which form the core business of The Void. The projects in The Void have provided a platform for Flinders University academics to pursue research outcomes in various aspects of 'live' performance, raising such questions as: What is live in an Unreal world? What is the experiential difference for a performer in a virtual world?

What is therefore being developed is a more immersive and integrated virtual production (VP) experience where users will be able to interact both digitally and in a real-world setting with live content. Already we have seen the emergence of in-game concerts within Epic Games' Fortnite such as Travis Scott's concert (Tassi, 2020) and live music such as Spotify island in Roblox. We have virtual versions of real bands performing as younger versions of themselves, as witnessed by the recent ABBA revival (ABBA, 2021). Consumers can already tour some of the best museums and galleries in the world from the comfort of their homes.

With the creation of The Void in 2020, the ability to work with innovative technology in the studio was realised. The scope of our projects and our community engagement to clients and partners, who could benefit from the knowledge we were amassing, also expanded. The more we worked on integrating differing technologies in the studio, such as using Vicon Shogun motion capture (MoCap) to drive real-time Metahumans in Unreal Engine, integrated with Faceware Technologies' face capture technology for an outcome of a live performance of a digital avatar, the more we realised the possibilities this could afford to a broader audience.

A core principle of everything we do in The Void is that technology is subservient to stories or ideas. This approach expands the use of technology and 'on-set' problem solving, identifying the most appropriate production methods rather than utilising a particular piece of equipment because it is accessible. Initial approaches for use of The Void will always involve discussions around suitability for the chosen technology to deliver the project. There must always be a solid and justifiable reason for the choice of technology for each project, not just using technology for technology's sake. For example, why is this project MoCap, not traditional animation, or why use VP, not standard production, or why use in-camera visual effects and not green screen? Constantly asking questions about the technology choices enabled us to better apply the correct solution to the projects initial research question or intent. Furthermore, it dictated which other integrations were necessary for the pipeline and workflows to complete each task, such as the method of sending human MoCap data from Vicon Shogun to Unreal Engine was streamlined and setup time was considerably improved by adding Autodesk's Motion Builder to the pipeline (the method of connecting software and hardware together in production), that is, Vicon Shogun to Motion Builder to Unreal Engine. However, this identified that to run efficiently and in real time, each

process required more computer power so an additional computer was added to the chain. Every iteration of the work achieved successful outcomes, while adding further obstacles to evade.

Within the university, The Void is independent of any particular subject or discipline, which has significantly impacted the knowledge base we worked from, and the opportunities to work across diverse industries and interests. Being independent from one specialisation has allowed us to develop integrated pipelines using film, game, or live performance technologies in any combination to facilitate the initial project parameters. This chapter will explore the projects we have undertaken in The Void and how the use of game engine technology is impacting and changing how we approach new Metaverse-era projects, and how the convergence and integration of technologies impact across a broad spectrum of industries and users.

Big Sand by Sally Coleman

The animated band 'Big Sand' challenged the way traditional concepts of live production are translated when working with virtual avatars and digitally created content. Big Sand features animated characters and a narrative set on a beautiful but harsh desert planet (Kelly, 2022). Musician and broadcaster Sally Coleman sought assistance from The Void to collaborate on an ambitious venture to create a live performance of a virtual band and an opportunity to work with the music from several inspirational musicians and artists. A new technological pipeline must be researched and developed, transitioning into The Void team's project proposal.

The initial concept seemed relatively straightforward: to perform as 3D digital avatars to a live audience. MoCap has been replicating human movement in animation for over a century. For example, animator Max Fleischer's (Max Fleischer, 1918) method of creating Koko the clown or animation of the seven dwarfs by Walt Disney (Barrier, 2007). With the development of computer animation in the 1990s, we also see this technique move into 3D technology (Rickitt, 2007), with early examples in films such as *Terminator 2* and *Jurassic Park* (Failes, 2016). However, the 'live' element this project introduced was a technical challenge to overcome. The performer presented live in real time would be streamed as a 3D animated character to a live audience in a different location. The problem posed many technical challenges that would lay the foundations for understanding pipelines in this entertainment style.

Initial discussions regarding the content creation method highlighted the need for an iterative approach to the technological challenges. Sally joined senior lecturer Jason Bevan and The Void lab coordinator Cameron Mackness at Flinders University for a week of R&D to understand what was possible using the technology (see Figure 4.1). A partner animation studio, CDW Animation, that provides workshop instruction for Flinders students in addition to their

FIGURE 4.1 Jason Bevan in The Void on a Big Sand development day. Photo credit: Cameron Mackness

commercial animation studio in Adelaide, also saw the potential of the project to demonstrate their skills in emerging technology, and offered to help clean-up the MoCap performances and add further animation. The final aim of the first collaboration was to create a high quality finished pre-recorded music video of one of five tracks, intended for a live gig in The Lab in Adelaide on 26 November 2022 (Kelly, 2022). The idea would be to approach the first song as an opportunity to create a pre-recorded music video, using some of the new technology while fitting into a more traditional production method. The pipeline of previsualisation, production, and postproduction was used where storyboards were created, turned into a moving version of the film called an animatic, and then used as a basis for creating fully animated scenes for the film. In contrast, Sally and a group of MoCap performers recorded the dance routines, cut scenes, and created most of the character moves, which then were handed over to the animation studio to apply further animation, clean-up, 3D rendering, and lighting to finish with a 3D animated film. Facial capture was also added to the pre-recorded and animated characters in postproduction, in addition to full character animation of 3D assets using animated rigs and blend shapes, which are pre digitally sculpted facial expressions used to animate a character's face, such as an angry face, raised eyebrows, open mouth, wink,

look left, etc. The end product was a stylistic 3D animated music video that introduced performers to the possibilities of the technology while giving an introduction to the world of Big Sand. The next challenge, however, was working out how we would perform this live. We needed to analyse the most appropriate production methods for the task to ascertain any quality loss of visuals and fidelity of movement to gain interaction with an audience.

Further R&D sessions with The Void team, Sally, and industry specialists at CDW Animation were held monthly in The Void, consolidating into two-week-long R&D testing sessions during university semester breaks. Michela Ledwidge and the team at the MOD (Museum of Discovery), a real-time and VP studio in Sydney, joined the collaboration to offer consultancy advice concerning live performance pipelines and workflows, which we put into practice.

A second music video was recorded, solely a MoCap dance with no further animation clean-up or postproduction to understand the difference in outcome compared to a fully animated pre-recorded video. The fluidity in human motion was still present; however, the nuances and principles you would expect from 3D animation in production were less apparent. When performing live as the digital character, Sally had to be more aware of imperfections, in the same way she would with a studio-album-recorded music track compared to a live on-stage performance. For example, if a performer sings out of tune, or not in time with a backing track, those imperfections can be rectified in the studio with another take. Performing live as an animated character, restrictions in movement or the environment would need to be considered for a character not to walk through a wall or place a limb inside another. These are practised and rehearsed rather than fixed in post. Sally held the live virtual performance at The Lab to a test audience to gain feedback on the experience. The event, advertised as a prototype, incorporated MoCap, face/performance capture, and live streaming. The project was ambitious regarding numerous technological challenges that deliver real-world outcomes related to combining various technologies to provide a 'live' performance. There was input and support from South Australian companies, CDW Animation, and ModelFarm as well as interstate from MOD, with additional support from the infrastructure manufacturers Vicon and Faceware Technologies in Los Angeles. Our partner institution, CDW Animation, has produced assets for the project and other pipeline fixes. Engagement with technological publications such as The *Virtual production field guide* (Kadner, 2019) has also contributed to the project's outcome.

Entering into a New Space

We have collaborated with game developers Mini Mammoth and 7D Games, visual effects companies Rising Sun Pictures and ModelFarm, film producers,

theatre directors, actors, dancers, VR developers BEER Labs, and MoCap studios Fika Entertainment. Each of these distinct groups provides us with new knowledge and experience, ideas for projects, and ways to integrate emerging technologies. An example of how we used this framework was on the Roving Rovers (Mini Mammoth Games, 2022) project, which came to fruition from a series of discussions with the Andy Thomas Centre for Space Resources (ATCSR) at The University of Adelaide. The initial conversations focused on how we might use MoCap to visualise astronaut movement within proposed space habitats for NASA's planned missions to Mars. The project took on a different aspect once we discussed opportunities to engage diverse audiences to help them tell a story or promote an idea. We concluded that the direction should focus on the Australian Rover Challenge, which the ATCSR runs annually in March in Adelaide. The proposal was to produce a demonstration level for a video game to work as a companion piece to the event. It would be a playable demo replicating the real rover challenges on the event days. Still, it could be further developed as a marketing piece and a STEM education piece to further engage with young people and careers in the space industry. Cameron Mackness worked as a consultant and producer to achieve this aim, linking The University of Adelaide, the ATCSR, Flinders University, and local games developer Mini Mammoth. Jason Bevan and Shane Bevin engaged Mini Mammoth to develop the game with students from the Bachelor of Creative Arts (Visual Effects and Entertainment Design) at Flinders University. The VEED students worked on concept design, model design, and user experience design (UX), among other areas, before passing on assets to Mini Mammoth who continued game-level design and coding. Cameron Mackness, Jason Bevan, and Shane Bevin assisted by helping to organise 3D light detection and ranging (LiDAR) scanning, a method of creating a 3D computer-generated model of the real rovers using photographic devices. In addition, the staff coordinated the direction of story and gameplay, and ran testing and playability.

This project demonstrated how our familiarity with game engine usage, integrating emerging technologies like LiDAR scanning and a solid story-based approach enabled and empowered a client. A client could be extremely well versed in some exceptionally high-end space technology, yet unaware of the potential for how the creative process and game engines could be utilised in promoting their specialist knowledge. While the physical stage in The Lab was not used in this case, it was engagement from The Void users' combined knowledge, experience, and access to industry experts that gave the client the impetus to make an extremely worthwhile product, which exceeded its original brief while also providing teaching and learning outcomes for our students and created a strong partnership which will in future use more of the physical assets.

The Void and First Nations Storytelling

The Void in Flinders University is committed to exploring the narrative of First Nations and Australian cultural heritage, welcoming a new audience and new technologies and storytelling methods. The Yuki: A Storytelling Vessel project is a collaboration between Major Moogy Sumner (a Ngarrindjeri Elder), cinematographer Josh Trevorrow (a Ngarrindjeri man), digital artists Arthur Ah Chee (a Wangkangurru man), Nathan Hartman (a Ngarrindjeri man), Flinders University staff, Jason Bevan and Cameron Mackness, and the History Trust of South Australia.

Uncle Moogy is a world-renowned cultural ambassador, and we are engaging with him to share his knowledge about Ngarrindjeri stories and cultural practices around the yuki (bark canoe). Ngarrindjeri were once skilled canoe makers, and the yuki was used for fishing and ceremonies along the Murray River and Lower Lakes regions of South Australia.

Uncle Moogy led the creation of a yuki (a bark canoe), which formed part of a multimedia installation at the South Australian Maritime Museum launched in 2024, supported by Arts South Australia, utilising projected imagery generated in The Void using games and MoCap technology.

After initial consultancy with Jason Bevan and Cameron Mackness and attending planning meetings at the SA Maritime Museum in May 2023, History Trust representatives at the meeting were invited to a full day's workshop in The Void, in the same week, to disseminate The Void team knowledge of what is now possible, not only in the studio itself but with the technical infrastructure and expertise they have gained. The idea of the event was not to attach a specific technological output to the project but for curators of museums to understand the potential of what can be achieved while maintaining creative control of their intended exhibition. The potential of the collaboration is for First Nations and Australian cultural heritage to welcome a new audience using new technologies and storytelling methods.

We first took this approach earlier in 2021. The Artist-in-Residence at Flinders University Assemblage Centre for Creative Arts, Liam Somerville, was approached to participate in an artistic partnership between Northern Sound System (NSS), BLKMPIRE, and Flinders University to assist in the creation of an animated contemporary Indigenous Welcome to Country with local musicians MRLN and Jimblah. The clip was created using Niagara particle systems inside Unreal Engine and MoCap data from The Void to drive the characters. Liam Somerville documents more of the processes he discovered as part of this collection of creative works in his chapter. The creative concept of this idea originated wholly with the artist, and the technology used realised that creative outcome. We have fully embraced this approach with the development of The Void.

Industry Standard

Understanding production methods and pipelines in MoCap can be simulated in an educational environment. However, dialogue with industry practitioners reinforces the need to emulate the technological pipelines that current companies are engaging in and the challenges faced. In May 2022, Flinders University and end-to-end VP company Fika Entertainment engaged in a week-long professional development visit for Jason Bevan and Cameron Mackness, to observe and participate in a commercial MoCap shoot of *American Girl*, an animated pre-teen series filmed at their MoCap studio on the Gold Coast. Fika Entertainment originated from project-led work within Deakin University, which later developed into a standalone studio. The infrastructure of the company originated from the same supplier of MoCap hardware used in The Void, namely Vicon and Faceware so, from a commercial aspect, the connection was ideal for a true comparison with regards to how the facility was used. The first impact of the collaboration was reassurance that the production methods The Void had already championed were almost identical to those used in a commercial setting, similar to documented MoCap pipelines (Kitagawa & Windsor, 2008). Optical MoCap is retargeted to 3D meshes in a suitable 3D package, recorded and processed to a universal format (FBX in this case), and uploaded to an online server to provide the foundation for the animation department to continue production. The addition of facial capture recorded videos to a solid-state data source was also familiar, albeit an updated version of the hardware with a more significant number of headsets.

Observing the production, Jason Bevan and Cameron Mackness acquired knowledge of several significant additions to the pipeline and workflows that have informed and improved the level of professional standards in The Void at Flinders University. The foremost factor was the production role. All employees had newly identified roles and responsibilities such as MoCap technician, MoCap supervisor, technical director, Unreal Engine operator, sound engineer, etc. While some of these fit into a traditional studio setup, some jobs are new production roles that continue to be identified as critical, as documented in *The virtual production glossary* (Kadner et al., 2022).

The second key takeaway from the experience was a more thorough appreciation of the pipeline. Synchronisation of recordings across multiple pieces of software and hardware was connected through a universal timecode and bespoke programming scripts. When the operator presses record in Unreal Engine, for example, this triggers MoCap to record in Vicon Shogun and record the facial capture to an Aja deck. Once capture had finished, the files created were immediately processed and delivered to online servers through computer-programmed scripts and newly identified roles (MoCap programmer). This allows for immediate post-processing of files while a client is still in the building, significantly improving delivery and decision-making

time on set. The knowledge obtained at Fika has directly been integrated into pipeline development in The Void, with the addition of further technological components and workflow changes that have kept the studio current and up-to- date with industry practitioners and researchers, who use the space frequently while contributing to a 'standard' in practice in MoCap studios.

Teaching and Learning and Commercial Bookings

Flinders University had invested in an optical MoCap tracking system manufactured by Vicon, embedded in The Void (the name given to the integrated TV studio, MoCap, and green screen studio) to include 20 Vantage V8 cameras as part of the research infrastructure awarded for the 'Lost Theatres' project. The technology would allow researchers, staff, students, and collaborators access to new technology to embed into research projects, teaching and learning, and R&D with industry. When the pandemic unexpectedly hit in 2020, and restrictions were put in place to isolate and move to online education, Cameron Mackness saw an opportunity to engage with creative event technology company Novatech, a manufacturer of live performance LED screens, to obtain some wall panels, which were currently not being utilised due to COVID restrictions. Novatech was not operating in the field of VP at that time. Hence, the mutual benefit for this company to engage with us in this space was to support the education and understanding of VP as a solution to mobility restrictions, providing the university with equipment and the company with opportunities to explore VP in an emerging marketplace. After immersion in this technology, filmmaking methods combining existing production pipelines with game engine technology were experimented with during this time. We were able to articulate to the university the importance and benefits of the technology, resulting in the purchase of an LED wall from Dicolor following a tender process, another local supplier of LED panels who were keen to explore business opportunities with VP. At the same time, Novatech updated its services to include VP as one of its specialisations.

When the restrictions started lifting, the development of VP had significantly been propelled. LED stages worldwide now provide safe studio locations to film any digitally generated environment. What this meant for course development at Flinders was offering entire semester topics in MoCap, VP, and games development through newly acquired skill acquisition. Emerging from the pandemic in 2022, the university has taught topics in these areas, launching a Master in Virtual Production higher degree, postgraduate courses in visual effects, and an undergraduate game production degree. In addition, collaborations with the Helpmann Academy, an organisation that provides professional development opportunities for South Australian higher education students and emerging talent, allowed us to engage with MoCap director, performer, and instructor Paul-William Mawhinney over newly created

online platforms to offer online classes from London to our Adelaide base. The classes took place in the evening at The Void via Microsoft teams, to allow for morning teaching from the UK by Paul-William. In this instance, technology has significantly enhanced our knowledge and offerings of this emerging film practice. Without the continued development of our expertise, these opportunities would not have been possible.

VP is disrupting all aspects of traditional pipelines concerning in-camera-visual effects (ICVFX), filming against LED screens, and postproduction. The associated technologies, such as MoCap, can provide a valuable solution for impending deadline pressures. To this end, The Void is engaging with local industry to arrange R&D sessions to solve problems associated with new production pipelines and develop solutions to streamline workflow, benefitting the industry, and learning and teaching in this field.

In 2023, The Void received several commercial requests from companies, including Rising Sun Pictures, 7D Games, and Model Farm, for MoCap bookings to streamline production and alleviate deadline-pressured VFX shots. The Void engaged with Kickstarter projects and large-scale Hollywood feature films in the Star Wars and Marvel franchises, providing MoCap performances to add CG characters into shots. This method of finishing shots has transitioned from the traditional compositing exercise of integrating CG render passes and live action in the Foundry's Nuke, industry standard compositing software. Instead, a new way of using a 3D character, animated with MoCap to replace live action background characters, has been developed as a viable solution to finishing a shot without excessive amounts of render passes. New pipelines are documented in *The virtual production field guide* detailing the change in production pipelines (Kadner, 2019). This methodology change requires significant pre-planning and delivery of the outcome, and needs to be addressed much earlier in the pipeline. Such case studies provide a substantial model of external stakeholders partnering with tertiary-based VP studios to produce viable pipelines for large-scale VFX shots and reveal how postproduction has transitioned to pre-production to help facilitate a simplified workflow.

Conclusion

VP studios, such as The Void, are addressing deadline demands of the visual effects industry by offering small-scale solutions to large-scale projects. The case studies illuminate the technical hurdles that have been overcome through engagement with technical departments regarding deliverables, and highlight future challenges that will require further collaboration and R&D with industry and researchers. Each case study has brought a different technical challenge and provided solutions that contribute to the overall expertise of studio offerings. Integral to all projects has been understanding how game

technology has been integrated with familiar film and production techniques, challenging the production order and deliverables of individual tasks. Exploration of production methods used is what makes The Void a perfect environment for evaluating where solutions may form the foundations of larger scale production or research projects.

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5

THE BEGINNINGS OF BIG SAND LIVE

A Real-time Virtual Music Performance in a Physical Venue

Sally Coleman

It's past midnight. I'm sitting in the dark lounge room of my Adelaide Airbnb, with the sickly glow of my laptop on my face. There are 46 tabs open on my browser, so slim they're barely clickable. I flick back and forth between them with a kind of manic intensity.

Epic Games Dev Community
Question | Unresolved
Exposed Variables in Sequencer not keyable

YouTube
Joe Dickenson 2.23k subscribers
How To Expose A Variable To The Master Sequencer In Unreal Engine

Unreal Engine 4.27 Documentation
Sky Atmosphere
A physically-based sky and atmosphere rendering system with time-of-day features and ground-to-space view transitions featuring aerial perspective

Epic Games Dev Community
Creating an Editor Tick in Unreal Engine
This tutorial covers different methods to achieve what is called an 'Editor Tick' in Unreal Engine that will tick either on demand or at a set time interval without having to start game or play modes.

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I open a new tab. Google waits patiently as I punch in another tired and exasperated query.

'What am I doing?'

In that moment, what Google should have said was: "You're working on a live, real-time virtual performance for your animated band, Big Sand. The performance is in two days, and everything's going to be OK. You're tired. You should go to bed."

Instead, Google gives me 5,960,000,000 ranked webpages. I'm tired. I go to bed.

This chapter is a case study about the experience of developing a prototype for the Big Sand live show, using virtual production technologies in a live performance context. In the chapter, I want to touch on some bigger questions around liveness and audience experience, but I also want to highlight the practical realities of working as an independent artist in an emerging field, and my motivation for exploring this technology.

I'm a musician who originally started my career as half of a hip-hop duo. Over the last decade I've performed in all kinds of contexts: from tiny open mic nights, to rapping with Australian juggernauts Hilltop Hoods for a packed festival tent at Splendour in the Grass. I've done multiple national tours, and I love the electric and unpredictable energy of playing for an audience. However, I've also found the travel and lifestyle of touring to be gruelling and sometimes isolating. And I'm not alone in this experience.

In order to perform live for new audiences, it's important for music acts to tour. But throughout 2022, headlines like 'Why are so many artists cancelling their tours?' and 'Why is touring harder than ever?' trended worldwide, as punters and media sought answers to a spate of high-profile cancellations from artists like Justin Bieber, Lorde, Santigold, Gang of Youths, Disclosure, and many more. Many cited the skyrocketing costs of travel, the untenable risk of cancellations, and the negative impacts of touring on the mental and physical health of artists and crew (Gilligan, 2022; Mims, 2022).

Even before the coronavirus pandemic triggered a new wave of instability for live music, the travel involved in traditional touring has made it an expensive exercise, especially for artists to reach audiences in regional areas (Rogers & Whiting, 2020). Live performance also makes up the majority of the music industry's carbon footprint, with the main contributors being audience and performer travel (Bottrill et al., 2010).

As such, interest in alternatives to traditional touring has been growing for a long time, but the pandemic triggered a new surge of experimentation. As health concerns closed venues and pushed many music fans online, a fresh wave of virtual concerts quickly followed. Real-world artists like Travis Scott

collaborated with battle royale game *Fortnite* to present a concert series for over 27.7 million viewers (Thier, 2020), while the *Roblox* game Splash allows players to become the performers, with over five million users 'singing' in front of an audience of their peers (Simmons, 2021). And a new wave of virtual artists – fictional and semi-fictional characters releasing music – has coincided with the increase of virtual spaces for them to inhabit (Simon, 2021).

Virtual, online performances overcome many of the disadvantages associated with traditional touring. But for most fans and artists, they don't seem to scratch the same itch for connection as a physical experience shared with others (Bennett, 2015). There is still a hunger for in-person music events, and the social, emotional, cultural, and economic benefits that concerts, gigs, festivals, mosh pits, and dancefloors provide.

So, why not have both?

'Live' Music? Virtual Music Performances in Physical Venues

What if it were possible to bring a virtual performance to a physical venue, reducing the amount of travel required for an artist to tour? To date, there have been a handful of high-profile creative projects tackling this challenge. One early example was the appearance of a Tupac hologram during Dr Dre's set at Coachella in 2012. Similar technology was used to take fictional Japanese artist Hatsune Miku on a series of world tours from 2018 onwards. ABBA's Voyage concert features virtual, youthful reproductions of band members performing 'an epic avatar mega-mix' (Trendell, 2022, n.p.). And bookending all of these is iconic virtual band Gorillaz who have been experimenting with innovative multimedia visuals in their performances for decades. Gorillaz concerts have ranged from a hologram appearance alongside Madonna at the Grammys in 2006 (Hofer, 2011), to a geospatial augmented reality (AR) performance in Times Square and Piccadilly Circus in 2022 (Shutler, 2022).

One feature of all of these examples, however, is that none of these so-called 'live' performances are actually 'live', in the sense that they do not unfold in 'real time'. Admittedly, there is plenty of discussion around the semantics of 'liveness', especially regarding whether a real-time component (or 'temporal co-presence with others', as Auslander [2012, p. 6]) puts it, is crucial or not. Auslander hypothesises that

> It may be that we are now at a point in history at which liveness can no longer be defined in terms of either the presence of living human beings before each other or physical and temporal relationships. The emerging definition of liveness may be built primarily around the audience's affective experience.
>
> *(2012, p. 6)*

Even though the performances I mention above are pre-recorded, they do still seem to provide some 'affective experience' of live-music-ness for audiences. The hologram concerts of Vocaloid character Hatsune Miko – a virtual idol with a vast, fan-generated catalogue of music and lore – are a notable example. In her article 'Locating liveness in holographic performances: Technological anxiety and participatory fandom at Vocaloid concerts', Alyssa Michaud examines the audience experience at one such concert, and argues that 'the creation of cultural meaning and the most significant interactions occur within the audience itself' as a type of 'participatory fandom' (2022, p. 1). Michaud writes that, although there is 'no human connection developed between singer and fans over the course of a Vocaloid show … the relationship between the figure onstage and the crowd is less important than the relationships that already exist within the community' (Michaud, 2022, pp. 16–17).

Another recent case study for this theory is the ABBA Voyage concert staged in London, which features avatars ('ABBAtars'?) of band members. This show is particularly relevant for me, because real-life performances by ABBA were recorded using motion capture (MoCap) and are played on screens rather than via hologram, two similarities to my own show. Sceptical critics have been won over, variously describing the show as 'a dazzling retro-futurist extravaganza' (Empire, 2022, n.p.) and 'everything it's cracked up to be and more' (Sutherland, 2022, n.p.). However, while I'm comparing this concert to my own show, it's probably relevant to note that Voyage cost an estimated £140m to create (Smirke, 2022), slightly more than my budget as an independent artist.

The fact that ABBA's performance (with the exception of the backing band) is pre-recorded doesn't seem to have dampened enthusiasm for the show. This lends weight to Michaud and Auslander's hypotheses that some of the 'liveness' at music concerts stems from interactions between the fans themselves.

This doesn't mean that audience co-presence with a performer is meaningless – far from it. My experience as both an artist and radio host is that intra-audience participation is only part of the story when it comes to asking 'what feels live?', and that sharing the present moment with a performer adds electricity for the audience. From talkback radio to sports broadcasts, breaking news to Twitch streams, ballet concerts to courtroom testimonies; there's consensus that we experience events differently when we perceive them to be unfolding in the present moment (Auslander, 2008; van Es, 2017). So even though seeing something happen in real time might not be the modern *definition* of liveness, it's still a powerful *contributor* to liveness – which, most importantly, makes it a special experience for audiences.

Technologies Making Real-Time Virtual Music Performances a Reality

New technologies are paving the way for virtual performances in physical spaces to become more 'live', as real-time motion capture (MoCap) systems become more accessible. Once reserved for multi-million-dollar blockbusters, the optical tracking systems used to portray Gollum in *Lord of the Rings* or record performances for *Avatar: The Way of Water* have been joined by increasingly affordable alternatives. Mid-range MoCap suits send data over home wi-fi, AI is increasingly being used to extract motion data from live video, and newer iPhones come with built-in technology that enables free face-tracking apps.

When combined with real-time rendering capabilities of game engines such as Unreal Engine, this technology has made it possible for everyday artists to livestream their performances in the form of an avatar. Early adopters have included VTubers (entertainers using an avatar) livestreaming on Twitch, but there's also a growing number of artists experimenting with ways to bring these live, MoCap performances to physical venues.

One of these artists is me. In 2020 I found myself on-air as the host of the Breakfast show on triple j, Australia's flagship music station. I spoke to music fans and artists every morning as a global pandemic roared to life, and saw first-hand the importance of 'liveness', both through my own experience as a broadcaster enjoying the risk, magic, and spontaneity of a live-to-air radio show, and from the reactions of fans as swathes of festivals, tours, and local gigs toppled under lockdowns, border closures, and health measures. By the end of the year, I'd decided to focus on my own artistic career, and at the beginning of 2021 I hatched the concept for Big Sand.

Welcome to Big Sand

Big Sand is an animated, virtual band with a science fiction narrative. As the lead songwriter and creative director, I wanted to use the band to experiment with new ways to connect with audiences through fictional storytelling. However, I quickly realised that I had more practical questions to answer first, for example: how could I show this imaginary band to an audience? And how could I create a music video?

And most saliently, how could the band perform live?

"So, back to the thing!" says Cameron, as the team gathers around. "Why are we here? What are we doing?"

Both questions are rhetorical, and he continues.

"Sally has this fantastic idea that she's started this new band, and she wants to do something different with it. So she's gone Gorillaz-esque and she's going to have a

fully animated band, which is great if we just work in the world of straight 2D, 3D animation. But she's far more ambitious than that, so she wants to do a great live show."

I'm finally standing in The Void at Flinders University, after months of Zoom calls and emails about collaboration. To be honest, I'm a little surprised by the team's enthusiasm for this project. Cameron Mackness and Jason Bevan seem genuinely excited about the prospect of testing a live, virtual music performance, and for me, being able to use the space seems a little too good to be true. It's the chance to answer some burning questions. How can Big Sand perform live, in real time? Is it possible to pull this off remotely? And how much will a real-time element add to the audience's experience of 'liveness'?

The Void is a motion capture stage, located in the university's Drama Centre. Charcoal coloured foam mats have been placed over the floor, and red-ringed infrared cameras stare down at us, unblinking, from their roosts around the ceiling. Soon, I'll be donning a pair of stretchy Velcro leggings and jacket, and sticking knobbly reflective markers onto knees, elbows, fingertips.

I first started experimenting with motion capture in my bedroom, after the impulsive purchase of a Rokoko Smartsuit. I say impulsive, because before this moment I'd never opened Unreal Engine (or any animation software), let alone learnt to retarget and animate a rigged character. But the process of

FIGURE 5.1 Sally Coleman animating Big Sand's lead singer, Taal. Photo credit: Brecon James, Big Sand

learning through trial and error was invaluable for me. It also meant that I fully appreciated the fidelity of movement I saw in a professional MoCap space.

Getting set up takes time. There's a helmet, and battery pack. There's Velcro shoe covers, and the reflective markers keep getting stuck to my hands. But eventually I'm doing a series of stretches in the middle of The Void, getting my body and movement synced with the software.

Then, the moment has arrived. My lead character, Taal, appears on the LED wall at one end of the room. She's got big, elf-like ears and a purple outfit, a brown leather cape, and a satchel on her hip. Her hair is in two yellow buns on the top of her head, along with a pair of pilot-style goggles (see Figure 5.1).

I look at her, and she blinks back. I smile, and so does she. We wave at each other. I re-experience that same strange feeling of connection to my character, who is simultaneously not-me and entirely me. It's an oddly protective emotion, like I have been given a great responsibility over someone else's body.

Then, I plug a big-ol' karate kick high in the air.

"You know, that's the first thing everyone does," says Jason.

The prototype for the Big Sand Live show was a public performance for an audience, as well as an R&D exercise. As such, when developing the show I had to balance competing creative and technical goals. From a technical standpoint, it was important to me that my performance happened remotely and was streamed to the venue, in order to prototype the concept of 'touring without travel' and the effect of mediatisation on liveness (more on this soon). Simultaneously, from a creative perspective I wanted the audience to experience the performance as being 'live', purely for the sake of their own enjoyment.

These goals don't immediately sound conflicting, but together they raised a key question. If the physical performer isn't in the room, how does the audience distinguish a real-time virtual performance from a recording? How does the audience *know* the performance is live?

Demonstrating Liveness in a Mediatised Performance

The field of real-time virtual performance is still relatively small, but I'm not the first creative in this space to struggle with the question of how to make liveness apparent to an audience. In 'How a hyper-actor directs avatars in virtual shadow theater', Gagneré, Mays and Ternova discuss the staging of a performance that uses pre-recorded animations triggered in real time (2020). One comment of theirs is that 'Some children were not even conscious of the

real-time process and perceived the animation as a feature film' (Gagneré et al., 2020, p. 8). This was one concern I had about my own show: that the audience might perceive the entire Big Sand Live show to be a pre-recorded video, meaning they wouldn't feel the same fizz of immediacy, human connection, and risk.

Underlying this issue is the concept of mediatisation. Auslander has written extensively on the 'mediatisation' of live performance, a term he admits to borrowing from Baudrillard and uses to mean 'performance that is circulated on television, as audio or video recordings, and in other forms based in technologies of reproduction' (Auslander, 2008, p. 4). In other words, a mediatised performance has been turned into a piece of media, which in my case involves converting my own movement, voice, and facial expressions into an avatar.

In 'Using contemporary technology in live performance: The dilemma of the performer' Schloss underscores this as a hazard of technologically mediatised performance, concluding that the audience/performer relationship depends 'on the audience understanding what the performer is doing' (2003, p. 239). In my case, using an avatar rather than physical co-presence might mediate my performance so much that the audience wouldn't understand that my performance was happening in real time, and recognise the show's 'claim to liveness' (Auslander 2012, p. 8).

There's plenty of creative ways to solve this dilemma, but I decided that the way I wanted to demonstrate liveness was to engage the audience in a two-way interaction while in character as an avatar. Again, this sounds relatively simple, but it meant that I needed to be able to see and hear the audience, turning the show from a one-way broadcast to a bi-directional streaming exercise. This emphasis on two-way audience interaction was a major point of difference between my project and other virtual performances; however, it also added an additional layer of complexity to the show design.

Designing and Performing the Big Sand Live Show Prototype

So, what was the show design, and how did the performance play out?

It's Saturday evening, and a small audience has started arriving at a venue called LIGHT in Adelaide. The show is being held downstairs in The Lab: a black band room with an artsy basement vibe and walls covered in glowing LED screens.

Tonight, the walls have become a cartoon-like desert, wrapped around the room in an immersive panorama. An ambient, mysterious soundtrack is playing, and on the screen at the front of the room is an empty stage. A small audience filters into the room, chattering among themselves. Nobody's quite sure what to expect.

From a creative standpoint, the show was presented to the audience as a 'sci-fi music gig'. The imagery of an empty stage helped me to tap into preconceptions of a live music performance, and I tried to replicate a familiar pop concert format – another way to make a 'claim to liveness'. The immersive, wrap-around visuals were intended to make the audience feel as though they were stepping into a new environment, rather than watching a film.

Meanwhile, an iPad at the front of The Lab sent a video feed of the audience back to myself, Cameron, and Jason in The Void, 13.5 kilometres away. I was able to watch this on the large LED screen in front of me, usually used for virtual production on film shoots. I could hear the audience murmuring via a ceiling mic at the venue, and to avoid feedback in my own microphone, I joined this video call on my phone and listened using my AirPods.

Cam and Jason are crouched over a row of computers to one side of the room, while I stand on the foam mats in the centre of the performance space. If I wasn't so used to my outfit by now, I'd feel ridiculous; I'm wearing the now-customary Velcro leggings and matching top, covered with a symmetrical rash of nobbly reflective markers.

We've already had some stress this afternoon; upon arriving in The Void, Jason realised that the university's Faceware software licence expired that day, making the facial tracking software unusable for at least 24 hours. The situation is nearly comic in its timing, but it's firmly in the 'nothing I can do' camp, so I try to put it out of mind.

As the performance ticks closer, there's heightened nerves on set, especially my own. In The Void we watch the audience arriving, dim and pixellated but undoubtedly live. For a strange moment I feel as though I'm the one watching a show, staring at a room full of performers trickling through the door and finding their places on stage.

In The Lab, the chatter fades as someone points at the front LED wall: the band has appeared unannounced in the distance, walking from a faraway dune towards the stage. As they gradually get closer, the music swells, rising to a climax as the members of Big Sand climb on stage. The lead singer Taal takes a few steps forward towards the audience, and waves.

Back in The Void, we watch the audience wave back. Again, it's a strange moment: they can't see me, but they're waving at me, and I feel as though I'm looking through mirrored glass. At this particular moment, Taal's performance isn't happening in real time; I made this animation a few weeks ago. She launches into the band's first song, dancing and singing the words to 'Take Me Home'.

Despite being framed to the audience as a live music performance, the musical numbers in the show were pre-recorded cinematic sequences, playing directly out of Unreal Engine via virtual camera feeds (from a plugin called Off World Live) and mapped onto the LED walls of The Lab. This was for several reasons: first, to make sure that there was still content for the audience in the event of a streaming failure. And second, because we still had concerns around syncing audio and video at this early stage of prototyping. The music was therefore pre-recorded and played out of Ableton in the venue, and MIDI/OSC sends from Ableton triggered the matching cinematic sequence in Unreal.

The song barrels towards its final chorus, and my nerves are wound tight, buzzing insistently. "Quiet in the room." I say. "We're going live … now."

The first song ends, the lights go down and there's a round of applause. Then the lights come up again, and this time, the audience is seeing my real-time motion capture performance. Hopefully, nothing looks any different to them: they're seeing the same elf-like figure in a purple costume, backed by two large alien insects and a cute drone. I take a breath.

"Hello! I'm Taal." I gesture to the imaginary figures behind me. "And this is Big Sand."

The real-time element of the performance was the interlude between the two songs, where lead singer Taal engaged directly with the audience. This was to be the moment where we would fully test the show's digital architecture and see how the audience interacted with an avatar in a physical music venue. To get my real-time performance from The Void into The Lab, we used the most accessible form of streaming available: a video conference call.

Video streaming is unlikely to be my long-term choice for remote virtual performance; it generally makes more sense to relay the raw MoCap data to the machine running Unreal Engine in the venue. However, networking limitations meant that video streaming was our best option for the prototype show. The biggest challenge that this introduced was the need to balance high-resolution output with low latency requirements, for streaming that felt interactive and not laggy. After testing a number of options (YouTube, Twitch, Zoom, VDO.Ninja, WOWZA), we landed on Microsoft Teams as our daggy but most effective solution. Figuring this out was a matter of trial and error: a day's worth of going through each option one at a time.

I kept the animated content for the show contained to a single panel at the front of the room. This meant that we only had to stream one video feed to switch the pre-recorded animation out for my real-time performance. From The Void, the virtual camera pointing at the band was streamed directly

FIGURE 5.2 Big Sand's lead singer, Taal, leads the audience in some stretches. Photo credit: Vipop, Big Sand

into the Teams call. The technicians at The Lab were able to grab this video and overlay it seamlessly to the correct position on the LED wall. The result was a transition between pre-recorded and live content that was more-or-less indistinguishable to the audience.

"Thanks for coming to our show!" I say. "I'm a bit nervous…"

At this point, my audio starts dropping out. The joys of streaming.

"Where did you travel from?" I try to ask a woman sitting at the front, but she can't understand me. "What's your name?" Shrugs and confusion. Eventually I resort to asking, "Can you hear me?" like a colleague who's finally managed to unmute herself on a conference call. "Yes!" yells the audience, just as the sound drops out again.

As expected, not everything went right during the performance. During the live section of the show, it became clear that the audience was having trouble hearing me.

It's chaotic, and silly, and messy. The audience isn't sure what to do, and neither am I; I'm wobbling around on the tightrope, trying to pull together some coherent moment of audience interaction. Maybe I'm imagining it, but it feels awkward, like a stranger seeing you trip over, unsure if they should offer help or pretend politely not to see. But then, a woman in the audience walks up to the front of

the room and waves enthusiastically at Taal. She's decided to help me up from the metaphorical pavement. "Hello!" she says, waving both hands above her head.

"Hi!" I say, and wave back. The ice has been broken, and despite the confusion, there's some feeling of connection. "Where have you travelled from?" I ask her. She looks uncertain. "I can't hear you well enough to answer!" she laughs, and the audience laughs too, grateful that someone has voiced the unspoken.

I jump on it and skip the rest of the chat. "Then I think we should do some stretches!" I say, and put my hands in the air. The audience's hands go up straight away, as though they're relieved to have a familiar ritual to follow. "Side-to-side!" I say, and the audience copies me, like Taal is some kind of Zelda-esque Jane Fonda (see Figure 5.2).

I'd already planned on asking the audience to do some physical actions, but in my struggle to communicate verbally, I fell back on an old faithful from my hip-hop days: "Put your hands in the air!" Thankfully, the audience was eager to oblige. Looking back, this moment of participation felt like a glimmer of an answer to those early questions: 'why is liveness important to audiences?' and 'how does the audience know a performance is live?'

The segue into the next song is slightly awkward; I'm left doing improvised star jumps for longer than I probably need to, and finish laughing and a little flustered. My live video feed is switched out again as the audience heads into the pre-recorded final song. All-in-all, I'm 'live' (in a real-time sense) for all of two minutes, and the show's only 15 minutes long.

As the last song comes to an end, the audience gives a round of applause and a cheer, and I appear again on the screen behind them. This time, it's really me, my own face appearing flushed and slightly grainy over a webcam from The Void.

"Aw, thank you so much for coming!" I say. "I have no idea what that was like for you. So what I would love, I guess, is your feedback on what the performance was like from your end …"

During the Q&A, feedback was positive, although I was surprised to hear how few people realised, at first, that the show had live elements.

"So, how much of that – for you – was 'live' live?"

"None."
"Not at all."
"Not really, no."

"So you didn't realise you were seeing a live performer until the end?"

Then someone else pipes up.

"Oh, when the interaction happened!"

What Does Real-Time Interaction Bring to Virtual Performance?

The Q&A highlighted that the interactive component of the show acted as an 'aha' moment for the audience, in regards to demonstrating liveness. The woman who had waved at Taal said that this was the point that things clicked for her. "When I ran down the front I thought, 'OK … maybe we are [live] …' I couldn't quite communicate because I couldn't hear you, but I felt maybe you were trying to." Her friend agreed. "When you were there at the start, and you said 'Oh, I'm really shy', and then there was just silence … I thought that was great!"

I found this exciting: although 'struggling to communicate' wasn't the impression I'd planned on making, I'd still managed to get an engaged and empathetic response from the audience. My presence as a performer had been sensed through the screen, and this moment of realisation was facilitated by the act of talking and engaging with the crowd. In some ways, the imperfections of the audio helped make the 'risk' element of the show more apparent, which the audience found engaging.

As the stream finally ends, Cameron pops a bottle of champagne and we all chatter, fizzing with adrenaline, as I rip off Velcro markers and switch off my headcam.

"I think it switched earlier than you thought it did!" says Jason.

"It's always the challenge, isn't it? Whenever you try new tech you never know exactly which bits are going to work," Cameron reflects.

"They were looking blank, and then someone just stood up from the back and walked up right to the front and waved at me …" I wave my champagne glass around.

The stress – many months of stress – has given way to a kind of post-show euphoria, or maybe just relief, as we compare notes; the 'maybes' and 'what-ifs' finally solidify into a series of 'and thens'.

Perhaps this was my biggest takeaway from the experience of designing and performing this prototype show. One of the (many) reasons that liveness is special to audiences is because of its unpredictability – the electric feeling that

'anything could happen'. Mistakes and improvisation are a vital part of any live performer's toolkit, and unlike traditional VFX, real-time virtual production allows for a kind of imperfect spontaneity. Sometimes this involves falling flat on your face, but this same sense of risk can heighten the joy of unexpected, magic moments. It's this idea that I'd like to continue exploring. How can I show audiences the tightrope I'm walking, so they can feel excited about the balancing act, the dramatic correction, or even gasp at the fall?

Likewise, I was surprised at how willing the audience was to physically engage with a virtual character, enthusiastically mirroring her stretches and dance moves once they understood that her performance was happening in real time, somewhere distant. In part, I put this down to the physical space they were in: sharing a music venue with other people helped encourage familiar group rituals like applause, dancing, and call-and-response. This isn't too surprising: we're quiet at a library, we shout at the footy. But, in the context of this chapter, I think this is another key learning. Although it's easy to conceptualise as a technique that makes physical productions 'more virtual', virtual production also means making digital elements 'more physical'. And that access to physicality brings a whole range of new opportunities for digital content, including changing the context in which a story is interpreted or even co-created by audiences.

What's Next for the Big Sand Live Show?

So what's next? I'm continuing to develop the Big Sand Live show, fleshing out the prototype to something longer, and polishing both the creative content and the tech I'm using to deliver it. Most recently, I've completed a full half-hour demo performance at Sydney's Powerhouse Museum, this time streaming motion capture data instead of video. Excitingly, I've also been seeing and hearing about more creators using MoCap and game engines in their live shows. From German–Cambodian dentistry-themed theatre (Hong, 2022) to hyper-futuristic, Buddhist inspired Metaverse dance (Sydney Opera House, 2022), live performances are increasingly making use of techniques and technologies that were previously confined to film and games. The barrier between screen and stage seems more permeable than ever; and it feels as though we're in the early stages of a new wave of experimentation for live performance.

For me, it's an exciting space to inhabit as a musician and a performer. Although the concept for this particular show arose as an attempt to rethink music touring models, I've realised that performances like this aren't just a substitute for a traditional music gig, theatre show or dance recital. Instead, this is a new medium: one where the conventions are yet to be written and anything feels possible.

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6

THE LINE WHERE RED MEETS BLUE

Big Sand Pioneers New Approach to Live Metaverse Performance Using Virtual Production

L. Nicol Cabe

Introduction

On 26 November 2022, Sally Coleman launched a hybrid live/pre-recorded musical performance event streamed from the Virtual Production (VP) lab, The Void, at Flinders University, into The Lab, now re-named Immersive Light and Art (ILA), an immersive venue managed by Light ADL, an arts organisation that describes the space on their website as a 'multi-functional, and multi-genre immersive performance space that supports art and culture while leading it in entirely new directions' (ILA, 2023). The livestreamed, Unreal Engine-generated performance sequences promoted Coleman's new sci-fi music band, Big Sand. Coleman worked with motion capture (MoCap) technology for several months, combining her expertise as the lead animator, music writer, technical director, and main performer with the talents of other musicians, dancers, animators, and virtual production (VP) specialists to generate a cast of alien characters, their extraplanetary backstories, and two (at time of writing) memorable pop songs. I had the good fortune to sit in on the performance from behind the scenes in The Void, where Coleman, the audio-visual (AV) technicians at The Lab, and the Flinders University team integrated all the disparate elements and livestreamed the virtual characters to the physically co-present audience across town.

"I think this is the first time in the world anyone has tried that", Coleman suggested during her post-show Q&A that night. 'Remote performance in-character' was Coleman's stated goal; this type of temporally co-present, physically distanced performance integrating VP is unique and may become a great way for musicians to perform to global audiences. While there are some digital concert precedents for Big Sand, Coleman's creative work is at the forefront of virtual performance. This 15-minute proof-of-concept live

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experience represents an important step in a world increasingly blending material and mediated forms of liveness as 'cyberspace', and 'meatspace' increasingly overlapping in a post-pandemic creative landscape influenced by the Metaverse.

Virtually Together

Liveness was a core component of the experience Coleman created for her audience, but her approach to *live performance* is a radical departure from the assumption of traditional, in-person, aka 'meatspace' concerts. As she discusses in her chapter in this publication, Coleman loves the energy of performing live for audiences but struggles with the exhaustion, expense, and carbon emissions associated with traditional touring models; VP and livestreaming offer a solution.

In the standard definition, performers and audience are physically co-present in a room, whether a massive amphitheatre or a small bar's stage; this live, in-person experience stands in direct opposition to film, which is pre-recorded and thus void of the performers', and increasingly the audience's, live presence. The performing arts have employed various strategies to navigate the ontological debate about 'liveness' since Peggy Phelan declared mediatisation a death sentence: 'Performance's only life is in the present. … Performance's being … becomes itself through disappearance' (Phelan, 2003, p. 146). Philip Auslander rejected Phelan's ephemerality requirement: 'the common assumption is that the live event is "real" and that mediatized events are secondary and somehow artificial reproductions of the real' (Auslander, 2002, p. 3); he argues later that the very concept of *liveness* stemmed from early broadcast radio which transmitted live music as well as pre-recorded music, and he wanted listeners to know the difference listeners needed to know the difference. Hans-Thies Lehmann considers that repetition onstage (compared to repeatedly watching a film) was possible with in-person performers, but even well-rehearsed live shows had few differences because the 'very position in time of the repeated is different from that of the original' (Lehmann, 2006, p. 157). This concept has been interpreted to suggest that errors in performance indicate lack of repetition, although 'glitches' and similar digitised errors have also been incorporated as aesthetic signatures of certain musical and performance genres, even in recordings (Cascone, 2000; Eno, 1996, Location 4550–4556).

Alongside this argument, live performances from Nam June Paik, The Wooster Group, Blast Theory, Sydney Theatre Company (STC), the Metaverse Shakespeare Company (hosted in Second Life), and numerous others generated a spectrum of mediated live events over several decades; in *Performance and Media*, Sarah Bay-Cheng expands Paul Milgram and Fumio Kishino's 1994 reality–virtuality continuum into three mediated-material spectra with which to understand combinations of physical co-presence and mediated additions

(Bay-Cheng et al., 2015, p. 45). Since Bay-Cheng developed these spectra, telepresence has expanded from grainy Skype to intricate social engagements over video call (FaceTime, Zoom) or in gaming spaces (*Fortnite*, *Roblox*), expanding further the consumer-level understanding of mediated liveness and co-presence which performing artists can play with.

As more users routinely engage each other in online communities, technology companies push to expand these social spaces into the Metaverse. Tim Sweeney, founder of Epic Games (the company that created *Fortnite*) has noted that *Fortnite*, for example, is a Metaverse, not just a video game (Seidel et al., 2022, p. 1) – arguably because players began socially engaging each other within the game space rather than just fighting. Social experiences in virtual social platforms meet Phelan's definition of *liveness*, with users playing, building, or partying together in a unique, ephemeral, and unrepeatable experience; yet the only way to have these experiences is in an immersive mediated environment, which can also seamlessly include 'pre-recorded' assets like non-player characters (NPCs) or cut-scene videos, and can also itself be recorded for posterity and streamed through a broadcasting platform like YouTube or Twitch. Immersive digital worlds with live, communal togetherness are now commonplace, making them new spaces for performing artists. How can artists invite audiences 'within the Metaverse'? For most performing artists, this means choosing a 'platform' or creating one's own. Understanding the Metaverse first can help VP artists intentionally integrate this medium as it continues to evolve.

Entering the Metaverse

What is the Metaverse? There is not one solid definition of this concept and, arguably, the Metaverse does not yet exist – instead, platforms like *Fortnite* are *proto-metaverses,* creating the foundational ideas that may soon become the Metaverse. However, examining some current definitions can help elucidate the budding concept.

Novelist Neal Stephenson is credited with coining the term Metaverse for *Snow Crash.* In his acknowledgements, he states: 'The words "avatar" … and "Metaverse" are my inventions, which I came up with when I decided that existing words (such as "virtual reality") were simply too awkward to use' (Stephenson, 1992, p. 440). Since the term's inception, it has relied on *virtual reality* as part of the immersion. Stefan Seidel and co-authors report: 'We define the Metaverse as the networks of digital technologies and people providing immersive, interconnected experiences … Moreover, the Metaverse will involve not only transitions between immersive virtual experiences but transitions between physical and virtual experiences' (Seidel et al., 2022, pp. 1–9). Matthew Sparkes agrees on digital connectivity: 'It's a shared online space that incorporates 3D graphics, either on a screen or in virtual reality'

(2021); and the *New York Times* provided: 'The metaverse refers to a variety of virtual experiences, environments and assets that gained momentum during the online-everything shift of the pandemic' (Herrman & Browning, 2021). In his recent book on the subject, Matt Ball developed an extensive, specific definition:

> Metaverse: 'A massively scaled and interoperable network of real-time rendered 3D virtual worlds that can be experienced synchronously and persistently by an effectively unlimited number of users with an individual sense of presence, and with continuity of data, such as identity, history, entitlements, objects, communications, and payments'.
>
> *(2023, Location 1045)*

Though Ball's definition requires technologies not included in other definitions, he specifies the issues around creating a fully immersive Metaverse: currently, users are not often synchronously together in the virtual world, which means liveness in the performing arts is one of the next great frontiers.

Luca Turchet's article on musical metaverses notes that 'a definition of the term metaverse within the literature has yet to be agreed upon' but 'considers the metaverse as a virtual environment blending the physical and the digital, facilitated by the convergence between Internet of Things and Extended Reality (XR) technologies' (Turchet, 2023, p. 1811). Compared to Ball's definition, this allows for a greater range of technology implementation, so artists have the opportunity to push real-time experiences without foisting the expense and physical burdens onto their potential audiences. In her discussion of material-mediated performance spectra, Bay-Cheng points out that 'it is nearly impossible to conceive of a performance that takes place exclusively within a digital environment, if only because spectators and audiences have to have some kind of material interface to connect with the digital' (Bay-Cheng, 2015, p. 50). An *interface* with the digital can include our very meatspace bodies and minds.

There are issues of technology adoption and power holding the full evolution of the Metaverse back. The expensive hardware including: VR headsets and even laptops or mobile phones that can handle graphics rendering (Burt, 2022; Turchet, 2023); stable internet access with no connectivity issues (United Nations, 2021); and nausea or disorientation due to divided proprioception between 'meatspace' and 'cyberspace' (Zhang & Wang, 2020). An apocryphal quote credited to science fiction author William Gibson states that the future is already here – it's just not evenly distributed. The Metaverse is closer than ever to full realisation, but with platforms disconnected and potential audiences at various levels of connection, which space should a performer pick? Or should they make their own?

An alternative Metaverse access is a venue where one or more audience members can gather in-person; while the artist must still upskill to employ technology, the financial burden is placed on the venue, rather than the individual audience member. Researchers at the University of Illinois pioneered immersive virtual room experiences in 1992 with CAVE, an acronym for Cave Automatic Virtual Environment. In their SIGGRAPH article detailing their construction, the researchers write: 'For virtual reality to become an effective and complete visualization tool, it must permit more than one user in the same environment' (Cruz-Neira et al., 1992, p. 70). Coleman among many live performance artists agree that togetherness, a sense of co-presence, is a defining component of live performance; but, when each individual audience member has a different level of technology access, creating community in a virtual performance can be uneven. Shifting to an immersive venue and creating a virtual Metaverse space within the venue can improve the audience's ability to enjoy community and the show. 'CAVEs are great for experiences where your body doesn't become fantastical, and where the virtual stuff is too far away to touch' (Lanier, 2017, Location 3364–3367). Although CAVE systems specifically have not proliferated around the world, immersive venues are becoming more popular – including The Sphere in Las Vegas (Sphere, n.d.), OtherWorld (OtherWorld, n.d.), and ILA.

Big Sand's Big Precedents

There are several pop culture precedents for Big Sand's live VP experiment. Perhaps the most obvious is Gorillaz, an animated band that formed nearly 30 years ago. Led by Damon Albarn, lead singer from Blur, Gorillaz featured 'meatspace' musical artists making albums since 2001 but utilising audience-facing virtual and/or animated performer-characters. Gorillaz have performed 'live', pushing technological boundaries to generate their characters before a physically co-present concert audience, much like Big Sand. Under the direction of animator Jamie Hewlett, their concert experiences incorporate animation, holograms, virtual reality, and most recently augmented reality (Milton, 2017; Monroe, 2022). Assorted members of Gorillaz have performed physically co-present onstage with their animated characters on a screen, either in front of or behind them; sometimes, these characters have been (pre-recorded, projected) holograms, as in their 2006 Grammy performance, while their more recent musical experiences were also pre-recorded, but activated through augmented reality, making them feel more immediate and alive. Avatars already are and will continue to be a core component of Metaverse engagement, and Gorillaz have pushed VP tools in creating their animated stage presence; however, they rarely use these technologies to create immersive environments for their concerts, relying instead on more traditional concert arenas. In contrast, Big Sand exists in an alien world, and the bandmates are aliens – VP tools are

used to create both characters and their fictional planet, and to immerse the audience on this planet.

Another metaverse-boundary-pushing concert occurred in April 2020, about one month into the world's first COVID lockdown. Travis Scott's 'Astronomical' tour became a 10-minute Player-vs-Player (PvP) event in *Fortnite* (Stuart, 2020), a videogame with millions of players all over the globe; *Fortnite*'s designers had also recently used the platform to host live, virtual events (like an album listening party with Weezer), building on players' use of the game to simply hang out with each other instead of fighting baddies. For 'Astronomical', Epic Games did more than set up a virtual amphitheatre for an avatar band to perform on: the concert was interactive with unlockable events that could be experienced from different places on the map and included a 12-storey-tall Scott dancing and rapping, individual players being launched into the stratosphere onto an orbiting planet with guest artists, and of course, opportunities to fight other players (Park, 2020). But Scott himself did not perform live: all the songs and associated avatar performers were pre-recorded, so each event was in effect an immersive music video – 'the concert in its present form resembles a sophisticated broadcast rather than a real performance' (Ludovico, 2021, p. 45). However, some of the players/audience members were live together, sharing the surrounding event and interacting with each other, creating a sense of social liveness required of metaverses, even without the energetic performer–audience exchange. Coleman strove to create a concert that was live both for the audience and the performer, which required livestreaming audio, live-generated assets, and motion capture; this step recognises that the connection between artist and audience is important both for concertgoers and for the performer, increasing social liveness.

The Royal Shakespeare Company (RSC) has experimented several times with virtual performances; most recently, their pandemic-era production *Dream* – a short, impressionistic reinterpretation of the fairies' mischief in *Midsummer Night's Dream* (Bushnell, 2023, p. 26) – featured a live Puck, played by E. M. Williams, as an avatar in the virtual world animated through motion capture using VR headsets on a COVID-safe, minimalist set with only seven actors present, as per UK regulations at the time (Lennox & Mason, 2022, p. 1). As noted by Danielle Rosvally and Donovan Sherman in the introduction to *Early Modern Liveness* (2023), this show exposed multiple levels of theatrical and social connection to the temporally co-present, physically remote, audience: some of the performers (like actor E.M. Williams) were temporally live on RSC's stage, while some (like musician Nick Cave) were pre-recorded; some of the audience could directly interact in the virtual world (paid tickets), but others were mere observers (free tickets); everyone could see 'proof' of the performers' 'meatspace' liveness during a Q&A at the end of the play, a step Coleman also took. Although the gamified interaction for paid

audiences aimed to increase the sense of live engagement with the performer and world,

> once audiences released the firefly, and it entered the storyworld, they lost control over its movements. Consequently, audiences never actually moved within or interacted with the actors or the storyworld … By creating a stronger affiliation between audience members and fireflies, the RSC could have generated a greater sense of presence and agency for audiences.
>
> *(Lennox & Mason, 2022, p. 6)*

Coleman's approach to Big Sand, in contrast, insisted the audience respond to her between-song banter and even dance along with her; the audience had greater freedom, not just of physical movement but of verbal and emotional response, all of which Coleman could see and hear. This pushes the show further toward Metaverse levels of interaction and immersion, as participants on either side of the video screen have choice in their interactions.

The Adelaide Experiment

To create a metaverse-like performance space, the performer(s) and audience must be temporally live together, able to energetically interact with each other (perhaps physically, perhaps not), and there must be digital assets defining the space (setting/place, avatars/characters, objects in the world). While Gorillaz, 'Astronomical', and *Dream* all used some of these components, Big Sand's first concert tested the boundaries of combining all these elements. At ILA, Coleman's audience entered a venue featuring screens on the two main walls and even two of the middle pillars, immersing them in images of a yellow sand-dune-covered desert planet. The Void not only streamed Unreal, video, and audio to ILA, but cameras within the venue provided a livestream of the audience back into The Void through VDO Ninja video call. This meant Coleman could see and directly engage her audience, without them becoming avatars themselves. The two large screens transported the audience to an alien planet without losing important physical feedback like touch and balance, and they could interact with a digital avatar performer in a virtual show, thus enhancing the Metaverse-promised social connection and virtual world immersion.

Big Sand has released two songs as of 2023 – 'You, Me & The Sky' and 'Take Me Home' – which have accompanying animated music videos introducing the band's lead singer Taal and her two alien friends/bandmates. For the November concert, Coleman developed special animations for both tracks that would seamlessly integrate with her livestreamed telepresence – and, as the animations were generated by Unreal in 'real time', there was a sense of semi-liveness as the computer temporarily became the live performer

in Coleman's place. The venue was responsible for running the immersive content directly from Unreal Engine to ILA, and neatly overlaying a video feed of Coleman's real-time live performance when the moment arose.

The middle two minutes of the experimental show was fully live, written, designed, engineered, and performed by Coleman (in MoCap for Taal), with support from Cameron Mackness and Jason Bevan at The Void and the AV team at ILA. A virtual camera placed within an identical Unreal Engine project at The Void was able to feed Coleman's live avatar performance into a standard video call. Taal and her two bandmates were seen on a virtual projection screen set up within Unreal while the rest of the fully dimensional alien desert planet continued generating its physics around the internal projection; even if Taal's presence could not take full advantage of ILA's 14 million pixel screens, there was consideration of audience immersion within the virtual world. To prove that she was temporally live with the audience during these moments, Taal said "hello", waved, asked audience members a question, pointed to someone she could see on the camera, and soon got the audience to dance with her to pick up the energy.

Specific technical issues impacted the live experience, stressful accidents that proved the liveness of the event alongside its heavy mediatisation. It was only possible, for example, to stream a single HD video output of Coleman's live two minutes due to data limitations. Prior to the show's start, the team in The Void were unable to access the face tracking software that would synchronise Coleman's mouth movements to Taal's. In ILA, audio problems meant that Taal's voice dropped in and out, so Coleman struggled to communicate with her audience. Alongside the Unreal-generated music videos, the audience did not realise the performance featured hybrid liveness until an intrepid audience member came from the back of ILA and engaged directly with Coleman before the main audience-facing camera. Coleman says that she was encouraged by this interaction, which led her to instinctively pick up physical engagement with the audience as she did in her pre-pandemic touring performances; this moment of dancing together appeared to energise the audience too, bringing a sense of community cohesiveness sought after in traditional live performance experiences. As physically co-present live concerts, the audience was patient and supportive during mistakes, but as in a potential future Metaverse, they engaged in real time with avatars and a fictional, virtually produced world.

Conclusion

After the program concluded, Coleman hosted a Q&A session for the audience. The AV team at ILA cut to a webcam feed to show Coleman's material presence in The Void so the audience saw the human performer suited up in MoCap dots and face cam rig, a camera and helmet strapped to her head. This video proved to the audience that Coleman was temporally

co-present with them. 'Proving' liveness as a virtual performer takes several additional steps in virtual performance because the combination of VP tools with a temporally live performer is new; audiences are more familiar with VP in film, a static and editable medium. However, hybrid live concerts and other experiences are becoming more popular as venues integrate immersive digital hardware, artists experiment with online liveness, and audiences coming out of the pandemic have more digital experiences to reference. With socialising and direct engagement, such a core component of the definition of 'Metaverse', this proof-of-concept concert separates Coleman's work from her predecessors' virtual shows, thus blurring the boundaries between cyberspace and meatspace to create something closer to the proposed Metaverse.

Coleman's Big Sand project combined predecessors' approaches to interactive fictional characters, live audience engagement, and audience immersion in a virtual world, while also focusing on the audience's ability to access the work. Choosing ILA immersed the audience without forcing them to purchase or wear bulky devices and split their haptic from their audiovisual senses, which often leads to disorientation. When venues take on technology burdens like high-speed internet and high-quality screens, audiences can find themselves walking into a Metaverse – a digital, virtual social space with live interactions between users/audience and other avatars, including performers. Big Sand has forged a path for the arts and culture sector to engage inside Metaverse spaces without isolating spectators. The Big Sand musical experiment brings the Metaverse into material reality so more people can enjoy the virtual world. This concert represents an important step in a world increasingly blending material and mediated forms to create the Metaverse.

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7

GENDER DIVERSITY IN ART AND TECHNOLOGY

A Conversation in The Void

Sasha Grbich

Introduction

Intersections where research-based experimental art praxis meets technology industries are fertile spaces for thinking about the cultural potential of technologies. These critical junctures reveal structures within both fields, and at best, contribute to decolonisation of digital technologies and the creation of important experimental artworks. This chapter focuses on two such interstices arising from local art and technology histories and present-day practices by considering them through questions of diversity, labour, and decoloniality. The first juncture, a 1987 special issue of *Artlink* magazine, provides an example early in the formation of art and technology discourses. The example encapsulates early theory and practice in the area and provides a framework against which to consider contemporary praxis. The second juncture takes the form of a conversation with artists V Barratt, Jess Taylor, and Rosina Possingham as well as with Flinders University staff within The Void – Flinders University's emerging virtual production (VP) space. As The Void is still in its early stages, this inquiry is intended as a way of thinking critically and constructively with The Void's Artist-in-Residence program as it unfolds, while attentive to learnings from recent art and technology histories via the early *Artlink* example (see Figure 7.1).

Art and Technology Histories

Artlink is a contemporary art magazine published in Adelaide from 1981 to the present day, and is a key archive through which currents in Australian experimental art can be traced. In 1987 *Artlink* produced *Art & Technology*, a

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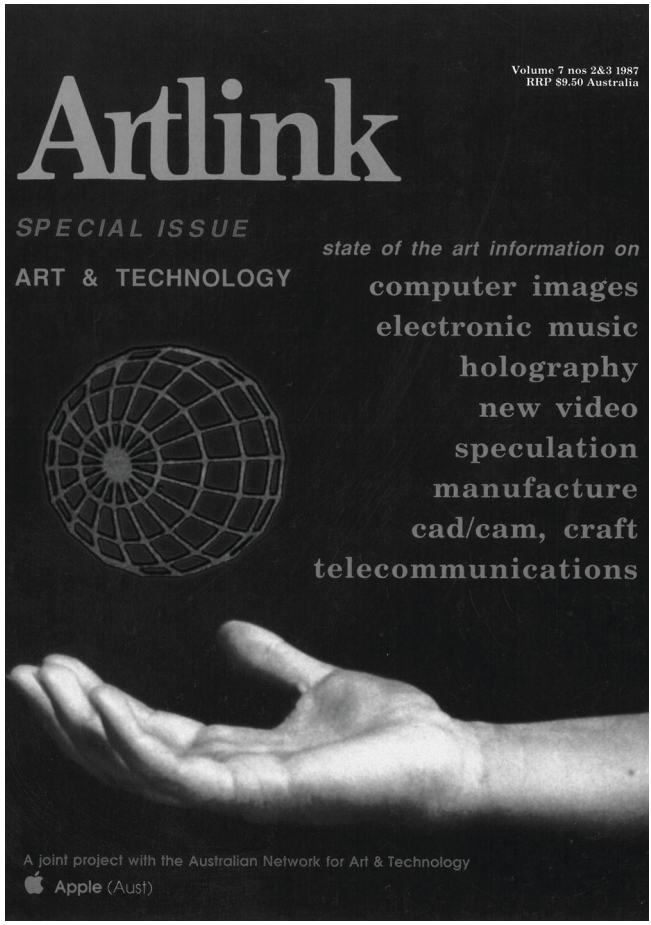

FIGURE 7.1 Scan of *Artlink* cover, Art & Technology Special Issue, vol. 7, nos 2 and 3, 1987. Photo source: Artlink magazine

special issue which differed significantly from its previous publications. It was four times as long, included colour pages, a thicker cover and glue binding, and was dedicated solely to a singular theme. It was also full of advertising, with eight full pages extolling the benefits of Apple and Telecom to be traversed before finally arriving at the editorial which begins 'Regular readers of *Artlink* will notice some dramatic changes …' (Britton & Da Rimini, 1987, p. 9).

The dramatic changes in this issue were not limited to the increased production budget. I undertook detailed content analysis to record the gender of writers and artists mentioned in every article published in *Artlink* between 1981 and 1984. My findings were compared with the same analysis of the *Artlink Art & Technology* Special Issue (1987) as well as a shorter

in-magazine feature on art and technology which *Artlink* published in 1985. Two interesting trends emerged. In the first half of the 1980s the magazine achieved an astonishing level of gender equity with women writing 45 per cent of articles and making 44 per cent of the artworks discussed. And second, special features on art and technology consistently saw dramatic drops in these statistics with the 1987 special issue having the poorest representation of women artists to date at 23 per cent and 37 per cent of writers respectively. *Artlink* founder and long-time editor Stephanie Britton did not undertake positive discrimination, nor did she keep records of gender representation. She accounts for the strong early representation of women in the magazine through the close relationship *Artlink* had with the Adelaide chapter of the Women's Art Movement, as well as her own embedded position within a network of female artists and writers (S. Britton, personal communication, 21 October 2022).

The 1987 *Artlink* special edition was edited by Stephanie Britton with then Australian Network for Art and Technology (ANAT) director Francesca Da Rimini, who in their introduction acknowledge the low representation of women as a continuing source of concern, observing that 'the old realities of technologies being a male domain are still current' (Britton & Da Rimini, 1987, p. 14). The articles in the issue develop the emerging art and technology movement as the newest page in the story of experimental art, with Simon Penny positioning it as the next generation to follow post-object art based on their shared critique of 'objecthood' (Penny, 1987). The early gender diversity revealed by *Artlink* editions was not reflected in collecting practices of the time, as can be seen in the poor representation of women in Flinders University Museum of Art (FUMA) own Post Object and Documentation collection, which contains less than 5 per cent works authored by Australian women artists. By positioning women's artworks at the periphery, the conceptual and post object art movements excluded what art historian Susan Best terms the 'feminine avant-garde', or more materially driven or affective works, more often made by women (Best, 2011).

Attending to the tensions and emphases in local art and technology histories via the *Artlink* example shows complex operations at play in the formation of dominant, gendered art histories as well as putting up a red flag where diverse participation in experimental art was impacted during the emergence of the art technology field. This historical account stands against simplistic progress narratives by making evident waves of headway and loss in a struggle for a diverse ecology of knowledges within experimental art – and The Void at Flinders University operates within its unfolding.

As the field developed, resistant feminist responses also emerged. Transmedia artist V Barratt remembers the 1987 *Artlink Art & Technology* edition. They were living in Brisbane and running the artist run space *John Mills National* where then ANAT director Francesca Da Rimini conducted

the Brisbane launch of the magazine. Following this encounter, V attended the 1989 ANAT Computer Summer School for artists and became deeply engaged in the art and technology field. They moved to Adelaide/ Tarntanya in 1989 to take on the role of coordinator of ANAT, and in 1991 formed VNS Matrix with Julianne Pierce, Josephine Starrs, and Francesca Da Rimini, collectively identifying themselves as 'saboteurs of the big daddy mainframe' in their Cyberfeminist Manifesto (1991). The collective positioned affect and logic as non-exclusive and welcomed chaotic, visceral possibilities of remapping cyberspace with a feminist bent. The importance of VNS Matrix's work has included their recoding social norms (Barnett, 2014), reclaiming the matrix as womb (Burrows & O'Sullivan, 2019), and creating new forms of pleasure and knowledge (Gronlund, 2017). V's is a long creative engagement with cyberspace, where early encounters in webs of human/machine intimacy led to decentralised collaborations using open systems for creative production, and to performance works where the possibilities of being in excess of the self was explored through the affect of panic (see Figure 7.2; V, personal communication, 12 February 2023).

Jess Taylor takes a feminist position within the politics of looking, as well as a position of entanglement and responsibility to digital and flesh others. Her body is scanned to create every figure in her artworks, which often draw on

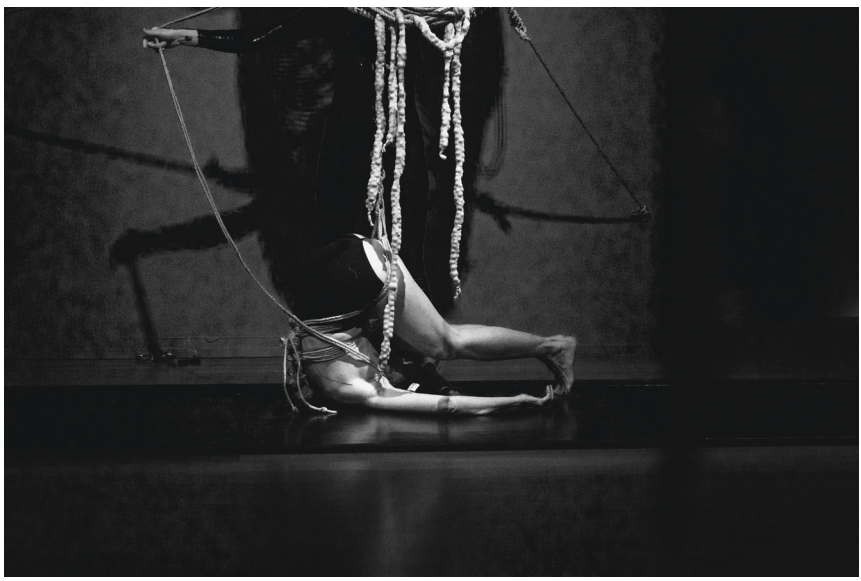

FIGURE 7.2 V Barratt & Em König, *Exosmosis* (2022). Photo credit: Sia Duff, courtesy of the Samstag Museum of Art

her experience of motherhood. Her many selves multiply and die by birthing and devouring each other within the digitally printed tableaus and virtual reality (VR) worlds she builds. Along with Taylor's form, they are also mothers and children and sometimes monsters, goliaths, and spiders. Working with the genre of horror provides Taylor with a symbolic language with which to speak about socially constructed feminine roles that she often defies. Like the affective operations in V's work, horror too is a space of unavoidable feeling that elicits terror, pleasure, and shrieks. Her work *Magic Mountain* (2018) is a VR environment comprised of massive scans of Taylor's naked body. Visitors to the realm traverse the pink peaks and troughs of an enfolding landscape enacting uneasy voyeurism. A significant part of the experience was the scale of Jess's VR body, which is almost too big to be seen at once. She describes the strength and passivity of that positionality as akin to that of the earth we stand on, as being both all-powerful and frequently transgressed (Taylor, personal communication, 24 May 2023). Her work raises questions about

FIGURE 7.3 Jess Taylor, *Shelob* (2022). Photo credit: Sam Roberts

the separation between lived and digital bodies, the positioning of women in these spaces, and the rights of non-human entities including those of her many scanned selves (Figure 7.3).

Both V and Jess Taylor have undertaken sustained work in the field of art and technology through feminist and affective methods. Neither artist has yet participated in The Void's Artist-in-Residence program. Bringing them into critical relation with The Void was motivated by a commitment to feminist methods where change is sought through conversation, and being together in difference (Roe, 2018), wherein agreement is not the aim (Mouffe, 2007). The strategy also learnt from the provocation is that unlearning imperial (patriarchal) constructs might be done co-extensively with those made marginal by dominant historical narratives (Azoulay, 2019).

Into The Void

In The Void, V and Jess Taylor met Rosina Possingham (an artist who recently received an Assemblage Centre of Creative Arts seed grant to undertake a project in The Void), Tully Barnett (Associate Professor, Creative Industries and Assemblage director), Jason Bevan (senior lecturer in Visual Effects and Entertainment Design), and Cameron Mackness (digital business developer and coordinator of The Void). The conversation took place on 2 June 2023, and unless otherwise indicated, the following comments were taken from voice recordings of the event.

The Void, Flinders University's motion capture and digital storytelling platform, is an innovation that arose from and responded to the disruption of the pandemic. It formed by thoughtfully reusing technology initially purchased and used for earlier projects and the re-allocation of staff hours and priorities during COVID-19 lockdowns and responses. Within Flinders University it is connected to the Assemblage Centre for Creative Arts and has many applications including research, creative practice, teaching, and industry in a mix of student projects, motion capture and virtual production classes, academic research, and artist residencies. No project is the same. The opportunism of its founding created open possibility in the use of the space post-pandemic, albeit one that has been rapidly taken up and overstretched by interested parties. Assemblage director Tully Barnett described the criteria used to direct the work done in the space, stating that "given the resource implications, each proposal is considered in terms of what it adds to The Void and its relationship to the college". She describes some issues as technical problems, others are creative problems, and some contribute to the ways The Void is embedded in SA, Australia, and internationally.

Our conversation focused on the Artist-in-Residence program, where artists from outside the university can apply for access to The Void, with successful applicants receiving an artist fee and significant in-kind support towards the

development of new work. As conversation progressed it became apparent that The Void has been experiencing capacity limits wrought in tensions between teaching, research, and industry, and very limited allocation of staff hours. Concern was raised that these tensions might influence decision-making, as well as bringing focus to the ways that artists gain access to the program. Conversation centred on the possibility that artists' applications were benefiting from having undertaken relationship building with The Void prior to the assessment process. Discussed as 'the hustle', this anecdotal evidence placed onus on artists to build relationships with the institution and could indicate a lost opportunity for The Void to carefully curate inclusion. Commenting on questions of access, Jess Taylor highlighted that "my own 'hustle' currently involves two children and two jobs, so my capacity to reach out and build relationships with spaces like this is limited".

In *Making a new reality: A toolkit for inclusive media futures*, researchers Kamal Sinclair and Jessica Clark challenge institutions to undertake audits and develop long-term programs towards behaviour change and accountability so that emerging digital media (such as VR) does not replicate the lack of inclusion of earlier waves of screen media (Sinclair & Clark, 2020). V provided a summary that located The Void within their own experience of art and technology histories, observing, 'it resonates very strongly with the early 1990 ANAT summer schools [where there was] lots of talk about access and the kind of industry hustle that we as artists must do to gain it.' Their experience bringing to the fore the ongoing complexity of navigating relationships between art practice and new technologies.

Sinclair and Clark highlight the importance of institutions building trust in areas where there have been poor records of creating safe and inclusive spaces (Sinclair & Clark, 2020). The university, inheriting as it does colonial/patriarchal structures and increasingly neo-liberal in orientation, must work hard to structure safe spaces for diverse communities (Santos, 2017). Given The Void has a small staff that does not yet meet an ideal level of diversity, the Artist-in-Residence program faces the challenge of building trust and reputation as a safe space for artists who might come with diverse and traditionally marginalised experiences. Jess Taylor recommended that stronger ties could be made with experimental art organisations with existing reputations for inclusion, to streamline engagement with artists (alleviating the workload on overstretched Void staff) and to ensure the commissioning of projects of strong creative merit. While this generous suggestion acknowledged the time constraints experienced by Void staff; Sinclair and Clark are clear that the challenge of inclusion is the responsibility of the institution, calling for change from within to prompt awareness of implicit bias, to encourage allyship, amplify the work of traditionally marginalised groups, and advocate for the under-represented (Sinclair & Clark 2020, p. 99).

Rosina Possingham received Assemblage seed funding for her project *Herding Caterpillars* (2022), a VR experience that locates viewers amidst

an interrelated ecology where the Chequered Copper Butterfly is in mutual symbioses with native sorell (*Oxalis perennans*) and common black ants (*Iridomyrmex rugoniger*), see Figure 7.4. Hers is an example where a project moved from Assemblage seed funding and scoping in The Void, and then to further funding and exhibition, in which Flinders became a partner. The seed grant she received allowed for time to be spent considering the project's possibilities, consulting with Void staff, and learning about technological restraints. Beyond this, Possingham successfully developed a partnership with CDW Studios who then provided avatars and characters which helped her to secure CreaTech: Digital Enterprise Program funding required for realisation of the project. The lack of arts funding, available for VR development was also a concern raised, as to secure adequate funding Possingham needed to re-orient the project to the objectives of non-arts funding.

Possingham's experience articulates the complex juncture into which artists in The Void are placed, whereby their projects and labour are often the trajectories through which relationships with technology industries are built. During the conversation Cameron Mackness clarified that Void staff place priority on projects that both have a clear outcome that can be used to build relationships with technology industries, and where artists come in with ideas that extend and develop the capacity of the facility. This assertion belied a difference in the orientation of The Void amidst the research themes of Assemblage, which prioritises creative contributions to discourses on posthumanities, feminism, and subjectivity. This dissonance may be due to chronic under-staffing of The Void, where overstretched staff face an impossibly large task of developing business relationships while supporting diverse

FIGURE 7.4 Rosina Possingham, *Herding Caterpillars* (2022) still from VR environment. Photo credit: Rosina Possingham

research, teaching, and creative projects. It also might indicate that technology industries are being approached as neutral partners – an assumption I will unpack via decolonial literature later in the chapter.

Given limits on resources and time, mutual benefit for all partners is an expedient aim; however, it is one wherein the dynamics of labour need attending to. Possingham felt that the opportunity provided by The Void was highly valuable to her as an early career artist. I observed that she also described many months of work that would have easily exceeded her $AU3,000 grant, articulated the need to pay performers and a dramaturg, undertook work that more often resembled that of a producer rather than artist, and gave her time in extensive public programs and talks which built the profile of The Void. Jess Taylor voiced the complex dynamics within mutual benefit programs of this kind:

> The institution – which does face funding and resourcing issues but I would argue are nowhere near those faced by artists – receives input which tests and advances both understanding and use of the available technology, while the artist receives the opportunity to make work and somewhat advance their own understanding. In my experience, you'll seldom find an industry partner that is interested in donating their time or providing it at the rate that artists will, and yet it is often commerce that benefits most once questions are answered.

V added that experimental art projects often 'don't play well with budget bottom lines', articulating the problems arising where contemporary, experimental art praxis that is research-based meets the technology industries with different financial orientation. V went on to suggest that for The Void to support the potential of open experimentation it would need to embrace works without a clear output, with separation between teaching and research being key. They stated that, ideally 'you would be able to come into a space and experiment and research and learn without the priority or stress of having to produce a huge outcome or manage lots of industry partners'.

The uncomfortable relationship of artist residencies in The Void to technology industries might be understood through considering the different orientations in experimental art and technological development. In the work of sociologist Boaventura de Sousa Santos these differences are given voice when he describes the role played by modern western science in consolidating colonial epistemologies. He goes on to identify that decolonial actions need to involve concurrent questioning of 'its colonial character … its capitalist character … and its patriarchal character' (Santos, 2018, p. 107). Within an Australian context, the assumed neutrality and universality of knowledge arising from western science is challenged by Angie Abdilla, Josh Harle, and Andrew Newman. In their book *Decolonising the digital*, they assert that its

claim to universality 'is fundamental to its use as a tool of dominance, and hides its subjectivity, cultural-sitedness, and Eurocentric perspective' (Abdilla, Harle & Newman, 2018, p. 10). While the aims of experimental art are as various as its practitioners, feminist approaches like those described in this chapter contribute to disarming western science's patriarchal character and making transparent its subjectivity through considering gender.

In rejecting colonial, patriarchal, and capital aims, new possibilities emerge. Angie Abdilla contributes a First Nations led understanding of technology as enmeshed with culture, where technologies arise from and shape ways of knowing the world, contingent on social systems and structures (Abdilla, Harle, & Newman, 2018). She provides alternative criteria for the success of new technological developments by attending to the leading work done by First Nations communities and practitioners where technologies are considered for their sustainability and interconnection with care for country and kin (Abdilla, Harle, & Newman, 2018). Her work provides a generative guide to questioning and reorienting digital media development such as that being undertaken in The Void. The nexus of art and technology has the potential to be a space in which technologies might be approached as culturally enmeshed, and where significant work could be undertaken to rethink the use of new technologies towards decolonial futures.

Assemblage director Tully Barnett reflected that The Void is a space where constant work was being undertaken to keep it accessible to creative projects against the prevailing hunger for commercialisation within the university (Barnett, personal communication, 10 October 2023). Resisting such neo-liberal currents might take the form of counter-movements within the university where epistemological transformation might become possible by 'privileging knowledges (be they scientific or artisanal/practical/popular/empirical) born in struggle or produced in order to be used in struggles against domination' (Santos, 2017, p. 381). Such counter-movements must be committed to decolonial aims and empower those historically marginalised by the university. Discussion of the Artist-in-Residence program in The Void brought to the fore this tension and possibility, wherein the experimental methods of art practice might offer a space of resistance. Our conversations ultimately expressed the need to protect such programs from commodification while carefully fostering resistant, diverse knowledges within them.

Ideally, junctures where art and technology interact can be spaces in which the flourishing of experimental art brings focus to the cultural potential of technologies. Sinclair and Clark voice a challenge for the field when they write that 'Story and narrative are the code for humanity's operating system. Emerging media cannot risk limited inclusion and suffer the same pitfalls of traditional media. The stakes are too high' (Sinclair & Clark, 2020, p.10). While they are writing in response to screen media pasts, this analysis of local art and technology histories attends most directly to gender and the possibilities

of feminist methods within decolonial approaches. Programs operating at this juncture, such as the Artist-in- Residence program in The Void, are faced with the potential and the responsibility of knowingly navigating the different orientations of the fields that meet in their spaces. The conversation recorded in The Void brought renewed light to the ongoing need to actively create inclusive spaces, articulate an understanding that relationships with technology industries can create barriers to experimental methods, and finally, highlight the important place that art and technology programs can play in decolonising digital technology.

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8

EXPLORATIONS IN MOTION CAPTURE AND DIGITAL ART

Liam Somerville

Introduction

As a video artist and cinematographer living and working on Kaurna Country in Adelaide, South Australia, I have completed two projects in The Void using Unreal Engine (UE): game development software with real-time rendering which allowed experimentation and the creation of these ambitious projects. The first was a collaborative animation, *Welcome to Larrakia Country* (2021), with First Nations musician MRLN which came about from a partnership between Northern Sound System (NSS) and Flinders University. The second project was the art-game and virtual reality (VR) simulation *ESCHATECH VR* (2021) – a posthuman take on the last 100 seconds of humanity made as part of the Assemblage Artist-in-Residence program facilitated by Flinders University. As I moved out of the confines of traditional filmmaking and more into that of a digital video artist, I have incorporated integrated virtual production techniques into my artistic practice and my interaction with The Void reveals the possibilities of what can be achieved in the space at this point in time, setting a foundation for future artists and technicians. The two different projects demonstrate two different approaches and outcomes of creating visual experiences to accompany music in either live performance or VR, which is significant for Research and Development (R&D) around refining workflows in virtual production.

I started my exploration of the moving image by undertaking a Bachelor of Digital Media Arts at the University of South Australia, majoring in Film and Television with a minor in Animation and Photography. Here I was taught the basics of traditional filmmaking and documentary production and practised by making both drama and factual short films. I excelled in the practical subjects and

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took a keen interest in camera work and capturing images, as this is what drew me to study filmmaking in the first place. Before undertaking formal studies I had a personal passion in experimental film photography where I explored techniques such as cross processing film, multiple exposures, light painting on long exposures, and the use of plastic lenses or filters. I shot hundreds of rolls of 35 mm and medium format images and extended this practice into my studies. This experimental attitude stayed with me throughout my studies and later into my career/arts practice. In my 3D animation subjects I completed two major projects in Maya, an industry standard software program which allowed creation of 3D assets, placement in scene, animation of movement, virtual lighting, and texturing inside the one program. I found the process of creating 3D animations solo was too slow, with a disproportionate effort-to-output ratio where the effort spent animating was not equal to quality or quantity of the finished final product. I came to this conclusion after spending five months creating a one-minute animation which I believed still needed more work to get to an acceptable level. I found that keyframing every movement manually was too time-consuming, and I did not see the value in creating 3D animations without a crew and a budget, as it was not sustainable to do by myself. When I graduated in 2012 I turned my back on 3D animation and instead focused my efforts on filmmaking at this initial stage of my career, being more of a generalist without a formal speciality. I teamed up with good friend and fellow film student Dom Sargent to form a filmmaking partnership, Capital Waste Pictures, where we created music videos and documentaries as well as corporate video content to pay the bills. We were wildly creative and collaborated with artists, musicians, and other film crew in Adelaide for many years before Sargent left the partnership to undertake additional studies in Melbourne. I happily adopted Capital Waste and carried that as my artist and business name (Somerville 2023).

I was forever experimental and found that the best way to explore the possibilities of the moving image was through the medium of music video where local bands gave me creative freedom and the opportunity to try new filmmaking processes. It was a great medium to experiment with as music video projects are often short (with an average duration of two-and-a-half minutes) and already have a soundtrack. My experimental attitude meant that strange briefs or projects provided many interesting opportunities to continue my exploration of the moving image in many different formats and modes.

In my artistic practice, I have enjoyed experimenting with analogue film as a medium but failed to see how I could do this sustainably as a moving image arts practice. I enjoyed the distortions of reality and perspective but the act of purchasing, capturing, developing, and digitising motion picture film was expensive, and time-consuming. Developing labs were limited, and existed

only interstate, not to mention the environmental footprint of using litres of water and chemicals to develop images. While working on a music video for local Adelaide band Hydromedusa, I experimented by dubbing the edited music video to VHS and dubbing back and forth between old tapes, harassing the VCR as it recorded. This was thrilling as the glitched outcome gifted distortions of reality with crunchy static, warping sound and vision, vintage digital artefacts, and colour anomalies. This new medium of digital tape distortion was exciting as it was instantaneous to create and very accessible as VHS tapes were cheap and easily available. This collaboration with technology became a pillar of my arts practice where I would guide technology to stylise video content but never had full control, which allowed for unexpected results and interesting images. This technique of dubbing between tapes did, however, damage the VCRs over time. In my ongoing search for new tools or techniques I came across circuit bent electronics, which is where intentional interference, shorts and distortions are created on electrical video equipment by soldering wires, resistors, and potentiometers onto the circuit board. I was able to achieve similar distortions to footage with the turn of a knob or flick of a switch and did not have to keep destroying VCRs. This technique of analogue glitch/distortion through circuit bent video gear still remains an integral part of my arts practice and once again demonstrates the experimental and explorative nature of my work.

In 2016, I was introduced to the game development application Unity (5.5), during a digital dome projection artist residency in Denver, Colorado, facilitated by Alt Ethos and partially financed by Carclew Youth Arts. I realised that this meant the time-consuming rendering and animation processes that had turned me away from 3D animation in university were now much more streamlined and replaced with node-based coding and rendering in real time. This meant I could gamify the animation experience and create more dynamic projects by driving the virtual camera, similar to playing a first person video game. I created *Welcome to the Tropixxx* (2016) an interactive dome experience which was a live, guided tour through a stylised tropical beach resort for robots. The project contained assets modelled in the freeware 3D software Blender and I animated the sprite textures by digitising analogue circuit bent hardware. This unique mix of techniques and technology old and new was all presented inside of Unity. I was excited by these new-found processes and tools, but I particularly liked that almost all of this software was totally free to download and use, unlike the expensive licence for Maya, which locked me out of the program as soon as my university credentials expired.

I continued to use Blender and Unity in my practice and found that these programs allowed me to create dynamic visuals in real time, which meant I could create live visuals on-the-fly to accompany music performances as seen

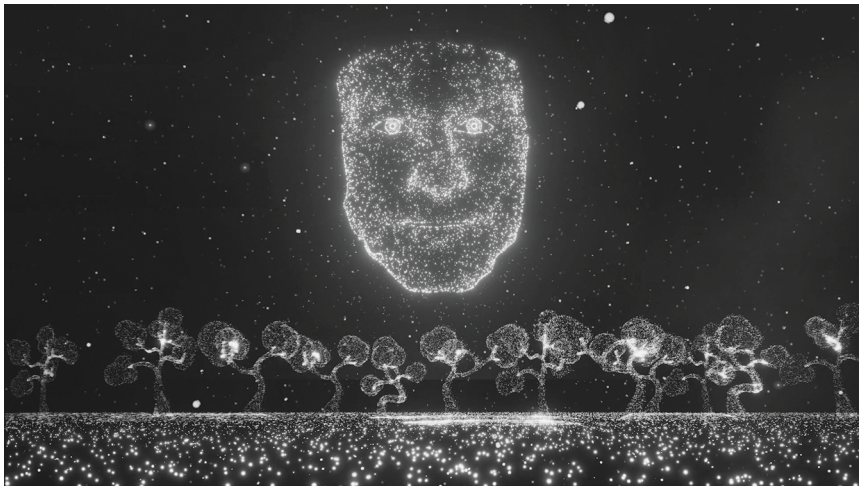

FIGURE 8.1 A still frame taken from the *Welcome to Larrakia Country* animation, which demonstrates the particle/starfield display of characters. Image credit: Liam Somerville

in *CHAMBER(live)* (2019) where I used night vision cameras, a real-time Unity project and pre-recorded VHS footage all mixed and glitched live as part of a performance at the Adelaide Grand Masonic Lodge. Following that performance, my musical collaborator Michael Ellingford worked with me on AV installation *NOISE//NATURE* (2020) at the Adelaide Botanic Gardens assisted by MusicSA. We created a 25-minute looping video that would be projected onto trees in the gardens, and the audience were invited to sit on the grass at night and become drenched in sound and light. This project also used a similar process to the previous projects and was created with assets built in Blender, compiled in Unity using analogue glitch gear.

At this stage in my career, I was still classifying myself as a filmmaker and took a generalist attitude to filmmaking where I would do the bulk of the concept, capture, and creation of my filmic ideas. However, I started to take on a video artist role as the techniques and outputs of ideas did not fit conventional film definitions but rather experiences, performances, or installations. As a digital artist I saw there was a pretty steep learning curve in the integrated virtual production (IVP) workflow, and although I had a background in animation, there was an enormous amount of detailed steps in the creation of both projects. While these technologies are becoming more accessible to the common artist through free software and endless online tutorials, there are still enormous amounts of time, skill, knowledge, and computer hardware required to create a game or animated film in Unreal Engine.

Project 1: MRLN *Welcome to Larrakia Country*

In 2021 I was approached by NSS, City of Playford, and Flinders University with a potential future project in collaboration with First Nations musician MRLN. This project was where my journey with The Void truly began.

NSS is a government funded youth and music focused community space in Elizabeth, SA, that had been working closely with musician MRLN (aka Marlon Motlop) – a football player turned singer–songwriter. MRLN had just been given the opportunity to perform the opening set at Bass in the Grass Festival 2021. As a traditional Larrakia man, he also had the privilege of performing a First Nations *Welcome To Country*, this time with an animated clip (Figure 8.1). The soundtrack was created through a collaboration between MRLN and hip-hop producer/rapper Jimblah (aka James Alberts), also a Larrakia man.

As musical collaborators MRLN and Jimblah both came from music backgrounds, the project took the form of a music video production model where the soundtrack was created first and became the spine that the rest of the project grew from. The concept of the animated clip was dictated by the soundtrack's musical journey, which set the story and pace. The concept starts with the eternal, peaceful paradise of Australia before colonisation; the earth is plentiful, the people are happy, and life is good. This is soon interrupted by the invasion of Captain Cook and the First Fleet with the decimation of native people, animals, and culture that soon followed. Throughout the animation MRLN's face appears in the stars and he speaks in language to welcome others to his Country, and to ask the audience to be conscious of the land they are walking upon and to tread lightly. The final three-and-a-half minute FullHD film was presented on a large LED screen at the back of the Bass in the Grass music festival stage before MRLN's music performance.

The project was to be created in Unreal Engine, and this would be the central application that the project would be made inside. After the concept was discussed and a loose storyboard was sketched, it was time to create a previsualisation (pre-vis) showing characters, environment, and camera movements set to the soundtrack, also known as 'greyboxing'. This process allows for planning asset lists as well as tasks required to get the project to completion. As this is a digital project it is simple to switch out low-quality placeholders and replace them with final assets/animations as the project progresses. This means that the Unreal Engine project is set up right at the start of the project, and although it takes many applications to create and modify the assets for the final result, Unreal remains the central application for the majority of production. It is, however, common to create progressive project milestones with sequential saving to create versions or levels inside the master project.

After approval from the musicians/co-directors MRLN and Jimblah the previsualisation guided the shot list, character lists, animation list, and asset

list. Upon reflection this is a milestone where I should have reined in the concept a bit to reduce 'scope creep', a common term in the creative industry that describes when the concept of the project slowly gets larger and the workload exponentially increases, while the timeline and budget stay the same. Perhaps this was due to a lack of confidence with the whole digital workflow in this new medium.

I quickly became concerned with some holes in my knowledge base as well as the time constraints of the project so I unofficially joined the R&D team at The Void at Flinders University to gain a better understanding of the workflow in action. There are certainly some workflow differences between traditional animation and motion capture (MoCap) as a part of IVP. The main difference was rigging and specifically retargeting, a process where a skeleton is put inside the mesh of the character and the motion data from MoCap becomes a master skeleton that puppets the mesh skeleton slave to animate the character mesh. This step is a new addition to post production workflow as previously the skeleton assigned to the mesh was animated manually by key framing bone transforms and rotations using only the mesh skeleton with a control rig and inverse kinematic (IK) relationships. The transferring of motion data along the workflow chain is an art in itself, where every step and handling of the data is crucial to get accurate movement in the final character. It starts with correct placement of tracking markers for optical motion capture, and the skeleton is generated in Vicon Shogun software and ported through MotionBuilder into Unreal via LiveLink. If the retargeting is not aligned throughout workflow the character can have an inaccurate representation and this can result in deformities in the performance. For example, a slouch due to incompatible retargeting or poor weight painting can drastically change how the body language of a character is portrayed. There are also consequences of poor joint placement that breaks some of the Disney 12 Principles of Animation (Thomas & Johnston, 1995), for example, limbs overlapping show the character is not holding a consistent weight or volume in three-dimensional space and demonstrates a clear malfunction or mishandling of data.

As with every project, it is important that the intellectual property (IP) of the cast and crew is respected. This means appropriate conversations and agreements so that all are credited and have control over their performance data. The agreement was that the motion/performance data was only to be used for this project and not used in other productions or any assets made publicly available online or otherwise. As motion capture has only just recently become accessible outside of the high budget feature film industry, the specificities of MoCap data IP ownership is a relatively new addition to common performance contracts. The paradigm shift created by the introduction of motion data as a performance asset is an issue that needs to be addressed. Traditional image capture is limited to the footage shot and limited to how that can be used

in different projects; however, with this new age of digital data the actor's performance can be captured and this 3D data can be used in infinite ways with interchangeable digital characters, viewing the performance from different angles and focal lengths. This 3D asset becomes extremely useful and highly resaleable, so it is important that the artists involved give consent, are correctly credited, and remunerated where applicable.

As this project is a First Nations story it is also imperative that First Nations people are in control of the project, and their story and culture. This means regular progress check-ins and updates of the animation as it is created. It also means that all First Nations characters must be played by First Nations actors, dancers or performers. This project was no exception, and local First Nations dancer Karra Nam was cast to play the female characters and Marlon performed as the hunter character. It was also great to have Marlon be involved in this process as he could get an insight into what went on behind the scenes of the vision side of the project.

It is important to always try and engage creatives from diverse backgrounds in every project and this project was no different. For this project I went looking for First Nations animators or 3D technical creatives and, at that time, quickly discovered a lack of First Nations artists in the field of 3D animation – a deficit the SA Film Corporation are aware of and are making efforts to change with their First Nations Screen Strategy. Screen Australia (2023) is also aware and since the project has introduced the First Nations Game Studio fund and Expansion Pack fund, which has seen over $5.5 million in funding for 41 games since it was created early last year. After reaching out to many of my contacts in the animation and games industry, I found no available First Nations digital creatives appropriate for the project and so enlisted some other local animation gurus.

Another problem faced was hardware/ computing limitations; the Unreal project started on my 2015 MacBook Pro soon after the project passed the previsualisation stage stuttered due to graphics processing unit (GPU) load to the point of being unusable when particle systems were introduced. This meant that the team had to work on Windows PC gaming computers instead of Mac laptops as the graphics processing power was not enough, even on a laptop capable of 4K video editing. This meant that I had to think about building a gaming PC capable of handling this project.

A typical Void session starts with the performer being fitted into a black Velcro, skin-tight suit and cap, which is followed by 'marking up' where the performer is covered in small reflective balls in a pattern that the array of specialty Vicon infrared cameras detect to create the data. The Void often use the Production 10 Finger mark-up configuration by Vicon Motion Systems (2023), made up of a configuration of 67 reflective pearl markers. Then a pattern of reflective balls or a cluster is stuck on the back of the performer to identify the digital character. The performers then provide a range of

movements which 'teaches' the software where the limbs are and adjusts the digital bones to fit. As a director, this is a good time to help the performers get into character, while doing stretches or, as The Void staff have coined, a 'range of motion'; this is an opportunity to literally warm up and get back into focusing on the project after the initial calibration process (Figure 8.2). Most of the time Void staff have found that performers are often very excited to be in the space interfacing with computers so morale is up. The session moved smoothly as there was an enormous asset spreadsheet that had every take itemised and detailed; this document was crucial to keep the capture day moving and to keep director, motion capture technician, and talent updated with fine details at hand for every shot. This spreadsheet was created from the pre-vis, much like a shot list in a conventional film shoot day but with some extra columns for Asset Code (a code system for easy identification of clip/animation), scene number, time in, time out, total clip duration, description of the action, character, performer, props, number of takes, best take, completed checkbox, and final filename of the best take. This document was made for the shoot but was incredibly useful throughout the workflow when looking for specific shots or looking for alternative takes. There are some extra challenges in the post production stage of MoCap projects when compared to conventional video post production. The main issue is that to view MoCap performances the take has to be assigned to a correctly rigged mesh and played in an animation program so it is a several-step process to watch a take which can be timely, whereas with a conventional video shoot the recorded takes/clips can be previewed outside of the editing software quickly and easily. This is one of many reasons why it is important and much more efficient to make as many decisions on the shoot day as possible.

With the MoCap data 'in the can' the next step was to add these keyframed animations to a mesh or virtual body. For this project the team decided to go with a particle system to display the characters and landscape for a number of reasons. First, in many First Nations groups they believe that when ancestors die they become stars in the sky to watch over the living people on Earth so this visual approach was a reference to their spirituality and connection to past ancestors. Second, we found star systems were a dynamic way to show and depict semi-graphic scenes in a tasteful way. The story of Australia's colonisation and genocide caused by the British is quite confronting and while the team did to want to 'sugarcoat' the content, we wanted to get the message across in a way that would allow viewers an emotional connection with the story but without the shock factor.

The next step was to create MRLN's face, up in the sky. And for this the team scanned MRLN's face using an XBOX Kinect camera and software to create a 3D scan of his head. Then the vocal take was captured as audio and as a facial performance was captured using Unreal's LiveLink Face iOS app, similar to the process of using MoCap to drive the body.

From there the team created the environment, particle systems, and set up the village, soldiers, and ships. All of this was composed in one large Unreal project and broken down into shots/sequences. The camera shots and movements were recreated from the pre-vis and rendered out as layers to allow for fluidity in the final edit and to nuance the layers. The layers were recompiled in Adobe AfterEffects and put into the final sequence where the vision was synced with the audio and final effects added.

Reflecting on this project I believe that the animation and MoCap performances were the perfect way to tell this specific story. The piece had a unique look and feel, and portrayed the hurt and decimation caused by the invasion of the British without isolating the audience to switch off from the message the team was attempting to portray.

Project 2: *ESCHATECH VR*

The next project I undertook in The Void was through Flinders University's Assemblage Artist-in-Residence program where a digital artist was invited to make a project using The Void MoCap facility to create a new digital work in any medium. I submitted a proposal for a project which was eventually named *ESCHATECH VR*. This project is a playable, first-person VR simulation of the last 100 seconds of humanity where the player awakes in a survival bunker with a descending timer on their wrist. Outside the bunker is a polluted, desolate world devoid of natural flora and fauna with four enormous anthropomorphic titans destroying the last remaining pieces of the Earth, each one representing a different facet of destruction- resource pillaging, irresponsible waste, corporate greed, and Mother Nature's retaliation. The titans can be seen at all points of the experience. When heading toward the ocean, between offshore oil rigs is the resource pillaging titan who is an obese, male, human creature who is dripping in crude oil; he is sluggish and flails his arms, trying to grab onto the shore and, over the game's short duration, the sea level rises at an aggressive rate, reducing the size of the explorable map as time goes on. Toward the city is the titan of capitalism, characterised as a businessman made up of a cloud of floating 50 dollar notes; he stands proud, laughing with overconfidence, stomping on the polluted lands. Toward the dump are piles of burning waste and smog left by human's irresponsible consumption habits and an obese male titan made entirely of rubbish. The final titan is a femme made out of fire, the ecofeminist representation of nature's wrath that starts weak, but over the 100 seconds becomes more powerful and extrudes flames to destroy the other titans and the player. There is also a music performance in the middle of the map where a large group of cyborg posthumans are dancing to a live music performance on a futuristic stage. Littered around the map are also 'pickups' or collectable resources that the player can collect and bank on their wrist display which include food, water, money, carbon credits, and fuel.

FIGURE 8.2 Performers in The Void capturing movements for *ESCHATECH VR* with director Liam Somerville. Photo credit: Rosina Possingham

In the VR experience the player has no objectives and is free to explore the map with their precious 100 seconds. *ESCHATECH VR* is an 'art-game' where, although the simulation includes many game-like tropes, the piece is made as an immersive experience as opposed to a traditional video game which usually prioritises gameplay and a timeline of objectives. The main reason for the creation of this art-game is to promote conversation and change outside of the experience, as the short taste of horrors in this virtual world invites questioning oneself and provokes conversation between other players about the human-caused climate disaster we are experiencing in our reality. The short and intense climate fiction (cli-fi) VR experience shows a possible future of humankind if we continue on with our unsustainable consumption practices and irresponsible use of fossil fuels. The medium of VR was the best way to convey this message as it really immerses the player in this future projection and demonstrates the enormity of the climate issues we are facing. Each player's decisions provide a unique experience for them and the different choices give insight into how that person interacts with the world outside of the VR headset. Essentially the experience poses the question: what would someone do if they knew there were only 100 seconds of their life remaining?

Would they stockpile resources? Gain currency? Or dance at the 'rave at the end of the world'?

While I had a solid concept for the experience at the start of the residency I allowed room for extra research and input throughout the process to utilise the wealth of knowledge in the Flinders post humanities group. This group of lecturers, researchers, and thinkers met weekly as the post humanities reading group, where I gained insight to some of the posthuman philosophies and concepts the group shared an interest in. Some hearty conversations with Flinders staff Tully Barnett, Garry Stewart, and Stephen Muecke added depth which was reflected in the project.

One of the most crucial concepts that informed the experience was what would the 'end of the world' look like? In this instance, it is more relevant to discuss the 'end of humans' rather than the 'end of the world' (Danowski & Viveiros de Castro, 2017). In reality, planet Earth is several billion years old, and it would take an enormous amount of energy and resources to destroy it with human hands. What human-caused climate change is doing is changing the elemental conditions on the planet, which will eventually make it unliveable for humans (and take other flora and fauna as collateral along the way). Like all lifeforms, humans can survive within certain thresholds: temperature, available air (oxygen), available water, pressure, and nutritional sustenance. When this environmental range changes due to modern humanity's consumption habits, it makes it harder for us to exist.

I wanted to create a lasting impact with players and to invite self-questioning through metaphors which I would call 'philosophical fish-hooks' where a seemingly simple question about the VR experience would ask players to question similarities in their own life. The first example is the unconventionally short duration of the game, 100 seconds, which is a reference to the position of the Doomsday Clock created by the Bulletin of Atomic Scientists (Mecklin, 2020) which

> warns the public about how close we are to destroying our world with dangerous technologies of our own making (The Doomsday Clock), a metaphor, a reminder of the perils we must address if we are to survive on the planet.
>
> *(Mecklin, 2020)*

This was originally created in 1947 to outline the existential threat of war, specifically the nuclear arms race between the Soviet Union and the USA at the time. However, from 2007 onwards other factors such as climate change were included in their predictions. This was also a metaphor for how a single human cannot experience everything on this wondrous planet in one short human lifetime.

Another metaphor is the clear lack of objectives in the 'game', where traditionally within the medium of video games there is an objective with a cause-and-effect relationship between the player and the outcome of the game. For example, in the Nintendo video game *The Legend of Zelda: Ocarina of Time* (Nintendo, 1998) the player must defeat the evil Ganondorf to save the princess by completing a series of tasks and puzzles. Even a simple video game such as *Tetris* (Nintendo, 1989) has an objective where the player guides different arrangements of falling squares into a solid block to gain points and advance to the next level of difficulty. However, in *ESCHATECH VR* there is no clear objective and the player has no control over the end of the game, whatever they do within the 100 seconds. This is a pessimistic metaphor that, as a single person, we really have no control over climate catastrophe, the problem is too large, and really requires human cooperation to solve. This feeling of hopelessness is one shared by me, the game's creator. I feel that as a human, born in 1990, I have heard about the devastating effects of climate change my whole life and still the majority of governments and corporations have made only superficial efforts to curb their negative effects on the planet. This was outlined in the 1992 *World Scientist Warning of Climate Emergency* written by the Union of Concerned Scientists (1992). This document signed by hundreds of published scientists around the world warned of the destruction we were to face if we did not change our habits swiftly; the warning fell on deaf ears and a second warning was issued years later. Living in the 2020s feels like Groundhog Day where our society is in a loop. We see the devastating effects of human-caused climate change but do very little to slow its impact or make meaningful changes to how we live. This was another metaphor I wanted to include in the game; by replaying the game time and time again the player relived the end of humanity many times over.

When building *ESCHATECH VR* the early tasks included making key decisions on how it would be presented and played. For this reason it was important that the player/viewer was in the driver's seat and has as much freedom as a VR game in 2021 could provide. For this I used Unreal Engine 4.27 and the OpenXR Template, which is a cross-platform VR format making the game compatible with many headsets. At this time many VR games had a click and teleport style of locomotion, but I wanted a level of immersion that was more natural and closer to how a human would move through the world. Popular VR game *Half-Life Alyx* (Valve 2020) had both joystick movement and physical movement, meaning that one joystick would move the player around the map while the other joystick would rotate the player's point of view horizontally. The player could also walk around virtual space as well as duck, crouch, and look with their head. This added to the immersive nature of the experience and felt the most natural with the technology at hand. To add to the realism pickable items were created and littered around the survival bunker and map; these items could be picked up with a trigger on the controller and

allow the player to truly interact with the space and objects present in the experience.

The countdown sequencing of the game was the next part to be created. This comes in the form of a master clock in the game that runs from the triggering of the Start button. This sequences the wrist timer, rising sea level, then the transcending post humans and then the end of the world sequence with the inevitable reset and holding screen after. This was an important backbone of the game's programming and coding. In Unreal Engine, 'On Play' is an 'event' that triggers much of the process in the game. For this game, On Play triggers a series of timers in Blueprints (Unreal's coding node tree) that run for 100 seconds. When the timer is completed, the screen fades to black and the player is teleported to the foyer or holding menu; the viewport fades up and the player has the choice to start again.

The landscape was made in Unreal in the Environment Mode using dynamic 3D brushes to 'paint' hills, valleys, and textures. Then many objects were added to populate the map. These meshes were classed as Foliage, where UE 'calls' them once and references multiple instances around the map, again reducing GPU load. When creating the environment and foliage special attention must be paid to optimisation where careful classing, level of detail (LOD), texture decisions, and use of objects reduce the GPU load as much as possible to maintain a consistent high frames per second (FPS) count. In film FPS sits around the 23–25 FPS whereas in VR FPS is often 60 fps and in some specialty desktop games 120 FPS is expected. In VR it is imperative to have an optimised game, as if the game has performance issues this can result in a reduction in FPS which means slow, stuttering, and sluggish rendering, which can often cause VR motion sickness. This happens as the immersed VR player does not have a perfect mimic movement to view representation in the game, making the player feel intoxicated. This breaks the immersion of any experience causing players to exit the experience.

The virtual space is inherently very clean and tidy as objects placed in virtual space only exist if they are placed there, so to make *ESCHATECH VR* feel like the 'real world' one must add mess by adding objects or imperfections. When looking at virtual textures, objects that are imperfect have scuffs, chips, and dents so they look like they have been used, damaged, and therefore more 'real'. For example, to make the survival bunker feel more inhabited and realistic I had to create mess and items one would need in a survival bunker, so I modelled items such as a small hydroponic plant for food, many containers for water or fuel, air filter systems, a bed, shelves, a computer, and cooking equipment. I also added some details such as a pile of VHS tapes and some electronics. These items were made by photographing all sides of real-world objects and using these textures to model the objects virtually. It also created an overwhelming amount of objects in the bunker, so the player didn't feel like there was one specific object they 'needed' to interact with to advance to the

next step of the game, again undoing the tropes of regular video gameplay to give the player a truly self-guided experience.

The titan character meshes were prepared and rigged accordingly, ready to accept the motion capture data from The Void. The next step was to motion capture the performers 'live' with all four titans performing in the same session; this would allow for a more realistic interaction between the characters and would reduce post-syncing issues. On the shoot day a 100-second timer was used in big text and the team used this as a central clock to rehearse, perform, and maintain consistent timing throughout the performances. This approach is not standard practice in MoCap but as the timer was such an important part of the experience it made sense that the timer was central to pacing the performance. The performers who played the characters mostly came from an acting or dance background with a few familiar with performance for MoCap. Each of the titans had minor features that distinguished them from each other; the characters had different personalities and so moved differently from one another. For example, the oil monster was sluggish and heavy and sat on his knees, as he was a part of the polluted seas whereas the money titan was fit and overconfident and stood up tall with a puffed-up chest. To help the performers with their MoCap performance and in particular their enormous virtual scale to the player, a foam tile was placed in the centre of the performance space as a reference to the size of the map and the player. This meant that in the experience the player could look up and have almost direct eye contact with the titans, which added a level of fear and connection which added to the immersivity.

For the posthuman dancers at the rave at the end of the world, four dancers were marked up, calibrated, and given a techno soundtrack to dance to, again going for a live performance for both time efficiency and to reduce beat sync issues later. The characters were asked to face the front and spread out evenly in The Void; this is so the virtual characters in the game could be positioned and face the virtual stage in the experience. The dancers did two extra-long takes and this would allow a level of offset in the game where the 50 or so virtual dancers could use different sections of the dance motion capture data to look like a large crowd of individual dancers instead of just four identical dance loops, again adding to the realism of the experience. Then the virtual DJs, played by my musical collaborator Michael Ellingford and me, were motion captured with a prop table in front of us to simulate performing in VR.

One issue that did pop up in this MoCap session was that the Vicon software only had male and female avatars in their software, being very masculine and buff or very feminine and curvy. Two of the dancers in the session were gender diverse (one gender non-conforming and the other non-binary), and there was no gender neutral avatar for them to be displayed as on The Void's big screen. It is not uncommon for non-binary folks to suffer body dysmorphia at some stage in their gender journey, and this was another example of how their

gender was not yet fully accepted, represented, or respected by society. At this stage The Void team had already contacted Vicon and expressed the need for a gender neutral avatar as default in the software, to ensure all people were well represented. The Void, however, had created work-arounds to accommodate for gender diverse performers. Then with all the performance data 'in the can' it was time to drag that data onto the characters and input that into the Unreal scene.

After much polishing and optimisation the game was set for presentation at the conclusion of the artist residency schedule. The game looked great, the main elements were present, operational, and the game ran smoothly at the desired framerate. There were still lots of details to add, but there was enough in the experience to demonstrate the idea to the audience/peers. In only two months this project moved from concept to presentation, which is a remarkably short time in terms of game development.

Conclusion

Following this exhibition I was lucky enough to have a showing of the experience at ASPERA Sightlines Symposium and share the experience with colleagues in the field. Participants donned the headset and were immersed in the VR experience and I found these sessions a great space for learning how *ESCHATECH VR* was received and perhaps some modifications to make the experience run smoother. The group of participants ranged from folks who had never entered VR before all the way through to seasoned gamers. It was observed that the gamers knew the language and layout of the controls and therefore did not have to be told as they were already familiar with this layout of game interfacing. However, some of the participants really struggled with finding the joysticks on the controller and felt very uneasy inside VR. It does take some time to get used to the medium of VR and many folks do need practice and time to feel comfortable in the medium. Often newcomers to VR experience motion sickness or uneasy feelings as their brain is being tricked that the player is moving while in reality their body is still; this disconnect can take some time to get over. Seated VR sessions are a bit easier to digest for newcomers as it feels more familiar like a rollercoaster or film, as we humans have had many decades of practice with these stimuli. The first iteration of VR was arguably created in 1962 with Morton Heilig's *Sensorama VR* experience and yet in 2024 VR has still not become a common household item as the majority of the population do not own a headset or are even comfortable/experienced at VR. According to Parijat (2022), the *Meta Quest 2* has sold almost 14.8 million units by 2022 and VR is more accessible than it has ever been. VR, however, has not yet been adopted like other devices such as the smartphone or television. An interesting observation through public presentation of the work was that most players 'wasted' their first round of the

experience and spent their time looking around the survival bunker and not really exploring the map. Perhaps this is a by-product of not being comfortable in the medium, or perhaps the game is working exactly as I intended with an overwhelming amount of objects and interesting distractions to play with.

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9

INTERVIEW WITH ROSINA POSSINGHAM

Rosina Possingham and Tully Barnett

19 October 2023

Rosina Possingham is an artist based on Kaurna land in Adelaide, South Australia, with a practice that includes photography, printmaking, graphic design, and increasingly scanning and mixed reality installations. In 2021, Rosina undertook a short artist residency with Assemblage Centre for Creative Arts at Flinders University, focusing on a project in The Void, the virtual production studio. This interview explores Rosina's practice before, during, and after the residency in the production of a virtual and augmented reality adaptation of the play *Herding Caterpillars*.

Tully: Tell us something about your work and how you came to apply for an Assemblage Centre for Creative Arts Residency.

Rosina: I'm an artist, designer, and photographer, and I think the expanded field of photography intrigues me. I became obsessed with the artistic possibilities of photogrammetry and 3D scanning to create new visuals and virtual worlds. I started scanning hands, bodies, people, gum trees, blossoms, groundcover.

Tully: So how did your project *Herding Caterpillars* come about?

Rosina: I was working on the Parklands Project, as an artist responding to the Adelaide City parklands towards a free, family focused art, music, and citizen science nature festival, to be presented in May 2021. I was assigned a Bush for Life site in the parklands. I was given Park 6 Nantu Wama. I was going into this little patch and trying to understand the diverse species of plants, gum trees from all around Australia, and I was investigating the difference between trees that are native or indigenous to site. I started 3D scanning the gum

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trees to look at the different forms. I wanted to overlay the shapes of gum trees so I could start to analyse their forms from not only a photogrammetry perspective but from artistic and photographic perspectives. I was working with 48 Year 5 students from Wilderness School using spatial mapping to represent where we were in the patch of the parkland, layering the pathways of sensor located GPS data with where the students thought they were – creating visual pathworks of data.

I had a dream to create a bigger virtual reality (VR) world based on a scan of this Bush for Life patch of trees to exhibit 2D, 3D, and sound works in that virtual world, so it could be accessible to people anywhere through the virtual world. This was during COVID-19. So I thought, there'd be many ways of different creative responses to a site that could hang as an artwork in a digital exhibition space. In my practice, I'm questioning how to create collaborative virtual art world experiences that examine, showcase, and delve into nature.

With Adam Drogemuller from the University of South Australia we were attempting to put this into practice through scanning the patch using the Faro scanner. He mentored me through a Guildhouse reVision Tech Mentor Program and this was instrumental in connecting the necessary tech knowledge with my artistic vision. From there we created a demo 3D world using point cloud data that we called 'The Patch World' and that's when I applied for a residency with Assemblage Centre for Creative Arts at Flinders University.

Between applying and commencing the residency, I had the opportunity to undertake another residency with Trees for Life. And I started visiting The Void while Liam Somerville was undertaking his residency. I observed the process of motion capture and questioned the possibilities of what someone can do in The Void. That's when my process shifted from representing trees digitally to recording bodies digitally – I understood that motion capture was going to be the best way of working with The Void. I asked myself, how do I best use that data and design a project that I can invest that much time in?

Jacqui Hunter and Gerry Butler, the Chairman of Butterfly Conservation South Australia, had created a play called *Herding Caterpillars*, that premiered at The Parklands Project in 2021: the incredible story of the lifecycle of the Chequered Copper Butterfly which can only reproduce through a unique mutual symbiosis with the native Oxalis plant and the obligate ant, the common black ant.

A few months later, I arranged to meet Gerry Butler at the Bush for Life site and he confirmed that native Oxalis was on the biodiversity site list for Park 6. It was here that I made the connection that *Herding Caterpillars* is a five-person play with the fact that The Void had five motion capture suits. I thought I could position the play as part of a bigger virtual gum tree playground.

Tully: And so what did you do in the Residency?

Rosina: Well, we were testing. I hit up Stephanie Daughtry to work with me as director and lead actor. So I asked if she would like to collaborate with me on this residency because I'm not a movement artist and because I wanted to be focused on the vision making and continually testing the viewer experience given that the audience would be experiencing this through headsets. Steph was instrumental in testing the translation from a real world play to a virtual and augmented reality experience – we were testing movement, testing butterfly rigs, and through this testing we realised we wanted a humanoid insect character. We tested props and practised simply techniques for rigging a 3D avatar up to connect to the body in Vicon (Figure 9.1).

FIGURE 9.1 Rosina Possingham records MoCap actors in The Void. Photo credit: Tully Barnett

Tully: So there was a challenge to go beyond the human in that space?

Rosina: When you are dealing with ants you have to figure out how to deal with six limbs. So we had to decide whether we just used two. Putting Steph in the suit and then seeing a live visualisation on the screen allowed us to test and trial different movements for non-human characters in real time which was really efficient. The natural inclination when acting as a butterfly is to move your arms as if they are wings, but we could see on the screen that this didn't allow the actor to use her arms as part of her character's performance so we decided to animate the butterfly wings afterwards, freeing up the actor to have more movement for the characterisation. So we were just kind of having a play, coming in and testing, because we're able to see and to scale in real time on the large screen.

Tully: What happened when you put on the suit? How did that change your understanding of the creative practice involved?

Rosina: I've come into this project with no animation experience, no film experience, only some very low end 3D modelling.

Tully: And what skills would you say you have now?

Rosina: I guess I managed the entire virtual production product. We were able to really quickly 3D scan the Oxalis model that was used for the original play. I 3D scanned that, so we had a quick representation, and we then plopped that 3D model into the scene, so we had instant feedback on our screen of that size. Some of my quick dirty modelling came in handy when we were trying to get a bit of recorded data. We then went to having three characters and were able to do a little bit of test recording, which I was then able to show James Marshall at CDW, to convince him that we do have the skills to record this project; it is only a five-minute play, it only has five characters, we simply need 3D models.

My residency with Assemblage and The Void was four weeks of one day a week in the studio and that was enough time to know I needed help with animation and rigging, so Jason and Cameron helped me design a pitch to CDW studios.

Because The Void is a share, play, and co-making space and Sally Coleman's Big Sands was in production there were some bug rigs in development. Ben Sakovits, Head of Pipeline at CDW, encouraged me to pitch my project to James Marshall, Head of Studio, CDW Animation, for CDW to come on board with the project. At that point, little did I know I needed an entire production team to make this work.

To my absolute joy, James agreed to work on *Herding Caterpillars* with us. I really felt that the merit of the project stood out strong even though it was clear there was so much I didn't know. I pitched

everything I'd been working on with Bush for Life and the work I had done with The Void to test, develop, and refine the vision and James trusted my drive.

In my view there were five factors that made this the kind of project CDW were willing to take a risk on: one was the scope of the project – the fact that it was only five minutes' duration. Another was supporting a local project with intersectoral connections (Gerry Butler and Butterfly Conservation SA with an expression on North Terrace outside the South Australian Museum). A third was having an open and malleable brief with shared IP for the project. The fourth factor was the luck of them having a gap in their schedule. Fifth, CDW values attributing team time to the forefront of research projects.

We knew that we needed a bigger budget so with CDW signed on just a week before the deadline for CreaTech City Challenge funding, we submitted an application, were shortlisted, and eventually successful.

I wasn't sure if they would fund virtual reality projects on their own because the funding was aimed at public spaces creative tech experiences and bringing people back to the city after lockdowns. Augmented reality (AR) seemed like the perfect self-discovery creative tech experience to expand the virtual reality play. A physical sculpture is important to connect to the AR experience for the audience. We chose three sites across the Adelaide CBD where sculptures and AR triggers could be situated to be part of the project: MOD at UniSA, the South Australian Museum, and of course the biodiversity site in the parklands, Pakapakanthi/ Victoria Park (Park 16). We were very lucky that Patrick Bugeja, Public Programs Coordinator at the State Library of South Australia worked with us as a project venue partner. They gave us the space for free, because it fitted really well with their programming.

Tully: So then you get the money from CreaTech …

Rosina: And you go, that's only going to pay for a proportion of production. Managing that budget was fun. I spent most of our marketing budget on the Caterpillar, which was a cardboard version of Luci the Giant Caterpillar made by Wills Projects, and placed on the South Australian Museum lawns. I thought that that would give us the perfect visual engagement asset.

We commissioned two other sculptures for the three CBD sites to sit alongside the trigger boxes. An emerging artist from Uni SA, Emiko Artemis, presented a tall pillar-shaped sculpture representing the mutually rewarding relationship between the butterflies and the ants at MOD. We created paper mâché sculptures with

Chris de Rosa, made at Post Office Projects in Port Adelaide. We needed something that would stand out in the parklands – these otherworldly, larger-than-life flowers and seed pods. Those physical objects enticed people to come up to the trigger box, to scan and to interact with the AR. Without a physical sculpture, you wouldn't have anything to grab your audience with. My opinion on digital experiences is that they add to an analogue real-life thing that's in the world with the audience member – somehow through the physical and the virtual there's a merging of interaction. The amazing part of AR is when people interact with it live, their hands show up in the real-time animation, they are melding the real with the augmentation.

Tully: What was the experience of the VR part?

Rosina: The first thing you see in the headset is a minute-and-a-half introduction from Uncle Mickey 'Kumatpi' O'Brien, Kaurna Elder, standing at the biodiversity site speaking language, and connecting the physical with the digital and connecting the butterfly to Kaurna knowledge systems. We filmed Uncle Mickey on site with a 360-degree camera so you can look around while he's talking. Having Uncle Mickey introduce the projects from the Parklands site was important to visually respect land and Traditional Owners and the effects of colonialism on bushland sites.

Imagine you put on a headset. An egg hatches in front of you. The ants inspect this egg and they're really curious about it. They acknowledge and wave at you. They know that you're there, you're in the scene; and then you're able to see this tiny little baby caterpillar emerge from the egg. Pheromones spray everywhere around the scene.

The ants lead the caterpillar to the Oxalis plant and the caterpillar grows strong from eating the plant. The caterpillar gives to the ants a drink of its honeydew nectar from its glands. The ants lead the caterpillar into the ant nest where the caterpillar goes through a series of growth scenes, from a young caterpillar with a baby's toy, to a teenager complete with PlayStation game, to a mature caterpillar sipping tea before shedding its skin one more time and metamorphosing in its cocoon for 12 days during which time the ants wait, partaking in games to communicate the passage of time. The butterfly emerges with its copper-coloured wings. The butterfly warms itself in the sun while the ants pamper her, fanning and celebrating her. The butterfly takes off to find a butterfly mate and the cycle begins again.

Gerry and I agreed that *Herding Caterpillars* is for all ages, which meant that VR could be experienced by anyone who could put a headset on.

CDW were an amazing company to work with. They helped to guide every step of the production process, from concept art and digital environments, to 3D character modelling to rigging, motion capture, recording, scene breakdowns, and entire project production. James, Ben, and I would meet regularly to refine the brief. They helped navigate the process of virtual production with someone who doesn't come from industry. Their in-kind investment in the project was instrumental in CreaTech funding. Their support and belief in the project was enduring.

One of my favourite meetings was about noodle bums. We realised that the motion capture data would be absolutely useless if the ants' abdomens and caterpillar's long body intersected. To create seamless recording data we needed to create a fake bum apparatus so the actors had a physical appendage that could guide their character and the limits of the characters' bodies. Ben from CDW checked every aspect of motion capture recording to ensure the animation process would be seamless. We attached pool noodles to the motion capture suits to serve the purpose.

James introduced me to Dr Damien Rompapas ('Doc'), a developer who runs his own company called Brewed Engagement Extended Reality Labs (BEER Labs), at CDW. I admitted that I hadn't done a project like this before and we had a limited budget. He saw merit in the project and wanted to know how he could contribute. Again, because the scope was five minutes and included working with CDW towards a public delivery project for CreaTech, he was keen to be involved. Doc became a key member of the project team and I couldn't have done it without him. He had the tools and he's a specialist in extended reality, which encompasses both VR and AR. While discussing the virtual reality project, it became clear that he was also able to create an entire *Herding Caterpillars* AR app for both iOS and Android. This was groundbreaking for our project and testament to the vision and skills he maintains. These extra deliverables made the experience much more engaging. The stickers had their own little character names as well as their scientific names. We didn't know what the AR was going to be at first. We decided to make a set of stickers that could be scanned from within the app to view the AR. Doc was able to bring to life through lighting. Because the timeline was so tight, it was really down to Doc's creative interventions that *Herding Caterpillars* worked so well (Figure 9.2).

FIGURE 9.2 The *Herding Caterpillars* augmented reality app in action. Photo credit: Rosina Possingham

In The Void, Jason Bevan and Cameron Mackness asked important questions about camera angles and interactions between various component technologies in The Void.

We got fabulous feedback, I guess because, you know, it's not a play and it just works on any phone straight away. I think it was Apple that took their sweet time approving that app. We only got data at the very last minute, so loading data from the MoCap (motion capture) recordings to the app was stressful. We had the launch ten days before and we had a working version that MP Susan Close went to and she was really interested in, but it hadn't had a final pass on sound. That was ten days prior to opening – a tight turnaround on everything. It was a big project with a whole production team at CDW, 15 or so people, working on it.

Because *Herding Caterpillars* is VR, it made it more interesting for some people. And we're going to be running this next year in the Biocon in the Botanic Gardens for Science Week.

I think the part missing for the public that I'd love to share is being in the suit and seeing this live feedback of you as a person, and a screen housing a digital avatar. I'd like to create a digital experience where you can walk up to the screen and all of a sudden you're one of these characters. It's an expanded version of AR. Amazing rigs designed by CDW mean that the process of integrating a character rig to an interactive experience should be seamless.

Tully: What drives your approach across all of these different things you work on?

Rosina: I guess, a valid project really drives me, like this one. I felt compelled to bring this project into fruition. It used a lot of my creative energy to pitch, to project manage, to problem solve in such a short space of time in an area where I had very little learning. I just needed to do it. But this would not have been possible without all of the support and collaboration from our massive project team. It was a community project on steroids. Everyone pitched in, became part of the process of wanting to make this work.

For example, the soundscape to immerse us was very important so I contacted Jesse Budel, a sound artist who creates sound installations and soundscapes with a nature focus and interest in creating live sound recording. He hadn't done much foley or projects that were shaped like mine, but I knew that he would nail the brief from an artist's perspective. This was a critical part of the storytelling of the thing. The sounds would change the experience and the choice was between electronic, game-style sound or nature sounds. It had to be live field recordings. Jesse's knowledge of multidirectional and ambisonic sound contributed to the project. At the beginning, I didn't quite understand how that would be implemented when we went into the development, and Jesse and Doc had to chat about the limitations of where the sound comes from. But when you are in virtual reality, the direction of sound is very important because it puts you into the 3D space. So if sound is coming from your far left, you're going to look there and it can lead the viewer quite well. So we did our foley art. Steph and I went to Jesse's home studio and we recorded a lot of chomping on different lettuces, capsicums, potatoes and so there was just kind of every element in the production. The narration was done by Miranda Daughtry, an actor who happened to be in Adelaide for a State

Theatre production. Her skill in enunciation, her warmth, and her engagement, combining scientific information with an emotional landscape guided you through the story.

Tully: Do you have any advice for people getting started?

Rosina: I think to be truly open to collaborations across disciplines and acknowledge that, when you don't know what you're doing, ask for help. I had no idea what I was doing. I just kept on saying to people I'm not trying to pretend I know, but let's go in this direction and listen to the advice of people who are experts in their fields. It's also important to learn the correct vocabulary so you can communicate clearly to your team. I had to learn how the pipeline was going to work for the recording and what rigs were, and what the character's face needed to do, and the exact ordering of those shots. My graphic design and marketing and communications background also really helped me to understand how to put together a big project.

But Jason and Cam created a space where I felt as though I wasn't embarrassed to say I was an artist, or a photographer or a designer. I was worried that because I didn't have technical expertise or a degree in virtual production that coming into The Void I wouldn't be able to add value or answer questions correctly. But in the end it did not matter because we were working mutually as a project team. Cam and Jason helped to bring all of their knowledge to this project and they openly shared it. I've never felt that supported in a project before.

Herding Caterpillars is an excellent example of a project that includes artists from a variety of artform knowledge backgrounds. If we make things, it's nice to share not only the end result but the process as well. We also had all the behind-the-scenes recordings from The Void in the background. When we took the project to VFX in Stuttgart to showcase the collaboration, there was a fabulous comment from the lead VFX artist at Wētā FX who'd done the work for *Avatar*. He said he could see young people in the suits from their weight, how they walked, and their actions as they moved up and down. He thought that was really cool, that it wasn't older actors in the suits. Artists bring that attention to detail into the making space. And it shows a story about our local Adelaide Parklands, the symbiotic relationship between tiny little animals that are rarely seen, and also the drama and production teams, and the CDW production studio and artist project. It illustrates what can emerge out of a four-week residency in a production space as an artist, and it brings together true collaboration across disciplines.

10

INTERVIEW WITH TIFFANY KNIGHT

Tiffany Knight and Zoë Wallin

24 August 2023

In 2022, Flinders University's Drama Centre produced the shows *Autobahn* and *Sweet Road*, which used The Void's resources to solve production and performance problems caused by ongoing COVID policies. This interview explores Tiffany Lyndall Knight's practice as an actor trainer using the virtual production (VP) facility, The Void, at Flinders University.

Zoë: Would you like to start off by telling us a little bit about how you used The Void, the VP facility, in the recent plays you and Chris Hurrell directed in the Drama Centre at Flinders? Perhaps a little about the plays themselves and the context for the performances.

Tiffany: I am a lecturer in the Drama Centre at Flinders University, teaching the next generation of actors to develop their craft. From The Void's inception in 2020, we staff members in the Drama Centre have been thinking about how to integrate the facility into our teaching and creative practice. But of course COVID was affecting our teaching and creative practice too.

At the beginning of 2022, Drama Centre staff members began developing two plays, while still dealing with COVID restrictions. Chris Hurrell, Lecturer in Drama and Manager of the Flinders Drama Centre, and I were both new staff members, and we were working with these students for the first time. We wanted to make sure they had a good experience of performing for a live audience.

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The Bachelor of Creative Arts in Drama[1] provides students with the opportunity to undertake embodied learning in voice, movement, and acting techniques. The application of these skills to a live performance project is a crucial learning outcome – one that had been severely impeded during COVID. We had to figure out how we could present these pieces while adhering to very strict audience limitations. A small house has an impact on performers. It can diminish their confidence and does not provide them with an accurate response to their choices. After two years of studying performance online, we felt it was important for the actors to celebrate their return to the stage with a production that was open to friends and family.

We presented two one-act plays in repertory. I directed *Autobahn* by Neil LaBute, and Chris directed *Sweet Road* by Deborah Oswald. *Autobahn* is a series of two-person scenes that explore the intimate and often shocking conversations that arise between people during a road trip. *Sweet Road* examines family relationships from the perspective of a number of different characters, against the backdrop of the harsh Australian outback. Both plays are naturalistic in style and employ a car as a key dramatic device. This allowed us to share a central design element – two car seats and a steering wheel mounted on a platform – which represented the car. *Autobahn* is based in the United States, so we swapped the steering wheel over to left-hand drive for that production, but other than a large stack of milk crates to define the space in *Sweet Road*, the set and lighting design for both shows was essentially the same.

Our solution to the university's restricted seating policy was to split the audience in half. While one group of audience members watched the first half of the live show in The Void, the other half watched a digital livestream of the performance across the corridor in the Rehearsal Room. At intermission, the two groups swapped spaces. This meant that every audience member was able to experience the show as both an analogue and digital event.

Zoë: Apart from using The Void as a television studio, were you able to use any elements of virtual production (VP) in your performance?

Tiffany: Our use of VP was the implementation of the 8×3 metre LED screen in The Void as a digital backdrop to the live performance. Digital images were implemented in a variety of ways: title cards

1 As of 2024, the BCA (Drama) will convert to the Bachelor of Performance, with specialties in Acting, Directing, and Theatre-Making.

denoted different scenes; still images communicated urban and rural landscapes; abstract images conjured particular moods or atmosphere, and videos suggested the movement of the car as the actors performed in front of it. While audience members in The Void watched the actors perform live in front of the LED screen, audience members in the Rehearsal Room viewed the production on a large monitor, so the analogue and the digital were compressed into a seamless screen performance. Students operated three cameras in The Void while a technician 'vision-switched' between different angles and frames in response to shifts in performance.

Zoë: What were some of the challenges in using The Void as a performance space, and the Rehearsal Room as a viewing room, simultaneously?

Tiffany: The Drama Centre, in which The Void and the Rehearsal Room are situated, was constructed in the 1990s, so we are constantly pushing its technological limits. The Void was originally designed as a traditional television studio, so we still have some legacy technology including a standard lighting rig, multi-cams, and vision-switching equipment. While this allowed us to work in a traditional, 'live studio audience' environment, the LED screen backdrop complicated the situation. We quickly learnt that the illusion of reality only extended to the edge of the screen; filming in profile meant that the realistic background suddenly disappeared. We had to make decisions about the world of the play, and what the most impactful camera angles were for the audience watching the live-streamed performance. Additionally, livestreaming the performance required us to develop a new system for running cables across the building into the Rehearsal Room for sound and vision.

We also discovered that while video is an exciting backdrop in theory, in practice there are a number of complications. The relationship of the image on the screen and the actors in front of it was a delicate balance; audiences in The Void could appreciate the scale of an image that took up the entire 8×3 metre LED wall; however, in the livestreamed version, the images were limited by the camera's lens. This meant that audiences in the Rehearsal Room would only see a fragment of the image projected behind the actors (Figure 10.1). We learnt that you couldn't rely on an image for communicating significant meaning if it depended on being seen at scale.

FIGURE 10.1 Franca LaFosse and Tom Spiby in *Autobahn*. Photo credit: Chris Siu

Moving images were also problematic. We didn't have the time or resources to film enough footage to accommodate entire scenes, and timing pre-recorded video to live performance isn't an exact science, so we had to find moving images that repeated on a loop. Finding material that repeated subtly enough, so the audience wouldn't notice the return to the beginning of the recording, meant hours of scouring the internet. And anything that was too big or involved significant camera movements would either overwhelm the actors' performances, or even cause some audience members to experience motion sickness! Ultimately, we discovered that the LED screen worked best for both audiences when it suggested a space or atmosphere, rather than attempt to achieve verisimilitude.

Zoë: Have you previously worked across mixed analogue and digital spaces? Did you find yourself using a different practice than how you usually work as a director?

Tiffany: This was the first time I've worked this way. It was very interesting to figure out how many bells and whistles you actually need to use with the LED screen. Although it's a wonderful tool, I quickly discovered that it best served our purpose as an evocative backdrop for the performances, rather than a central dramaturgical device. What became the more interesting challenge, and more pertinent to the

students' learning about acting for the stage versus screen, was how to approach the production for both a live audience and the camera lens.

Fortunately, we had assistance from our technical staff who trained the students in Q-Lab. This software allowed us to program and run lights, sound, and digital cues from a laptop. Although this is standard technology in theatre production, working with the LED screen added an additional level of complexity. The next generation of actors need training in new technologies because these may form a significant part of their work in the sector. This was the first time we had used Q-Lab for this purpose and the software has its quirks. It was a steep learning curve!

Zoë: Due to COVID restrictions, you and Chris Hurrell needed to share the performance space for your shows. How did you manage to meet this challenge?

Tiffany: We were two different directors working on two distinct projects, so we had to communicate closely about our lighting requirements, the use of the space, and our actors' specific needs with regards to the central set design piece – the car. Due to the nature of his show, Chris needed to rehearse in The Void most of the time, so he was able to think about and choreograph scenes with cameras embedded in the performance from day one. This was essential for *Sweet Road*, which featured multiple locations and intersecting plot lines, which Chris was able to communicate to the audience by creating several different playing spaces within The Void. I remember that in *Sweet Road*, one scene required an actor to express profound rage and grief while she was driving. I watched an early performance in mild panic as she banged furiously on the steering wheel, which was mounted on a flimsy wooden stand. *Autobahn* depended on that steering wheel, and we didn't have a backup set piece; it was a good opportunity to discuss alternative ways for expressing rage in performance! (Figure 10.2).

FIGURE 10.2 Monica Patteson in *Sweet Road*. Photo credit: Nick Hassan

By contrast, *Autobahn* is written as a series of duologues, all of which are set in a car. By confining the entire performance to two car seats, I was able to focus on ensuring that the actors' performances were truthful, connected, and nuanced; qualities that are essential for the screen, but – as they discovered – are also foundational to stage performance. One of the interesting features of *Autobahn* is that in many scenes only one character speaks. This was a wonderful learning opportunity for the students. As young actors, they initially fell into the trap of thinking that the person with all the lines has the 'big' role, while the silent character is simply a prop. It took them a long time to realise that the person listening and reacting is actually the one the audience is drawn to: almost like the Chorus in Ancient Greek theatre, the character who is listening and reacting communicates what the audience should be feeling and how we should respond to the story. Teaching them how to actively listen was an exciting challenge; they had to learn how to craft a vivid, specific internal monologue and have a personal investment in or opinion about every phrase the other character uttered. By rehearsing and watching each other's scenes, they gained an embodied understanding of how critical active listening is; particularly for film, where editors commonly prefer to use the shots that focus on the person listening rather than the one speaking (Figure 10.3).

FIGURE 10.3 Em Ritson and Luke Furlan in *Autobahn*. Photo credit: Chris Siu

We focused on active listening while rehearsing for a live audience; we didn't get into The Void until production week, so we actually didn't focus on acting for the camera until the eleventh hour. What the students discovered was that they didn't really have to adjust or minimise their performances for the lens. There is a popular misconception that screen acting has to be 'small'; I think they learnt that if the thoughts are specific and emotions are connected, size really doesn't come into play.

They also learnt about the importance of focus. Because we were switching between angles, the actors could see the lights on top of each camera. These would illuminate to indicate which camera angle was being featured in the livestream. The actors had to develop strategies to avoid getting distracted or intimidated by which camera was 'live', particularly because this changed from performance to performance as the vision-switcher followed the natural progression of the story. It was an exercise in cultivating focus and learning not to fear the lens, which is a very common trap for inexperienced performers. This is an important skill for young actors to develop for the purpose of live theatre as well: you're inevitably going to hear phones go off, people coughing or other distractions. Actors need to learn how to use their imagination and awareness of the present moment to enhance communication with their scene partner as well as the audience, rather than feel as though they need to put an invisible wall up to protect themselves from the distractions in the house.

Zoë: And do you have a sense of how the audience engaged with the performances and the staging of the plays in this particular way?

Tiffany: I was the person vision-switching between the cameras during *Autobahn*, so I didn't get to spend any time in the Rehearsal Room during the performances. I was told by colleagues that audience members in that space were really vocal – much more so than when they were watching the analogue performance in The Void. Perhaps this was because they knew that the actors couldn't hear them, and so they felt greater freedom to laugh and comment on what was happening on screen. I think that it was probably closer to the experience we have in our living rooms when we're watching screen content; you don't have to censor yourself. Several people told me that they anticipated the experience in the Rehearsal Room would be inferior to the live performance, but they actually found it exciting to watch the performance in two different media. The screen performance was just as compelling, but different.

FIGURE 10.4 Luke Wiltshire, Lauren Jones, and Connor Pullinger in *Sweet Road*. Photo credit: Nick Hassan

I did get the opportunity to watch *Sweet Road*, and on reflection I actually think I was more engaged by the half I watched on screen. Perhaps that was because I had already been in The Void. I could reflect on how Chris had constructed the different performance spaces in the real world; there was a magic to then seeing those spaces transformed by the camera's lens. Close-ups revealed aspects of the characters that were unexpectedly intimate and vulnerable. The walls of The Void and the edges of the screen diminished, and the characters seemed to exist in their own world. It was as though the strangers I had made acquaintance with in the first half of the play suddenly transformed into intimate friends after the interval (Figure 10.4).

Zoë: And thinking more generally about the use of virtual production technologies in theatre, there have been big successes recently. Is this something that we are going to see more of?

Tiffany: The interplay between live performance and digital content has been around for quite a while, but Kip Williams has certainly demonstrated with productions like *The Picture of Dorian Gray*[2] and *Strange Case of Dr Jekyll and Mr Hyde* that there is a wonderful theatricality available when you have the resources to push the boundaries of the technology. One of the most effective examples I've experienced of the mingling of screen and live

2 *The Picture of Dorian Gray* by Oscar Wilde, adapted and directed by Kip Williams (Sydney Theatre Company, 2022–2023).

performance was Ivo van Hove's *Roman Tragedies*. This epic, six-hour adaptation of Shakespeare's *Coriolanus*, *Julius Caesar*, and *Antony and Cleopatra* was presented at the Adelaide Festival in 2014. I vividly remember watching Marc Antony deliver his famous speech at Caesar's funeral (in Dutch!) and being fascinated by the actor's capacity to simultaneously connect with the audience in the huge Festival Theatre space, while also communicating great subtlety in extreme close-up on the enormous screen mounted above him. This production placed Roman politics and intrigue squarely in the contemporary world, so the use of digital images made dramaturgical sense; the televisual version of politicians is the image modern day citizens are most familiar with. At the same time, Shakespeare's Roman populace was also acknowledged in the tiny figure of a powerful man radiating his ambition and grief to the audience, who in essence became the Roman masses on the steps of the forum.

I think that the video techniques Kip Williams used with *Dorian Gray* and *Jekyll and Hyde* – playing with scale, facial filters and multiple, superimposed digital versions of the actors – were ingenious. But I must admit that seeing two successive productions using the same techniques felt a bit predictable. Theatrical experimentation with digital technology is essential. We live in a digital world, and theatre at its best is a commentary about the society we live in. But the techniques can become gimmicky if they are not embedded in the dramaturgy. Ultimately, in my opinion at any rate, the story comes first. Unless the technology is used to enhance or support the story, then it is more of a toy than a tool.

Zoë: Thinking back on the performances and staging in The Void, were there any key takeaways from this unusual experiment, or anything that you have since applied or would like to apply in future in your work?

Tiffany: We learnt a lot about the opportunities and challenges involved in filming theatre content for digital audiences. This was the first time we had experimented with live streaming as a method for disseminating content, and the success of the project gave us the confidence to record all of our Honours student productions going forward. This has been invaluable, both as archival footage for research purposes and for showcasing the students' work to industry.

The productions also demonstrated the value of The Void as a VP studio for screen projects. In the past, we would shoot our Honours student showreel scenes on location. With up to ten different scenes to film, this involved an enormous commitment of time, planning,

and resources. The techniques we experimented with during the production of *Autobahn* and *Sweet Road* confirmed that The Void could function as an effective VP studio, allowing us to control sound and lighting while replicating various locations with the selective use of lighting, flats, and set dressing in conjunction with the LED screen.

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11

DEEPER NOT BROADER

In Pursuit of an Actor Training Language to Elicit Nuance and Complexity in Motion Capture Performance

Renato Musolino

> Everyone thinks I sort of wandered off the street into a motion capture costume and started playing Gollum, and that's far from the truth.
>
> *Andy Serkis (2020)*

Rigorous and embodied theatre training provides the fundamental skills required for actors to excel in the motion capture (MoCap) and virtual production (VP) studio. Since 2020, aspects of theories and taxonomies of dance and movement pioneer Rudolf Laban (1879–1958) have been used within the Bachelor of Performance (Acting) at Flinders University (Flinders Drama Centre) to facilitate the student's trajectory from the movement studio to its very own volume,[1] The Void. This chapter outlines how Laban's theories of movement have informed theatre training, and how this translates to the work required of the actor when performing in MoCap and VP.

Laban's theories of movement are often integrated into western actor-training programs to assist students in developing physical awareness and expanding their expressive range. Mention the terms flick, dab, and punch to any trained actor, and they may have a sudden sense of déjà vu. When taken further, which I think it always should, Laban's far more wide-ranging work can be used to cultivate the student's psycho–physicality, 'the dynamic relationship between inner impulse and physical expression, and physical action and inner response' (Gillett, 2007, p. 306). This integration of inner and outer, and vice-versa, was somewhat postulated by Laban himself with his

1 The area where motion capture data is acquired is commonly known as the volume.

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now much quoted observation that we 'move to satisfy a need' (2011, p. v). Years later, renowned choreographer Pina Bausch (1940–2009), taught by Laban's student Kurt Joos (1901–1979), would say something quite similar with her 'defining statement' that she isn't 'so interested in how [dancers] move as in what moves them' (as cited in Climenhaga, 2018, p. 2).

This is essentially a chapter about dynamism, dexterity, embodiment, and, most significantly, language as a tool to elicit expressive behaviour. It highlights the significance and benefits offered by theatre training for the MoCap actor, and then details how this is being examined at Flinders Drama Centre via two strands of Laban's theories. First, the concepts of Body, Effort, Shape, and Space (BESS), commonly encapsulated within Laban Movement Analysis (LMA). And second, Movement Psychology as initially developed by Laban and his collaborator William Carpenter, and then 'brought to its conclusion' (Fettes, 2015, p. xvii) by the dancer and drama teacher Yat Malmgren (1916–2002). The latter offers a new methodology in developing performance outcomes with motion and performance capture and has been used at Flinders Drama Centre in research that seeks to animate psychologically complex avatars within the heritage industry. The ongoing research seeks to empower the student/actor and, within the current limitations and/or confines of virtual production, to convince the viewer that avatars possess complex subjective interiorities.

Why Train?

Andy Serkis was catapulted to overnight stardom with Peter Jackson's the *Lord of the Rings* trilogy (2001, 2002, 2003). So mesmerising was his turn as Gollum, there were calls for the Academy of Motion Picture Arts and Sciences to introduce a category for best performance in motion/performance capture. Serkis not only voiced Gollum but provided his dynamic and distinct movements and 'became the public face of motion capture' (Allison, 2011, p. 325). As John Dower and Pascal Langdale suggest, it was Serkis' Gollum that 'really put motion capture as we know it on the map' (2022, p. 10). And yet the narrative was not quite how it appeared. While Gollum put Serkis on the map, Serkis had indeed been around for a while. After completing an Independent Studies degree in Theatre Design and Movement from Lancaster University (Bryning, n.d.), Serkis began working with the Dukes Playhouse. As he recalls, 'I started acting when I was 21, professionally, and did years and years of theater. I think I've done about 60 or 70 plays all in all over the years' (as cited in Lindsay, 2020). Sixty to 70 plays. It's quite an apprenticeship. And while it may have appeared that he 'wandered off the street into a motion capture suit', it's what Serkis brought with him that is pertinent to this chapter: the benefits of theatre training and experience. As he elucidates:

> The grounding that you get as a theater actor sustaining a character over the course of a play for three hours every night, you learn so much. And the rehearsal process, obviously, and how to deconstruct a script and working on a role and embodying that role, working on the character, I do feel like that grounding has seen me through all aspects of filmmaking.
>
> *(ibid.)*

Serkis is certainly not alone in his thinking. Dower, co-founder of the MoCap vaults, a leading training institution for MoCap acting, and Langdale, a graduate of the Royal Academy of Dramatic Art (RADA) and teacher at the MoCap vaults, argued 'that acting for MoCap is *real acting* and takes great skill, ability, and dedication to achieve' (italics original, 2022, p. 7). So, how to achieve this embodiment, and how to assist student/actors to develop 'great skill' that can assist them in the MoCap studio?

What Training?

The theories of Rudolf Laban have become synonymous with western actor-training, in particular, within the study of movement. Indeed, aspects of Laban's concepts have become so familiar they run the danger of becoming horribly clichéd. Born in Hungary, Laban was a polymath, with interests in, among others, visual art, movement therapy, research, and dance, where he 'was a key figure in the German expressionist dance/theatre of the 1920s' (Bloom et al., 2018, p. 1). Originally conceived for the dancer, Laban's theories of movement have effortlessly integrated themselves into the training and development of the actor. Like the revered teacher of acting, Konstantin Stanislavski (1863–1938), Laban's true gift to the performer is that he left us a wide-ranging grammar to assist in the training and ongoing development of the psycho–physical actor. Indeed, 'in terms of the number and range of applications', Laban Movement Analysis has 'remained rather peerless' (Moore & Yamamoto, 2011, p. 130).

Laban Movement Analysis can be broken down into the interdependent concepts of Body, Effort, Shape, and Space, or BESS. While a more detailed description of these concepts can be found elsewhere,[2] simply put they refer to work on the physical instrument (Body), the dynamics of movement (Effort), the form of the body in relation to inner and outer influences

2 See *Making connections: Total body integration through Bartenieff fundamentals* (2002) by Peggy Hackney, Routledge; and *Meaning in motion: Introducing Laban Movement Analysis* (2014) by Carol-Lynne Moore, MoveScape Center.

(Shape), and where the body moves (Space). For the performer in the MoCap studio, these concepts are vital given that 'physical and behavioural truth in MoCap is the pre-eminent focus' (Langdale, 2022, p. 25). Think of the physical dexterity that Serkis needed to play Gollum or Caesar in *The Planet of the Apes* trilogy (2011, 2014, 2017). His kinaesthetic and proprioceptive awareness, his seamless shifts in movement dynamics, and his sense of (three-dimensional) space. Not to mention the physical discipline to navigate the plethora of technical demands of the MoCap studio (see Langdale, 2022, p. 35). Serkis' work was strongly supported by embodied theatre training principles, and each facet is covered by BESS. Further to this, there is another layer of Laban's work that we at Flinders Drama Centre have experimented with to support the student/actor/performer: Movement Psychology.

It was in England where the work and theories of Laban slowly became associated with the training of the actor. While in England, Laban was assisted by a range of outstanding students and collaborators, one of these being William Carpenter. It was Carpenter who originally worked with Laban in the 1950s to develop the system of Movement Psychology (Mirodan, 2015, p. 31). In a nutshell, Laban and Carpenter set out to develop a system that captured a greater sense of psycho–physicality, a synthesis of an inner quality to action. They explored the concept that 'between certain psychological and certain physically based concepts, *there is a direct correspondence*' (italics original, ibid.). Enter the theories of Carl Jung and the correspondence of the psychological functions of Sensing, Thinking, Intuiting, and Feeling to Laban's Motion Factors of Weight (Sensing), Space (Thinking), Time (Intuiting), and Flow (Feeling). Each of these duos, a psychological function paired with a corresponding physical function, was then paired with another duo to form a dominant combination which revealed a particular typology, or, as it's commonly referred to, an inner attitude. Think of them as recipes of sorts, with each recipe made unique by its own sequence of tempi, 'a cocktail of Motion and Mental Factors through which one can both conceive and perceive a character' (Mirodan, 2015, p. 34). Mirroring the pattern of nomenclature often found in Laban's theories, each of these inner attitudes, six in total, are labelled in opposition to each other with, and this is key, sensitising terms that immediately offer the performer an embodied association. They are: Remote (Thinking/Space and Feeling/Flow) and Near (Intuiting/Time and Sensing/Weight);

Mobile (Feeling/Flow and Intuiting/Time) and Stable (Thinking/Space and Sensing/Weight);

Adream (Sensing/Weight and Feeling/Flow) and Awake (Intuiting/Time and Thinking/Space).

Following Carpenter's death, Laban recruited Malmgren to assist him with the developing system. Handed a bunch of papers, Malmgren

progressed to make it his own, adapting it to the needs of the actor by integrating it into Stanislavski's grammar of action (What does the character want? How do they get it?), along with 'other important concepts from Laban's published work [such as] Working Actions [flick, dab, punch, etc.]', developing 'a System designed to *sensitise actors to the links between physical activity and mental emotional states*' (italics original, Mirodan, 2015, p. 33). This concept of sensitisation has been the key provocation for our work in The Void.

In The Void

In 2022, actors (past and present) from Flinders Drama Centre, as previously mentioned, began experimenting in The Void with the aim of animating psychologically and emotionally complex avatars for the heritage industry. Nuance was the operative word, requiring us (actors and facilitators) to 'move' human avatars by moving very little. This challenge was a divergence of sorts for The Void, requiring the performers, and those capturing their behaviour, to move away from more traditional MoCap forms of physical expression which emphasise a certain heightened broadness in size and dynamism – stage combat, martial arts, extreme character transformation, and dance among others. These practices are of course ideal for the MoCap studio given that, one, it mostly captures action sequences, the creation of creatures and animals (Gollum and Caesar) and serves the gaming industry. And two, what is essentially captured in the MoCap studio is the skeleton, not 'human skin, muscles, body shape, clothes […] just the skeleton' (Dower & Langdale, 2022, pp. 10–11). We were presented with the following challenge: no extreme characterisations and action sequences, but rather the task of animating the avatar via the entry points of sitting and listening, walking, and gesturing. The avatars were audience members watching the opening night production of *Othello* in 1838 in the Queen's Theatre, Adelaide.[3] This gave us the added challenge of having to consider the avatars' restricted parameters of movement due to their evening dress clothing, 'highly tailored with waisted coats and breeches for men and corsets with pinched waists for women' (Tompkins, Holledge, Bollen, & Xia, 2022, p. 79). The avatars would also be seated closely together, squeezed in thigh-to-thigh, with 1,050 spectators at the opening night performance (ibid.). Furthermore, there were a range of social and racial issues pertinent to the period that needed to be considered when providing the actors with movement and gestural provocations, such as 'audience reactions to the play

3 More on the *Othello* Queen's Theatre Project can be found in *Visualising lost theatres: Virtual praxis and the recovery of performance spaces* (2022) by Tompkins, Holledge, Bollen, and Xia, Cambridge University Press.

amid growing frontier violence in the colony' (Tompkins, Holledge, Bollen, & Xia, 2022, p. 66), and 'the colony's unease with the perceived threat of miscegenation […]' (Tompkins, Holledge, Bollen, & Xia, 2022, p. 68).

Within these parameters, we set out to explore how and if the avatars could be moved in a way to convey nuance, and emotional and psychological complexity, capturing their subtle reactions to the unfolding drama on the imagined stage. While the reactions of the actors could potentially move and engage us in the MoCap studio, would this be emotionally perceivable via the avatar on screen? How to go deeper and not broader and for it to be communicated to an audience? Before answering these questions, we have sought to find a language to assist the actor and director on the journey. Enter Laban.

Laban's theories of BESS and Movement Psychology made the students' journey from the movement studio to The Void seamless. Laban nomenclature provides a tool not only for analysis but for embodiment. It captures and indeed elicits sensations. It is a form of phenomenology, the study of essences, of the direct experience of moving and living. As Susan Kozel notes, the work of Laban (and Bausch) is connected to phenomenology through the themes of '(i) the concern with essences [and], (ii) the return to lived experience […]' (Kozel, 2013, p. 300). These themes provide insight into tasks and learning outcomes explored by Flinders Drama Centre students. BESS terminology becomes a part of their daily way of behaving and observing behaviour. It is applied to most movement and acting tasks and is a foundation for their psycho–physical development. Even their yoga work is often supported by BESS nomenclature. Slowly, via daily repetitive work, these terms begin to live. They creep into their muscles, under the skin. Language develops a feeling, an association, a texture – an embodied memory, a psycho–physical mnemonic. A subjective essence that is owned by the student and yet, such is the brilliance and universality of Laban's language, objectively recognisable to the outside eye. Laban's language is not only a tool for the student to observe movement and behaviour, but the training 'requires the development of tremendous sensitivity and understanding, which comes largely from extensive exploration in one's own body experience' (Kaylo, 2007/2008, p. 6). Our initial work in attempting to animate avatars simply looked at the transference of these BESS terms and frameworks into The Void. The actors were directed via the concepts of Effort, Shape, and Space. Some examples:

- Effort – 'Look to your left in light weight, sustained time; lighter. And lighter again; let your fingers dance on your lap in quick time; find me flick and shades of flick; stronger as you sit. And stronger again'.
- Shape: 'Sit in Pin; as you watch, allow the torso to move into Wall; internalise screw shape, and slowly let it permeate to your outer'.

The actors were simply asked to yield to the offers. To surrender to what begins to happen to them while they live within the parameters of the physical score. While the avatars moved with a degree of nuance, the challenge was to elicit more textures and nuance which moved us, the viewers. An attempt to go much deeper.

To achieve this, the second phase of the work saw the introduction of Movement Psychology into The Void, and it is in this area where, to the best of my knowledge, Flinders Drama Centre is experimenting with a newness in MoCap performance. Having developed an embodied knowledge of each inner attitude in the movement studio, the actors were now once again tasked with transferring it to The Void. Directions and behavioural provocations now took on a new form. While the actor/avatars were sitting and watching the imagined performance of *Othello*, they were asked to do so via a particular inner attitude. In one of the first examples, it was in the inner attitude of Adream (Sensing/Feeling, Weight/Flow), in the interpretation of 'Diffused' (Light/Bound). With an embodied knowledge of the terms, the direction of 'Adream, light and bound' was all the actors needed. They immediately dropped into the state. Here again lies the magic of the work. Vladimir Mirodan has referred to it 'as a complex of metaphors' (Mirodan, 2015, p. 39). He notes that 'psychological functions are perceived as movements: feelings run *high* […] thought goes (*straight*) to the heart of the issue […] Our psychological experiences are structured in terms of physical forces' (italics original, 2015, p. 40).

In initial experiments, the actors were simply asked by the investigators/directors to sit and generate the inner attitude of Adream/diffused. Do not show it, but simply let it move internally. As the inner quality manifested, they were then encouraged to allow the inner attitude to 'leak out' via the smallest of shadow movements, movements which reveal the inner attitude and/or feeling to the viewer/audience. To those of us observing the avatars (two directors/investigators), it was evident that some of the gestures were too nuanced, and not clearly perceivable due to the limitations of the technology. Nuance in the fingers was particularly difficult to read in the avatar, as was subtle breath in the torso. What was easily seen live through the work of the actors (the nuanced movement of the lungs and torso, small gestures of the fingers), was very much lost on screen. The inner attitude of Remote (Thinking/Feeling, Space/Flow) was particularly difficult to pick up through the avatar. Remote, as its mental factors suggest, has an affinity with an internalised state. What is perceivable through the eyes and general atmosphere with the actors when working live was very much lost through the avatar.

We discovered that many of the inner attitude experiments needed assistance in order for the internalised qualities to be drawn out. A boost of sorts. The actors were often asked to play with 'dials', dialling up the inner life by numbers, shades, colours. Or by stressing one of the elements at play, such

as flexibility. Shape was re-introduced in our experiments with inner attitudes to give more definition to the outer shape/posture/silhouette of the avatar. While not a part of Movement Psychology, the entry-point of Shape provided us with a rich catalyst to help further animate the avatars, providing slightly more range of visible behaviour via the three planes of motion. For example, avatars that slightly grew taller (Pin shape), or showed more width across the chest area (Wall shape) or retreated back in the chair through sinking in the chest (Ball shape). In our quest to have the avatars convey psychological and emotional complexity, we found that we had to (re)integrate certain BESS terms into Movement Psychology nomenclature to assist in drawing out particular qualities – an exercise in mixing and matching. This is where the research will take off from in the future – in the pursuit of language.

Our experiments in The Void have focused on finding a language that will assist in animating nuance through human avatars. The work of Laban and his collaborators has provided us with a strong foundation to do so. His nomenclature provides a shorthand, assisting our actors with a bridge in transferring knowledge from one learning strand to another. More, it offers a way of working that is immediate. Given the expenses associated with working in the MoCap studio, the use of Laban or similar is something to consider for those wishing to make this medium more accessible. Going forward, perhaps the conversation can turn to how Laban's language can assist directors, animators, and technical support in the MoCap studio. And as the technology continues to improve, there will be more opportunities to explore how Movement Psychology can assist MoCap artists in going deeper, not broader. Watch this space.

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12

THE ROLE OF EDUCATIONAL ENVIRONMENTS IN INFLUENCING THE EXPERIENCE OF WOMEN AND GENDER DIVERSE PEOPLE IN THE VIRTUAL PRODUCTION SECTOR

Julia Erhart, Kath Dooley, and Tully Barnett

Introduction

As a new means of filmmaking that harnesses game engine technology to create 'previsualised' location and screen content, virtual production (VP) is arguably the most significant technological change the screen sector has witnessed since the coming of sound. VP utilises traditional physical and virtual filmmaking techniques to generate photorealistic environments that are displayed on large LED walls (aka 'volume' studios), behind physical components such as actors and props. VP reconfigures filmmaking workflows, as visual effects are no longer delegated to post-production but are visualised and iterated throughout pre-production and production. Several industry leaders have championed these developments, suggesting that the zero cost of accessing game engine technologies such as Unreal Engine might 'democratize visual effects technologies and, thus, allow a greater diversity of individuals to tell unique stories' (Jobin, 2022, 105). Moreover, it has been posited that VP's renegotiated workflow may present opportunities for practitioners for whom on-set production work was previously unfeasible, due to physical or other constraints (Jobin, 2022, 102). However, we do not yet know to what extent these new technologies, workflows, and means of creative production will change the experience of the labour force within the sector.

While VP is the focus of considerable attention in industry publications, attracting investments in hardware, the growth of the sector has been hampered by a skills shortage that has created a workforce problem for the screen industries more broadly. There is some evidence that the COVID-19 pandemic provided justification for investments in VP (hardware and new working methods), as companies saw the benefits of producing in contained

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environments with fewer travel requirements. Theoretically, the industry offers new modes of remote work/working from home that would be of benefit to those with care responsibilities; however, in drawing as it does from pipeline industries such as film and games that have grappled in recent years with #MeToo, gender pay gaps, gamergate, and worsening statistics about women in leadership positions, VP may import workplace cultures that continue to make it difficult for women and gender diverse people to succeed in the workforce. Initial reports suggest a domination of white male workers in VP recruitment (Bennett, Heath, KilKelly, & Richardson, 2021, 15) and the sector as a whole (Koljonen, 2021), which raises questions about the attractiveness of VP for female and non-binary practitioners. To date, no published academic or industry research has taken women's participation in VP in Australia as a point of focus, and international studies have only lightly touched upon the subject (Bennett et al., 2021; Jobin, 2022).

This chapter considers questions about gender, careers, and workforce opportunities for women and gender diverse people in the VP sector in relation to the educational environment in which workforces are grown, developed, and framed. In response to the global growth of the industry, Australian education providers have responded quickly and developed courses that can be offered to undergraduate students and/or experienced practitioners looking to reskill. Our investigation of this area acknowledges that educational environments in which VP skills are taught and through which internships and work placements are administered, and the role that educators play in recommending students and graduates for work, have an impact on worker expectations which they will carry forward as they enter the sector. We offer an analysis of preliminary data drawn from interviews with tertiary instructors involved in VP education around Australia. Part of this rapid VP growth means that definitions are broad, and how VP is expressed in different industry and educational environments is not always consistent. Our interviewees refer to studio shooting with LED volumes, use of remote technologies such as Zoom to enable broader participation in screen production, and projects using game engines, such as the Unreal Engine Short Film Challenge, as activities in which they have engaged with students in VP; however, some common themes and educator concerns emerge from our analysis, as outlined below. This research is part of a larger research project to audit and creatively communicate differing experiences of women and gender diverse people in the nascent VP industry in Australia.

Pipeline Industries and Inherited Problems

The VP industry has emerged from and shares labour patterns with various other screen-based industries, such as film, games, animation, and visual effects. These industries have long grappled with the challenges faced by

women working in the sector. Extensive research spanning four decades has consistently presented a discouraging picture of gender equality within these fields (Cobb & Williams, 2020; French, 2014). Studies have unequivocally demonstrated that women's representation in the Australian film and television production sector remains chronically lower than that of men (Cox & Laura, 1992; Marsh & Pip, 1987; Ryan & Appleton, 1983; Screen Australia, 2015; Verhoeven, Coate, & Zemaityte, 2019). Harassment, inflexibility, and the inherent incompatibility of screen industries with family life have forced many skilled female practitioners to abandon their roles (French, 2020; Screen Australia, 2015; Verhoeven et al., 2019). Although an equal number of male and female students graduate from screen production, visual effects (VFX), and animation courses – an initially positive statistic – it is disheartening to note that an equivalent number of women do not progress to top positions within the screen industry (Bizzaca, 2019b).

Considerable attention has been given to examining the experiences and employment statistics of key creative film professionals, including directors, writers, and producers. In the Australian context, it has been revealed that only 17 per cent of feature dramas shot between 2011 and 2018 were directed by women, and research suggests that rates of women's participation have hardly increased in decades (French, 2020) or rates are declining (Nash, 2019). Because VP is built on the industrial framework of the broader screen industries, and inherits workforce cohorts, workflows, and even policy approaches, it is at risk of inheriting these problems.

On a related note, recent research and industry surveys have aimed to understand female participation in the Australian post-production and VFX sector (Dooley & Erhart, 2021; Erhart & Dooley, 2022), as well as in the broader VFX domains and games industries (Bailey, Miyata & Yoshida, 2021; Game Developers Association of Australia, 2018; Harvey & Fisher, 2015; Keogh, 2021; UK Screen Alliance, 2019; USC Annenberg Inclusion Initiative, 2021). In the Australian game sector specifically, women's involvement remains low: 48 per cent of companies have exclusively male workforces (Game Developers Association of Australia, 2018). Barriers to women's employment in these fields are multifaceted, deeply ingrained, and often exacerbated by pervasive sexism and gender-based biases regarding women's worth and capabilities (Keogh, 2021).

Despite the wealth of existing research and increasing scholarly awareness regarding the importance of assessing industry opportunities and roles beyond those of directors, writers, and producers, we currently possess very limited knowledge regarding the challenges and opportunities that VP presents for women in the Australian screen sector. We lack an understanding of how the lower participation of Australian women in the pipeline industries of games, film, animation, and VFX (French, 2014; French, 2020; Screen Australia, 2015), the prevalence of gender-based discrimination, and/or

the underrepresentation of women in leadership positions have influenced the VP industry (Game Developers Association of Australia, 2018; Screen Australia, 2015). Furthermore, the experiences of transwomen and individuals identifying as non-binary who contribute to this sector remain completely unexplored (Verhoeven et al., 2019).

Gender and Screen Education

Further to these studies of gender within industry sectors, limited research has explored gender and diversity issues within educational institutions teaching screen production, despite substantial studies on tertiary screen production education more broadly in recent years (Aquilia & Kerrigan, 2018; Chambers, 2019; Hjort, 2013; Petrie, 2010). Moreover, we are unaware of any prior scholarship exploring gender issues in the specific context of teaching of VP methodologies. The literature that does exist highlights the challenges that female and gender diverse students experience in the screen production classroom and suggests strategies to address these challenges (Banks, 2019; Dooley, McHugh, & Berry, 2020; Dooley, McHugh, Berry, Batty & Verdon, 2022; Mehta, 2015; Orwin & Carageorge, 2001). Ritesh Mehta's study (2015) of US film school students, for example, reveals their diverse characteristics and the process of 'resocialization' as they integrate into temporary film crews. Observing a similar phenomenon, Anne Orwin and Adrianne Carageorge (2001) highlight the need to address the different needs and biases favouring men in film schools. Likewise, Miranda Banks (2019) suggests interventions for equitable media production in universities. Educator interventions are also explored by Dooley et al. (2020) in their study of diversity in Australian film schools. A recent Screen Australia report confirms gender discrepancies in below-the-line crew roles among Australian film school graduates (Bizzaca, 2019a), also noted by Dooley et al. (2020). Similarly, Professor Trish FitzSimons observes a balanced ratio of male-to-female students but a higher male presence in camera and directing areas (as cited in Nash, 2019). These findings underscore the importance of addressing gender biases and fostering inclusivity in screen production education.

Method and Interviewee Profiles

For this pilot study, we interviewed a small sample group of people working in the field of tertiary-based VP education in Australia. We interviewed four educators who were currently teaching VP or developing courses for imminent delivery to tertiary students. The sample size is small because few universities in Australia have developed VP programs. In conducting these interviews, we hoped to further our understanding of gender dynamics in the classroom, which, as stated above, we believe is a factor that informs expectations around

working practices, by gaining insights into gender dynamics in training programs. The educators we interviewed worked for both public institutions and private educational providers. The public institutions were at varying stages in their rollout of courses (with one having received a sizable government grant to support low-cost VP training). Some of the educators were teaching VP techniques in practice in a volume studio while others were preparing to teach VP with this approach. Others were teaching VP using related tools.

Our educators had a mix of industry background: some of them had VP experience in industry settings while others had come to the work through a games or filmmaking background. They were located in three states within Australia: South Australia (2), Victoria (1), and New South Wales (1). In terms of gender identity, our interviewees were female-identifying (2) and male-identifying (2). In regards to intersectional factors beyond gender identity, no one identified as Indigenous, or from a culturally or linguistically diverse background. This small sample serves as the base-line for our ongoing research project.

Preliminary Findings

A number of common themes that emerged from interviews shed light on some complexities around women and gender diverse people's capacity to advance in the VP sector and its aligned industries. Some of the findings come as no surprise and appear to echo much of what is already known from several decades of studies of gender equity and media. Other themes were somewhat more surprising to us as researchers, indicating perhaps small but still significant breaks with established patterns of discrimination, exclusion, and disadvantage.

Before delving into these findings, we must note that all of the educators we interviewed had long-term experience in the education sector and all were aware of longstanding inequities in access. All of them expressed a strong desire to have gender parity in the classroom and had spent time devising varying approaches to support their female and non-binary students to experiment and trial new tools and approaches.

Student Cohorts and Teaching Staff

Data on the ratio of male to female students enrolled in VP classes were mixed. Two interviewees observed female students enrolling in equal numbers to male students, and reported some female students' strong desire to be involved in VP. One said,

> As soon as information about an industry collaboration became public, a [female] student banged on my door and said, "If there's any opportunity at all for me to see the virtual production spaces … please can I? Remember me."

This same educator continued:

> we actually had far more female identifying students than male identifying students pitch films, for example [for The Unreal Engine Short Film Challenge], and the project we ended up going with … [had] mainly one director, which was a woman.

By contrast, another interviewee noted problems attracting female and non-binary students that went above and beyond ratios of the 'traditional' (non-VP) filmmaking classroom. This educator expressed that the gender balance which had been "nearly 50/50" in the filmmaking program had changed when VP, as a focus of filmmaking activity, was launched. As this person put it:

> we were so proud of the fact that it was 50/50 … And we worked really hard to get to that level. And now, it just kills us … [in my upper level cohort] I have a non-binary student, a female student, and 10 male students. In my first years, I have a total of 28 students, three of those are female and one is transmale.

When we drilled in, it was suggested that this could have been attributed to adverse marketing decisions, with this educator explaining that the course marketing material "is making it look like it's very technical focused rather than storytelling focused." Existing research into the gendering of crew roles in the broader Australian screen industries (Bizzaca, 2019a) and in the context of screen education specifically (Dooley et al., 2020) suggests the dominant take-up of 'technical' roles such as cinematography and sound recording by male students may be fostered by cultural ideas related to capacity. This interviewee's observation suggests a marketing approach that positions VP as a technical (rather than creative) pursuit is likely to attract male students, which has flow-on effects for every part of the VP education and industry.

Further to the subject of gender balances among students, educators spoke of gender issues related to staff and mentors. Concerns were raised about all-male teaching teams and the near non-existence of female or non-binary industry mentors**.** Moreover, educators noted an overall lack of female role models in industry. As one interviewee put it:

> My students were assigned an industry mentor organisation that specialised in work generated with Unreal Engine. This organisation had a staff of about 12 artists. Only one of these was a woman. Several staff mentored the students, but the female staff member was not involved [in the mentoring].

Some interviewees noted this was especially true in the 'below the line' areas of production, where female workers and mentors were believed to be scarce. There was consensus among the interviewees about the need for better representation in these mentoring roles, and the likely link between mentoring and the ability of female students of VP to see themselves as industry professionals.

Further factors that were noted included a dominance of male instructors and consultants. One educator commented that all of the technical staff associated with teaching VP were male: "when we were having the studio built and making all the decisions … there were probably ten of us in the room … from electricians to campus managers and … it was men [in] the decision-making process." Another educator commented on curriculum design: "The team is all male at this point. This is not by design. It's just the way it has panned out." Yet another interviewee stated: "We had three main instructors working with students – two of these were women. A broader group of one-off tutors and mentors were brought in to help students with various aspects of the project. These were all male." All of this suggested to us that the situation was not only the same as in filmmaking courses currently but was actually worse – perhaps similar to how it had been 20 years ago. Hearing these comments, it seemed old patterns of gender imbalance that we hoped had attenuated, were back with a vengeance.

Something we're now watching is whether there are differences in student experiences, according to type of education providers. We noted that the instructor whose course demonstrated the lowest rates for women and non-binary students happened to be working for a private provider. This contrasted with the experiences of a different educator (employed at a public institution and in receipt of a generous government grant), who expressed confidence in being able to use grant monies to especially support female and non-binary students. In Australia, all filmmaker training (VP and pre VP) is now delivered by a mix of private and public providers. Thus more research needs to be done before we can assert what the driver/s for this apparent discrepancy might be. Although our sample size for interviews was small, this will be an important line of inquiry for a larger study.

We now turn to statements made by educators in VP that give insight not only into their classrooms and the dynamics they witness there but also into the industry as they see it from their vantage point of education, often well connected to industry and the cohorts that move into it. Some of the patterns we noticed seemed to be replicated from 'legacy' areas of the film industry. One significant pattern we noticed included the notion that when women are 'in charge' more women have courage to go for roles they perhaps wouldn't go for with a male in charge, that is, the beneficial effects of having women in key roles and visible at the top. Lisa French cites numerous Australian feature films where women's presence in such roles has

resulted in more women in the crew (2015, 141). In VP, as one interviewee states:

> if it's a female director, they're much more likely to get a female camera operator. I've noticed that so many times … because they're learning, they haven't got anything to back themselves up … it's a very exposing kind of a thing to do to be the camera operator and everyone sees your mistakes. So yeah, they know it's just not a safe zone. We self-sensor ourselves I think as women, to jump in.

This interviewee's perspective shows the ongoing snowball effect that women's participation in education and industry can have.

Similar to what has been shown in the film industry more broadly, VP projects work like a holistic ecosystem, meaning that on projects where males appear to dominate, women and non-binary students appear to hold themselves back. Balances that one interviewee described as "out of whack" would appear to have compounding effects on a particular production's opportunities and gender balances. As one interviewee stated:

> But when the balance is out of whack, the women tend to gravitate more to the production roles [i.e. to the producer roles, which in other media spheres have been one aspect in which women have gained a foothold]. They will occasionally direct, but they tend to hit [sic] the production …. But when the gender balance is going [well] then it's really good.

As with traditional or legacy filmmaking, an issue that may affect students' willingness to put themselves forward was the perception that in doing so would make them visible to their peers, doing camera, for example, rather than, say, sound. Students, an interviewee observed, may try other roles (such as audio) "where they're not too looked at", echoing poor gender equity rates in areas such as cinematography.

VP's Potential to Be a Leveller

More than one interviewee spoke hopefully of the potential for VP to "level the playing field" and provide opportunities for students regardless of prior experience. As one interviewee put it:

> I think what's good is that there's no prior knowledge that they're bringing. A lot of my students are quite successful YouTubers or they've got a lot of great photography. And so they're coming in with already a very strong body of work. But when you chuck them in, all of them in the volume, they're all on the same, "Oh, we don't really know."

However, this same educator noted a potential gendering of risk taking and willingness to make mistakes, and female-identifying students' differences in their willingness to give-it-a-go with brand new technologies and approaches. Scholars such as Miranda Banks (2019), and Anne Orwin and Adrianne Carageorge (2001) support these claims. The educator commented:

> I think the boys just get on and they just have that bravado and … there's a … [an approach that's] like "well done for fucking it up Cody, that's awesome". You know, it's almost like the boys congratulate them for doing something stupid … but if one of the female students does something stupid … it's not congratulated in the same way. [The girls say] "Oh sorry, sorry, sorry."

In this and other ways, instructors were aware that the promises of the new technologies weren't always (or yet) borne out. One interviewee states:

> I had great hopes that VP would be more of a leveller because it takes some of the physicality out of the filmmaking and that it will be more equitable if you had a family because it's more of a nine-to-five type of environment, maybe not so much travel, and you can stay with your family and that.

Conclusion

There are limitations to our study. We asked our interviewees to partake in an interview about gender and VP in educational settings and this may have primed our interviewees to talk differently about how gender matters work in their own environments. Our sample size is very small and as a result we do not seek to make any generalisations about the gender dynamics in VP classrooms. At the same time, our study reveals some emerging themes concerning gender and VP as illuminated through talking to educators in the emerging field. We reiterate that this is very much a preliminary study and we intend to interview a wider pool of practitioners and educators in the coming weeks and months. If there are a few unifying themes, it's that the resource-intensive aspect of VP (coupled with skill shortages and time pressures), may lead people to revert to traditional means of vetting workers – with decision-making roles often being filled by men. The newness of VP means there are smaller pools of expertise to draw on, and we lack a diverse pool of established practitioners. VP holds promise as we have outlined, but hasn't been entirely borne out. VP may level the playing field but change is yet to come.

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13

DERRIDA IN PRACTICE

The Possibilities of Theory in The Void

Amy Matthews, Kendrea Rhodes, Melanie Ross, and Kathleen Stanley

Origin/Against Origin

In *Of grammatology*, Jacques Derrida explored the 'problem of writing' (Butler, 2016, p. viii), considering semiotics and advancing his theory of deconstruction. In Derridean terms, we understand texts, language, and the world through contrasting oppositions. For example, we understand virtual reality (VR) by contrasting it with reality, in opposition to reality, and we also understand writing in opposition to the visual world of VR. Reading and writing about Derrida's *Of grammatology* is an opportunity to engage with philosophical ideas and questions, a 'wrestling' of sorts, to beneficially shape thinking and research at a postgraduate academic level (Kezar, 2004). We seek to extend 'the problem of writing' beyond the page, imagining the practice of Derridean theory entering The Void, Flinders University's virtual production platform. This chapter assumes a basic knowledge of Derridean theory, as our purpose is not to explain but to *do*, and to consider doing in emerging technological environments.

At the beginning of 2021, the Theory Reading Group, comprised of postgraduate students and their supervisor, began discussing Derrida's *Of grammatology* online via Zoom and Teams, with the intention of exploring how Derridean concepts related to individual thesis projects in Creative Writing and Literary Studies. Other theorists also formed our reading list and contributed to our understanding of Derrida, with Judith Butler and Gayatri Spivak acting as guides to *Of grammatology* through their Introduction and Translator's Preface respectively, and the work of Jean Baudrillard rising to the surface as we moved to reflecting on the ways Derridean theory might twist

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and tumble, if and when moved into technological contexts. We were drawn to Judith Butler's idea that 'Derrida's writing … herald[s] a future through a break with a set of [inhabited] discourses, … exposing these unsettling and promising sites of breakage found "within" the discourse even as they open to the "outside"' (Butler, 2016, p. xix). Our 'promising sites of breakage' (Butler, 2016, p. xix) began with the idea that 'freeplay should be conceived of as the activity of origination and generation for the sign' (Hayes et al., 2015, p. 41). In response to the challenges of grappling with and applying Derrida's key concepts, including those of ruin, the trace, and *différance*, we extended the initial intention of our reading and asked ourselves, how could we *do* theory through creative praxis to explore our always-expanding-never-arriving readings and enhance our critical reading practices? And what happens when ideas and knowledge are moved from the book to the art object, such as the reading of Derrida using a photographic image? And further, if we move into the spaces of extended reality, such as exploring Derridean concepts in The Void? What developed was a multi-layered, embodied theory praxis, venturing well beyond text on a physical page.

Theory and Praxis

Over two years of COVID lockdowns, Derridean concepts of 'inhabiting' and 'cohabiting' had multifariously knitted themselves in our group's praxis. Spivak observes that 'Humankind's common desire is for a stable centre, and for the assurance of mastery – through knowing or possessing. And a book, with its ponderable shape and its beginning, middle, and end, stands to satisfy that desire' (2016, p. xxix). We four became the 'stable centre' of a group that often seemed to have no centre, our reading of Derrida's *Of grammatology* an iterative and non-linear process of 'desedimentation' (Spivak, 2016, p. 350) and, eventually praxis, as we sought to *do* theory. We realised we were amidst the 'digital transformation of knowledge' within universities, where the 'technology of hyper-capitalism is transforming learning and teaching for students and professors alike' (Mui *et al.*, 2019, pp. 455, 463). We were engaging in non-physical interactions as a result of the COVID physical distancing requirements and the separation of group members across Australian states, mediated by laptops and phones and screens across different time zones. We embraced the technological experience, adopting its potentialities as we dug into Derrida, very aware as we interacted in the virtual spaces of Zoom and Teams that 'reality [was] textured' (Germain, 2009, p. 14) by the fact that we were reading the screen as we would read a text, and also aware that in Derridean terms we were traces of ourselves – our physical absence embedded in our digital presence. Our interactions with one another in every reading group online were haunted by the theory we read and discussed. We were the speaking traces.

Our reading of Derrida's *Of grammatology* was a two-year endeavour, supplemented by other theorists and readings and we are not seeking here to explicate the process or to articulate a summary of Derridean theory. Rather, we decided to embrace Derrida's challenge 'to change certain habits of mind [because] the authority of the text is provisional, the origin is a trace; contradicting logic, we must learn to use and erase our language at the same time' (cited in Spivak, 2016, p. xxxvi). We decided to use and erase our language through praxis. We wanted to embrace the opportunity to change our reading and thinking habits, all the while grasping for an understanding of *différance* (Butler, 2016, p. xix; Spivak, 2016, p. xxxvi). *Différance* is endless deferral in search of origin, and just as we land on the mother dough, the thousand-year-old starter, it slips from our hands, leaving behind gooey splatterings of potential on our fingertips. Traces of origin. It is the effect of presence and absence. Spivak asks,

> at what points along the seams of a phonic theory do we discern the 'incomprehensible' elements, stubborn graphic tufts or knots—metaphors that signify in a direction opposite to the argument for which they are deployed, diacritical marks without which the argument cannot proceed—that call into question the phonetic basis of language?
>
> *(Spivak, 2016, p. xiv)*

The excluded, incomprehensible elements, Spivak says, are supplements 'that impose in a preemptive way the limits of linguistic intelligibility' (Spivak, 2016, p. xiv). Language supplements are absent and present, like the gaps between words in voice and text. They are negative space, like margins, temporary comments, physical spacing. But what if they can be caught? What if the incomprehensible elements do not need a phonetic basis, a mark or absence of a mark, on a page? What if there is a 'poin[t] along the seams of a phonic theory' (Spivak, p. xiv) and this (our digital grapplings and creatings and meeting points) is it? Not in the elusive way *différance* defies language and text but in its capture as it differs, detours, and refers.

We chose to explore these ideas through creative praxis, settling in the first instance on the medium of iPhone and Android photography, leaning into the portability and accessibility of smart phones, and into the ways smart phone technology has already been integrated in daily life. The choice of photography to embody Derridean concepts embraces the fragility of origin. If you see the photos and are unfamiliar with the Derridean origin of our creation-thoughts, do the images still express/contain traces of the theoretical concepts? As readers/viewers we subconsciously know that 'incomprehensible elements' (Spivak, 2016, xiv) exist. Without labelling our photographs as connected to specific theories or meanings, we expect multiple readings and meanings to occur. As a group, we shared what we could 'read' from each

other's images, unspooling a multiplicity of readings. We were not seeking to 'capture' Derridean ideas, but rather to play in the margins of meaning, in a medium beyond the Derridean suspicion of language, in a space of arche-language and arche-trace.

Ross on Ruin and Fixity

> If ruin is there from the word go, then so too, is mourning, prior to any nameable loss, which is surely why Derrida confirms that translation is a work of mourning (CI 199), more of a task than a given.
>
> *(Spivak, 2016, p. ix)*

Melanie Ross's image gestures at Derridean concepts of ruin; it is a scene wordlessly connected to mourning, with additional layers of meaning possible through the viewer's acts of translation. The image depicts a decaying bird of paradise stem tied with a pink ribbon and a shred of twine to a public bench; the ribbon has loosened, and the flower upended. The bench sits on a public pathway at the edge of a wintry beach front. There are no people. The subdued waves are caught mid-lap at the shore. Possibilities present themselves. The flower can be read as an act of memorial, commemoration, a common sight at places where death and loss have occurred (gravesites, crash zones on roadsides). The meaning here is generated through arche-writing, which precedes speech and writing, and the Derridean idea of fixedness: customs are a fixed meaning that we intuit, for example when we 'know' that a flower tied to a place is an act of memorial. The tight framing of the photograph fixes attention on the flower, on the sliver of bench and path and shore, focusing attention on the cultural 'fixedness' of memorial, of flowers as commemorative, of loss inscribed through the act of leaving floral tribute. Tangled in this network of meaning are ideas of loss, pain, grief, absent/presence, memory, and more.

In a group reading of Figure 13.1 we suggested that it might be viewed as a visual representation of climate change; a state of global ruin resulting from human actions. The removal of the flower and the tying of it with materials that are human-made and not compostable (the string and the ribbon seem to be acrylic) becomes part of a network of meaning: one destructive act in a line of actions for generations. The fallen position of the flower and its brokenness can be read to symbolise the physical ruin of the natural world from human action. The flower's similarity in form to a bird highlights a connection to the fauna impacted by global warming, as we move towards a sixth extinction (Kolbert, 2014). At the time the photograph was taken (19 June 2022), Queensland and New South Wales were recovering from major flooding, an example of extreme weather that is expected to become more common because of global warming (Bureau of Meteorology, 2022). These contexts

FIGURE 13.1 Left: Ross on ruin and fixity. Right: Stanley on love and supplement. Photo credits: (left) Melanie Ross, (right) Kathleen Stanley

were specific to us in our moment of reading. The trace of climate change and floods are unlikely to be present to others. Like items swept away in the floodwaters, and displaced plant and animal life, the flower is dislocated from where it grew/belongs and is unable to survive the new conditions.

The photograph of the scene, and our analysis of the image, are examples of translations that ruin the original: 'if ruin is there from the start of any translation, its condition of both possibility and of failure, then so, too, is lamentation' (Butler, 2016, p. ix). Butler asks, 'if ruin is there from the word go, then what is original?' (2016, p. x). At what point was the flower on the bench an 'original'? The photograph is not 'original'. Was the flower tied by some unknown hand ever 'original'? The act of leaving flowers in memorial is itself part of a long tradition; flowers have cultural meaning and thus the flower was only left as an embodiment of tradition and pattern. It was speaking a language culturally understood. Modest floral shrines can be seen on roadsides everywhere, bunches of both fresh and artificial flowers can be seen tied to posts and rails and trees where people lost their lives. This is not an 'original' act, but for the people involved it is both original and a trace, its meaning gained from a network of meanings. In Ross's photograph we see the trace of possible mourning, the trace of cultural practice, the trace of people we will never meet, and grief we will never know the details of; and we engage in acts of translation as we read the image – an image that is both origin and trace. Derrida observes that 'trace is not only the disappearance of origin … it was never constituted except as a back-formation by a non-origin, the trace, which thus becomes the origin of the origin', an endlessly deferred meaning (2016 [1967], p. 66).

Stanley on Love and Supplement

> We hear that it is time to let the outside in and are warned not to suspend the supplement; that in our global predicament, we need to step outside.
>
> *(Derrida, 2016 [1967], pp. 365–366)*

Kathleen Stanley's photograph foregrounds the construction of the image itself, the conscious placement of materials to make a pattern. This photograph is highly choreographed; the elements were actively arranged to insert the presence of desired trace signs. Spivak notes that for Derrida 'supplements include the graphic and spatial articulation of language on the page' (2016, p. vix); here we have the graphic and spatial articulation of objects in a frame. We were told we were seeing a collection of toiletries that Stanley's husband brought home after travelling for work around Australia during COVID, as a military emergency worker. The extra-textual explanation haunted our readings of the image, as did the spectre of COVID. The mini disposable toiletries are arranged in the shape of the number 60, representing the percentage of time the couple spent apart (we know this because we were told, it is not implicit in the image). The hotel toiletries are the traces of absence from the family home – and the signs of transitory places Stanley's husband inhabited without her. The percentage sign is made up of Stanley's wedding ring on one side and engagement ring on the other, representing a relationship spent half together and half apart. How do we trace love? What does love look like when its signs, signified, and signifiers are hotel shampoo bottles? And how would we read this image without the context?

When the group attempted a reading of this photograph without the extra-textual explanation, the closest they got to the concept of love (the trace Stanley saw in her constructed image) was the loose idea of connection. We could see the traces of something meaningful, but the emotion eluded us – the signs and traces were there but slipped out of grasp, beyond translation. We gravitated towards the disposable nature of the hotel toiletries. In *Of grammatology*, Derrida talks about 'Dangerous Supplement' (2016 [1967], p. 153) and cautions against the claims (by Rousseau) of the naturalness of speech, urging us to practice mistrust with speech and to remember the 'concealment within speech itself' (p. 153). Speech is just a reflection of thought, a death of this idea of origin which Derrida claims 'opens as much as it threatens' (p. 154). The idea of an origin of the sign died the moment the photo was taken, perhaps even before, but it also opened the origin of meaning. This image is a personal statement of love and also a story of loss – a loss of time and closeness in partnership that can only be traced outside

of physicality. But it is also an image that frustrates reading, when offered up mutely, without context or explanation. Spivak claims the supplement 'is dangerous because not only does it suggest that full presence can be added to, but it also suggests that presence has a lack which can be filled' (2016, p. 355) and yet we experienced a palimpsestic non-arrival of layering supplementarity, not a lack and a filling but a deferring and unspooling and tangling and *adding*. As Derrida says, 'the strange movement of the trace announces as much as it recalls: *différance* defers-differs [*diffère*]' (2016 [1967], p. 72) and 'there is a lack, and an addition can be made; so presence is undone by supplement' (2016 [1967], p. 355). But Spivak acknowledges that a 'critical reading … attempts to track the structure of subjective production of the text' (2016, p. 347), and we felt our subjective production and critical reading practice, our doing of theory, had uses for supplement (and we have replicated the supplements here, gesturing to our origins, a trace of our supplementarity).

Matthews on Masking and Absent Presence

> If the trace sends back to an absolute past, it is because it obliges us to think of a past that can no longer be understood in the form of a modified presence, as a present-past.
>
> *(Derrida, 2016 [1967], p. 72)*

A triptych of tiles. New white tiles in a renovated bathroom; old white tiles in a bathroom half dismantled; the filthy smear of a rude gesture on a wall, the trace of communication from an unknown hand. Amy Matthews told the story of her bathroom renovation, of old brass taps that could not be removed, and so were tiled over, still existing behind the shiny new tiles, a ghost of bathroom past. The renovation happened in 2020, as the COVID pandemic breached familiar reality, and continued through lockdowns. There is no trace of COVID in the images of the bathroom, old or new, but for Matthews there is a trace of the seething anxiety and anger and emotionality of the experience in the splatter of the raised finger. COVID restrictions meant the renovation happened out of sight, and Matthews could only see the traces of the builders in the steadily emerging new structures, which occurred in her absence. The sound of demolition, power tools, radios, and the builders' voices were phantoms during after-hours site visits. The builders were an absent presence. The reading group's discussion slipped from Derrida to other theorists, notably Baudrillard and questions of palimpsests of meaning. Baudrillard supplemented our thinking as we drifted to considering VR, and how we might enter a virtual version of our photographs, inhabiting the frames, raising questions of masked realities. Here we have a palimpsest of images, story, physical bathroom,

imagined bathroom, images, the ekphrastic imagining of the walls (past and present) brought into being in VR – all of it simultaneous in our conversation and reading. None of Matthews' supplementary story is obvious when visitors walk into her new bathroom; only if they are told the story do they enter the masked world: 'pretending, or dissimulating, leav[ing] the principle of reality intact …, simply masked' (Baudrillard, 1994, p. 3). The new bathroom is not a simulation of the old, because the old still exists in both memory and in trace elements behind the tiles, a site speaking to 'the difference between the "true" and the "false", the "real" and the "imaginary" ' (Baudrillard, 1994, p. 3), and there is no trace of 2020 and the pandemic unless the photographs are supplemented by Matthews's spoken or written memories. Derrida argues that speech is 'originarily passive' and that this 'passivity is also the relationship to a past, to an always – already – there that no reactivation of the origin could fully master and awaken to presence' (2016 [1967], p. 71), suggesting that knowing Matthews' story of the traces of the old bathroom beneath the new cannot fully awaken the past or bring it into being. The spoken past is passive, and yet spectral, a potentially active haunting once it has supplemented the image, even if it is not 'fully awake' in the Derridean sense.

There's a natural compulsion to put Matthews' photographs in order, old to new, left to right, but that would then represent the erasure of the old. It would be a false representation of this wall palimpsest. Spivak says that in 'examining familiar things we come to such unfamiliar conclusions that our very language is twisted and bent even as it guides us. Writing "under erasure" is the mark of this contortion' (Spivak, 2016, p. xxxii). The word 'Walls' typed in Times New Roman font on Matthews' photograph, reminds the viewer of the image on the page, that these are just walls, all in simultaneous existence, gesturing to Derridean ideas of absent presence.

Rhodes on Phonics and Writing

> One must begin from the possibility of neutralizing the phonic substance
> *(Derrida, 2016 [1967], p. 67)*

> *Différance* 'does not depend on any sensible plenitude, audible or visible, phonic or graphic. It is, on the contrary, its condition'
> *(Derrida, 2016 [1967], p. 68)*

Kendrea Rhodes' image reflects the temporality of sound, affect, and proximity of a trace long gone. The sound pictured in Figure 13.2 is one among many within the acoustic plenitude of podcast editing. While manipulating the voices of others, Rhodes followed the familiar highs and lows of human vocal rhythms, audibly and visually.

There were moments when all three voices spoke simultaneously in extended spikes of purple, yellow, and blue. And moments of silence on a black screen.

FIGURE 13.2 Top: Matthews on masking and absent presence. Bottom: Rhodes on phonics and writing. Adobe product image reprinted with permission from Adobe. Photo credits: Amy Matthews (top) and Kendrea Rhodes (bottom)

Or a sudden splutter of unexpected laughter thrusting the Adobe Audition software into the red zone. Experienced writers discussing their craft and imbuing their friendship through colourful, jovial interjections. Connecting with their future audience (who they imagined was already listening), but behind the camera of Figure 13.2, the audience was one.

To someone walking into that room, editing the podcast may have appeared a quiet exercise. The only trace of sound, an array of coloured lines dancing across a computer screen. But for Rhodes, with headphones on, ears full of voices, head full of words, it was the opposite. Trying to convey the absent sound of a voice with a visual image feels impossible; but here we have the rainbow record of speech, without the sense of meaning from the words or the sound of the phonics. For the visitor to the room, this is *différance*. They do not hear a voice; there is no speech, but only writing on the screen and their interpretation of the colourful spikes is contingent on a network of meaning, for example, whether they know the software and how to interpret visual representations of the human voice. The attempt to seek the trace elicits something like presentism, déjà vu or memory, sparking a momentary

familiarity with *différance* and endlessness, because, upon the utterance of the word 'voice', a person – the signified – appears in our minds. They are that very distant trace missing from this image.

As the signifier, the software 'writes' the knowledge of sound visually, creating the sign. Is it an absence or presence? The aim when editing sound is seamlessness between the two, deleting and rearranging voices in acts of supplementarity. Removing silences that appear as blanks on the screen. Gaps between words. Speech. Language. Text. The aural result is compression of spaces where silence and blanks once reigned. Silence: pluralised visually and erased aurally.

This is an image on which we practise deconstruction: the logocentrism is enacted through a desire to have a focal point, a centre (should it be the (unheard) sound causing the spikes on the screen?). Here we also find nothing beyond the text … there is no sound to hear. No words. No meaning. But we know the podcast is about words, meaning, and writing. We know there is speech, but it is an absent presence. It is *différance*. The meaning is reduced to the 'writing' on the screen, inaccessible, even as we strain for it, regardless of what we know. Derrida argues that 'what we here call the erasure of concepts should mark the places of meditation to come' (2016 [1967], p. 66), a summons to a present future, a deferral of meaning, generated through the passive (and potentially transcendental) action of meditation.

The Possibilities of Virtual

> Without a retention in the minimal unit of temporal experience, without a trace retaining the other as other in the same, no difference would do its work and no meaning would appear
>
> *(Derrida, 2016 [1967], p. 67)*

> It is the reflection of a profound reality; it masks and denatures a profound reality; it masks the *absence* of a profound reality; it has no relation to any reality whatsoever: it is its own pure simulacrum
>
> *(Baudrillard 1994, p. 6)*

As we circled readings of our images, our readings grew slipperier, endlessly deferring until we butted into the limits of language. That's when we turned to the possibilities of technology, specifically The Void, and the potentiality of extended and virtual realities. Stepping into The Void is to step into worlds in waiting, signs signifying things as yet unrealised. If 'technology is an extension of the body' (Baudrillard, 1994, p. 111), we imagined The Void as an extension of our minds and imaginations, and in a Derridean sense a tool for rememory. We were curious what would happen if we could extend our praxis by using the technologies of The Void.

As scholars existing in an institution with access to further technology, we considered, as the next step of our project, how we could extend ourselves

beyond the praxis of photography into newer technological forms, and how questions of origin, trace, and meaning might be further complicated. What might be gained from creating a moving image? Or immersive movements, flowing audibly, visually, filling the sense of space and surrounding us on all sides? Imagine a live, immersive, experience tailored to ideas and thoughts: to theory. VR moves us beyond photography and supports a new dimension 'for the maker [and reader] to live inside a concept or an idea' (Orasi & Sameshima, 2022, p. 167). It seemed to us that VR opened doorways to consider Derridean 'overflow' and 'effacement', complicating ideas of 'inside' and 'outside'. Derrida referred to 'writing, sense-perceptible matter and artificial exteriority' as 'a "clothing"' (2016 [1967], p. 38). If in Derridean terms speech and writing is 'clothing', we felt VR could be conceived of as an even more extreme version – a sensory 'clothing'. 'Representation,' Derrida claims, 'is intimate with what it represents' and in 'this play of representation, the point of origin becomes ungraspable' (2016 [1967], p. 39). As inhabitants of the fourth industrial revolution, with smart phones in our pockets, and social lives enacted on apps, learning in digital environments, faced with the possibility and potential of motion capture, Unreal Engine, and the creation of worlds and situations and contexts that are virtual, Derrida's *Of grammatology* cut sharp, applicable even as it slipped from firm grasp.

Orasi and Sameshima claim that 'VR can be a lens to critically examine the threshold spaces for, and the complexity of, creative literacy in education' (2022, p. 162); they deploy the Japanese concept of *ma,* 'used by curriculum theorists to describe what is expressed, repressed, or suppressed in a space between two markers … a gateway into the in-between that other scholars have described as prosody, liminality, third space' (p. 162). *Ma,* they tell us 'is the pregnant void', a term particularly resonant with us, as The Void is the name of Flinders University's motion capture/VR experimentation space (2022, p. 164). Relevant to our purposes for this chapter is the idea of VR 'as a seemingly impossible projection … [which] allows for the maker to live inside a concept or an idea' (Orasi & Sameshima, 2022, p. 167). What would it do to the experience of doing theory to be inside an embodiment of an idea? Arche-writing, in Derridean terms, 'is that very thing which cannot let itself be reduced to the form of *presence*' (Derrida, 2016 [1967], p. 61), and the nature of presence is slipperier and slipperier in the non-present presence of VR.

In 1999, Marie-Laure Ryan wrote about VR's 'implications for literary theory and the question of textuality', even though she felt it was 'still largely science fiction' (p. 110). We were drawn to Ryan precisely because she spoke to us from the 'before', when VR was conceptual, theoretical, and because she was in the process of imagining future applications connected to theory – a process we were beginning to dip into. Ryan unpacked ideas of immersion and interactivity, speculating on the potentiality of VR, which was even then possible enough to be worth speculating on. More than 20 years later, and in a world of VR applications, Ryan's concepts continue to inform new research.

Quoting Michael Benedikt, she considered a 'post-literate' technological era (Ryan, 1999, p. 114) and explored possible worlds' theory, where the 'actual' world exists in 'a semantic model including a plurality of worlds' (p. 115). Ryan was imagining a technology where 'for the first time in history, the possible worlds created by the mind become possible entities, despite their lack of materiality' (p. 115), with implications for narrative and theory alike. Now that we are in the third decade of the twenty-first century and our institution, Flinders University, has both The Void and an ambisonic sound studio, The Cube, we find ourselves in Ryan's future world, where possible worlds are no longer theoretical, and immersive interactivity is a ready tool.

How could we *do* theory in VR? How would our thinking about ruin and fixity, origin and trace, supplementarity, absence/presence, and *différance* extend if we extended beyond written and spoken language and into a virtual embodied experience? What would happen if you could stand beside Ross's bench, or sit on it; if you could touch the flower, and hear the sound of the waves on the shore? What is reading (and reading practices) when the text is lived? What is theory when there is a collapse between texts and realities, idea and being? Derrida considered computers as 'nothingness that produces something, or at least the appearance of something' (Germain, 2009, p. 21) and new technologies like VR take that further, as the something can be mimetically uncanny. Spivak notes that the 'young Derrida writes in hope that cybernetics and informatics will join hands with a philosophy defeating itself' (2016 [1967], p. 345) and that we would move beyond writing. What role do we have now in forming that world as we move into The Void?

Baudrillard was a nihilist and felt that with the rise of simulacra all would collapse into ruin (Baudrillard, 1994). Derrida thought the boundaries between disciplines should be broken down and the Humanities activated for the social good, if they were to remain in universities (Derrida, 'The University Without Condition', 2002). We, the authors of this chapter, move through a world in which the university is hyper-capitalist, actively requiring us to invest in technologies whose use is not yet known, and operating in modes that already rely on technology. We live and learn in ways that philosophers and theorists imagined and feared, and we choose to do so in hope, with a sense of agency and possibility. New technologies may be invented and implemented for capitalist purposes, innovation to open new in-roads for profit and productivity, for industry and tertiary sector alike; but that is not their only potential. In seeking to imagine ways in which these new technologies could be used for abstract thinking and learning, by expanding our existing reading practices (which are practices that extend beyond the written word into reading all texts and signs), we are creating possible futures where anti-capitalist, collective, curious, creative thinking harnesses the future, and doesn't simply moulder in the ruins of memory – a simulation or simulacra of what has already been. Theory is active and unfixed, a muscular articulation of

what is, and a visionary conversation with what could be; The Void is a vessel and incubator, where these conversations could be extended and re-imagined, opening up possibilities beyond the limitations of language. We enter The Void, as origin and trace.

The Void, as demonstrated by its name, is an intentionally blank 'experimental space' in which creative concepts can be explored and captured on a stage using digital production technologies, including motion capture, and virtual and optical screen capture, and translated into a screen format. The operating programs, including Unreal Engine, offer a multitude of virtual character images and settings, and a database of sound artefacts, all of which can be utilised in and contribute to the translation of creative concepts. To enable 3D capture, cameras provide multiple points of view. The Void offers limitless possibilities for experimenting with Derridean concepts. Image and sound, image and spoken words, image and written words, image movement and disappearance, the connection of image and words with human action and setting; layering across each other, translated to the size of a pinhead through to the size of a cinema screen. What are the possibilities of using new technologies and extended realities to construct virtual realisations of our images? What new readings of Derrida's *Of grammatology* might emerge? Readings that extend our thinking beyond language – beyond even arche-writing and arche-trace.

Derrida challenges the idea that writing is representational of phonic speech; do we fall into the trap of considering extended and virtual realities as representational in similar ways? In Derridean terms, there is a 'presence' in written language: 'understood as a primary and original reality' (Butler, p. xiii). In the language of virtual worlds, presence can be defined as 'a psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience' (International Society for Presence Research, 2000). In virtual worlds, 'presence' takes on new meaning that extends written language into new understandings. The physical presence of the Derrida reading group together in The Void represents new territory, after having met only online, in addition to our presence in the worlds that the photographs can become.

Taking photographs into The Void, and all of the processes each could go through and the infinite variations of how we could interact with these images raises further Derridean discussion. The 'original' images are saved to the computer as a template or base, with the date and time of creation. No matter the extrapolations from this beginning, the image can revert to the 'original'; but as a result of all that has happened in the experimentation, the image can never truly return to its earlier meaning for the people who have been privy to its transformations and the connected discussions. Interpretation

and meaning are in continual shift, at the level of each individual as well as at group level, even when an image itself appears to be fixed. Would it be possible for the Derrida reading group, using The Void, to reach a *final* screen product of the photographs that could be transmitted to others, beyond the 'original' photographs?

Though the creative products of The Void which can be transmitted in an online or in-person manner; the production process is an in-person one, an evolving experimentation of humans moving in a room and controlling audio speakers, microphones, desktop computers, and a wall-sized virtual production screen, translating ideas onto a screen. The physical process of playing with possible derivations, and the inevitable new methods that must be navigated to achieve these, takes these ideas in new directions that could not have been foreseen at the beginning of our journey, our reading *Of grammatology*. The use of The Void technologies requires a skillset that has been developed through training and application. Prior to the exploration of Derrida's ideas in this space, these ideas need to be communicated/conceptualised in words to a person or people who have not been part of the reading group discussions, and potentially, have not heard of Derrida and his body of work. This is another translation of Derrida required to access the technological assistance to explore other translations in The Void.

In exploring our Derridean reading practices in relation to new technologies, we also consider directions for the future, particularly artificial intelligence (AI). Ryan felt 'a simulative system is not a narrative but a narrative matrix' (1999, p. 123) due to the real-time dimension of interacting with the simulation and that simulations are non-iterative, in the way they are impacted by variables. Human interaction changes the matrix, making the user a co-creator, their actions changing the metaphorical flight of the plane. VR, Ryan claimed from the 'science fiction era' speculation of 1999, 'turns the user's sojourn in the virtual world into a creative membership' (p. 134). The use of these technologies inevitably opens our Derridean reading group to include non-human systems as parties in our conversations. An older Derrida wrote, 'deconstruction does not seek to discredit critique, it ceaselessly relegitimises its necessity and heritage, but it never renounces the genealogy of the idea of critique' (2016 [1967], pp. 347–348). We are the inheritors of critique, practitioners of theory in the age of dawning AI and technologically created realities; we feel both the responsibility of our genealogy and the excitement of future possibility as we step into The Void.

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14

PHOTOGRAMMETRY AND GEOPHYSICS FOR ARCHAEOLOGICAL AND HISTORICAL RESEARCH USING IMMERSIVE ENVIRONMENTS

The Case of Martindale Hall

Jarrad Kowlessar, Tully Barnett, Anna M. Kotarba-Morley, Heather Burke, Ian Moffat, and Penelope Edmonds

Introduction

Martindale Hall is a Georgian stately home located south of the town of Mintaro in the Clare Valley region in the mid-north of South Australia on the land of the Ngadjuri people. It was built in 1879–1880 by the Bowmans, a wealthy pastoral family (Warburton, 1979) and subsequently purchased by the well-known pastoralist and politician, William Tennant Mortlock in 1891. Martindale Hall was bequeathed to the University of Adelaide in 1979 with its contents and interiors intact. It passed to the Government of South Australia in 1986 and now functions as a house museum under the care of the Department for Environment and Water. The property is an important example of colonial South Australian architecture and is well known by members of the public for being used as the set for the film *Picnic at Hanging Rock* (1975). This unique history of ownership has left the interior and much of the Hall's original contents from the colonial pastoral period intact. The vast collection of original artefacts from the Mortlock family's personal collection are best represented in the so-called 'Smoking Room', where a variety of objects are on display, including a suit of samurai armour, a dugong skull, Egyptian tourist artefacts, and spears and weapons from various First Nations peoples around Australia and the Pacific.

The surrounding property also holds remnants of the original gardens, orchards, workers' cottages, ruins of the mill, and coach house along with much of the original driveway and overall property configuration. In short, the property represents a unique cultural landscape which can reveal significant insights into local, regional, and global colonial histories (Davis, 2011;

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Joseph, 2018; Smith et al., 2000; Swyngedouw, 2004). Despite this, the Hall's collection is not well catalogued, and the locations of outbuildings associated with the primary residence are not well known, nor are the articulations between the Hall, the earlier Bowman and Mortlock properties, and the wider processes of colonial ideology and imagination that created the contemporary pastoral landscape of South Australia. The use of geomatic and geophysical techniques provide an opportunity to remedy this and provide new insights about this important property. This project aims to begin the process of organising some of the histories on site by creating an immersive digital framework which unites separate data sources and heritage records from the site into one 'holistic virtual cultural storytelling landscape' (Figure 14.1).

Archaeological data and cultural landscapes represent more than just the discrete material culture and heritage features present on site, but also encompass the space that unites these as a collective and human sense of place, becoming a portal into the dynamic relationship between humanity and its surroundings. A sense of place is a nuanced, often subconscious, experiential, and deeply intrinsic understanding of location that includes, but also transcends, the physical, and which extends to the impacts of personal social and spiritual identity and context within the world (Bender, 1998; Forbes, 2007; Johnson, 2012; Tilley, 1994, 2008, 2010). This interplay that unfolds within the cultural landscape, which acts as a multidimensional space, unites various strands of human artefacts and gives them a new meaning. As we venture further into the digital age, the digitisation of stately homes and

FIGURE 14.1 An in-engine rendering of Martindale Hall with gardens and house ivy matching photographic records from the 1930s. Image credit: Jarrad Kowlessar

their artifacts promises to be an indispensable tool for both their heritage conservation and education surrounding their role in shaping the narratives around the colonial past. While these values and concepts are true for any location, a cultural landscape with complex, inherent symbolic values such as Martindale Hall, represents a palimpsest of multiple levels of identity and value. These are linked both to the modern memory of this place and to its original role in the region, as well as wider circuits of social and public memory that are linked to state and national identity on larger scales. The branch of archaeology that focuses on cultural landscapes seeks to quantify and characterise the individual facets of landscapes (e.g. social, economic, physical, environmental) as separate layers which combine to form a whole in the mind of a human who occupies this space (David & Thomas, 2016). Occupation of the combined space is therefore critical for a proper understanding and impact of place to be understood. The Martindale Hall project seeks to combine object biography methodology, oral histories, text and object digitisation, and storytelling with archaeological work to capture a variety of perspectives on memory, material culture, and the pastoral history of South Australia. In this way the project seeks to reveal hidden and overlooked histories and to proffer new and creative ways of understanding and experiencing the Hall and its surrounding landscape. As an extension it aims to engage with a multitude of voices who can be recorded for posterity as part of a future virtual museum (Sylaiou & Dafiotis, 2020)

Contemporary digital archaeological approaches have produced new ways to capture and represent material culture in highly detailed ways that serve as both a record of these materials and as new analytical tools (Chapman & Gearey, 2000; Kowlessar, et al., 2019; Monteleone et al., 2021). The production of highly detailed representations of material culture extend beyond discrete objects to representations of entire landscapes and all their features, including built heritage, vegetation, terrain, and even atmosphere and climate. Emerging from these highly detailed records is a research paradigm that reconnects these records with the human sense of experiencing place. The engagement with physical space has been a well-established approach in landscape archaeology over the last three decades and often explored through theoretical frameworks such as phenomenology (Fleming, 2006; Tilley, 1994, 2008, 2010). Now, this approach can be extended to explore virtual spaces (Chapman & Gearey, 2000; Johnson, 2012; Kowlessar et al., 2019; Monteleone et al., 2021). Rather than archaeologists viewing, and in turn interpreting, material culture outside of the time and space of their original use; detailed reconstruction and visualisation of both culture and place can return some context and extend reconstruction and interpretation to a broader landscape level (Monteleone et al., 2021).

With this growth in highly detailed digital representations come new platforms for the visualisation of these digital products which further support immersive comprehension, intrinsic to space. What was once a relatively

simple display on a flat computer monitor has now morphed into a variety of virtual reality platforms. These platforms allow immersion in a digital environment and retain proprioceptive natural human sensory engagement, usually via technology such as stereoscopic head-mounted display (Benford & Giannachi, 2011; Rokhsaritalemi et al., 2020; Speicher et al., 2019). Immersion platforms have important benefits for engagement with virtual cultural landscapes as they retain the correct scale relative to a human observer within an environment. This scale allows a relatively familiar field of view and physical movement of the body to engage with and explore the space. However, virtual reality can also be an isolating experience and suited only to one user at a time. Extended reality (XR) may be a solution enabling groups to simultaneously and collaboratively explore space. The emergence of virtual production facilities, designed specifically to blend physical and virtual space, presents an opportunity to extend representations of virtual cultural landscapes into a communal shared space. Such a space allows highly detailed visualisations to be shared between observers and retains much of the scale and impact of the real space that is lost with traditional visualisation methods. This has clear benefits for the human experience of place and for the exploration of a virtual landscape rather than purely visualisation. A key advantage of virtual production facilities, therefore, is that it allows physical artefacts to be integrated within the immersive digital environment and thus to articulate with their original context and the participant's experience like through a computer game (Champion, 2021, 2022).

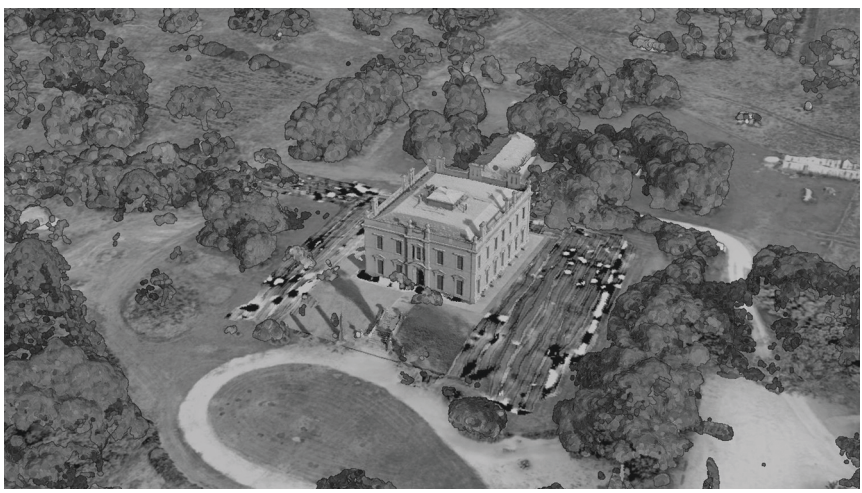

FIGURE 14.2 The 3D terrain, vegetation and buildings from photogrammetry data in a 3D GIS with the geophysics results overlaid for immersive interpretation. Image credit: Jarrad Kowlessar

Our project uses a digital framework to unite separate records of material culture collected throughout the Martindale Hall estate. This framework has been developed to include 3D models of objects from within the Hall, the outbuildings, and structures on the estate, including records of both interior and exterior, contemporary vegetation and terrain of the estate, and geophysical data (including buried structures or ruins) to reconstruct past configurations and activities on the property (see Figure 14.2). By combining all of these records into a single system of visualisation and exploration, the interpretation of individual material elements – both visible and invisible – can be made within the context of the rest of the data and, indeed, the larger landscape. Further, we seek to investigate enhanced pathways for virtual object biographies. The use of 3D scanning and visualisation technology offers a promising opportunity to extend and enhance the object biography methodology enabling the inclusion of rich and supplementary data, images, and text within the single system of visualisation. Moreover, this technology allows for the manipulation of the virtual twin of the object within the immersive environment, enhancing the overall methodology.

Methods

Geomatic methods such as photogrammetry and laser scanning provide a means to accurately document, in high levels of detail, archaeological or heritage sites. Structure from motion photogrammetry, in particular, is widely used because of its ability to create immersive 3D models, digital elevation models (DEMs) and orthophotos by stitching together multiple photographs or video footage, which can be obtained from ground or drone-based platforms (Magnani et al., 2020). In Australia, this approach has been used most recently to document historical (Kowlessar et al., 2019), Indigenous sites (Jalandoni & May, 2020; Kowlessar et al., 2022; Kreij et al., 2018), as well as to reconstruct historic shipwrecks in maritime archaeology (McCarthy & van Duivenvoorde, 2023).

Geophysics for Martindale Hall

Geophysical methods provide the opportunity to image the subsurface of archaeological sites in a non-invasive and rapid fashion. These techniques have historically been underutilised in Australian archaeology (Lowe, 2012) but increasingly used in recent years for projects ranging from locating burials (Bladon et al., 2011; Lowe et al., 2014; Marshallsay et al., 2012; Moffat et al., 2016; Moffat et al., 2020), identifying buried Indigenous sites or their elements (Kenady et al., 2018; Moffat et al., 2008; Moffat et al., 2010; Ross et al., 2019), exploring frontier conflict (Roberts et al., 2021), reconstructing archaeological landscapes (Kowlessar et al., 2023), or locating underwater sites (Simyrdanis et al., 2019; Ross et al., 2019).

The most commonly applied geophysical methods in archaeological investigations are ground penetrating radar (GPR) and magnetometry. GPR works by transmitting pulses of electromagnetic energy which bounce back to the antenna from boundaries between natural or anthropogenic material of different dielectric permittivity (Conyers, 2013). GPR is widely used for archaeology because it can image a wide range of materials at high resolution (Aspinall et al., 2009). Magnetometry, as summarised by Aspinall et al. (2009), detects variations in the Earth's magnetic field caused by the presence of iron or from the creation of magnetite and/or maghemite due to firing and oxidation/reduction processes (Linford & Canti, 2001). It is the method of choice for most reconnaissance archaeological investigations as it can be acquired rapidly, is not data-processing intensive, and provides data that can be readily interpreted by community partners (Wallis et al., 2008). Gradiometry is a sub-field of magnetometry which measures the difference in magnetic intensity between two magnetometers, an approach which preferentially detects small features in the shallow subsurface.

Recent new methodological developments in geophysical data collection can facilitate the acquisition of ultra-high-resolution data at high speed over a landscape scale. These advances take advantage of both multi-sensor platforms and high-quality streaming of positioning data. Conventional GPR survey methods provide, at best, 25 cm resolution in the cross direction of measurement and coverage rates of ¼ to ½ hectare per day with two to three operators (Trinks et al., 2018). In contrast, a motorised multi-sensor GPR allows the collection of more than a hectare of 6.5 cm cross line spaced GPR data per day by one operator. Similarly, conventional two-sensor gradiometry typically provides coverage of ½ hectare per day with a cross line resolution at 0.5 m, while multi-sensor gradiometers allow coverage of 2.5 hectares at a resolution of 0.25 cm (Moffat et al., 2015). These approaches have been widely used for archaeological research internationally (Donati et al., 2017), but this chapter, based on results from fieldwork at Martindale Hall in 2023, represents the first publication of such results from an Australian site. Data of this density and size is ideally suited to immersive visualisation as, unlike previous generations of geophysical data, it is similar in scale and resolution to visual information. Nonetheless, caution is still required, as the nature of the geophysical response is controlled principally by the physical properties of materials. Integration of geophysical data within a larger landscape visualisation inside a virtual production facility allows for both more immersive and integrated ways to interrogate and draw geophysical interpretations from the data. Additionally, it then provides new ways to engage with models of the past produced through geophysical interpretation. This connects geophysical interpretation with broader archaeological landscape analysis, as well as with more publicly accessible (and community friendly) forms of heritage exploration, interpretation, and understanding.

Gradiometer data were collected using a Sensys MX3 using 11 FGM650/3 gradiometer sensors positioned 25 cm apart. These sensors were hand pushed using a non-magnetic cart. Positioning was provided using a Leica GS16 base and rover set up on an arbitrary base point. Data were processed with Magneto software and overlain on the drone-constructed orthophoto for interpretation in Arc GIS Pro.

GPR data were collected using a Malå Mira HDR GPR with 12 receivers spaced at 6.5 cm attached to a John Deere 1550 Terrain Cart. As with the gradiometer, positioning was provided using a Leica GS16 base and rover set up on an arbitrary base point. Acquisition parameters included a trace increment of 0.056 m, a sampling frequency of 5120, 288 samples, and 40 stacks. Data were processed using rSlicer software, including the DC remove, adjust time zero, bandpass correction, and background remove filters. The processed data cube was outputted in time slices at a range of depths between ~0-3m and overlain on the drone constructed orthophoto for interpretation in ArcGIS Pro.

Photogrammetry at Martindale Hall's Smoking Room

Drone photogrammetry of the house and surrounding property was collected using a DJI Mavic Pro positioned using an onboard GPS. Flight planning was undertaken using Drone Deploy software. A total of 948 photographs taken at a range of heights between 60 m and 120 m were used to build the model. Airsoft Metashape's point cloud classification function was used to classify ground points, buildings, and vegetation. A DEM and orthophoto were constructed using Agisoft Metashape Professional. The DEM was produced based on only those points classified as ground points to produce an elevation model which does not contain contemporary vegetation and only represents terrain. The DEM and orthophoto were exported as Geotiff files for visualisation and interpretation in Arc GIS Pro. Building models from external drone photography were separately modelled based on 235 images of the Hall and 203 images of the coach house on the property. These images were taken at heights between 10 m and 30 m at a range of angles to provide even coverage of the building's external surfaces.

Ground based photogrammetry of the Smoking Room was undertaken with a Nikon D3200 using a 18 mm lens. A total of 244 photographs were taken from multiple positions with the aim of documenting both the architecture and material culture items within the room. Photos were taken with a method focused on even coverage of the wall surfaces without specific focus or attention for individual artifacts, to evenly capture the space to minimise introducing bias of attention favouring specific items (Figure 14.3; Harle, 2018).

FIGURE 14.3 A 3D model of the interior of Martindale Hall's Smoking Room with many historical artifacts in situ. Image credit: Jarrad Kowlessar

3D Modelling and Visualisation

The Void is a virtual production facility at Flinders University that combines motion capture, in-camera effects, and other affordances of virtual production. This facility is housed within a shooting stage with rigged walls and ceilings for stage lighting. The stage is fitted with an 8 × 3 m LED wall with 1.9 mm pitch LEDs. The walls are managed by a NovaStar processor, and the system is controlled though Unreal Engine and ArcGIS Pro.

ArcGIS Pro was used to display the landscape orthophoto in 3D using the DEM to apply topographic detail. 3D models of Martindale Hall, the workers' cottage, and coach house were converted into multipatch features and added to the GIS scene. Geophysical data were added to the scene as image data fitted to 3D terrain. This allowed a combined 3D viewing of the surrounding landscape and local buildings, as well as the geophysical data to give the most intuitive landscape model within which to make an interpretation of the geophysical features present in the dataset.

The Unreal Engine was used to create a visually detailed and photorealistic virtual cultural landscape. The DEM was imported as a landscape using Unreal Engine's heightfield import process. Photogrammetry assets for the buildings were imported and placed on the landscape in their correct locations. Landscape materials and associated grass and foliage assets were generated using assets imported from Quixel Megascans collections. Landscape materials and associated grass layers were created to match existing land cover types

present in the property and supervised to match drone photographs. These materials included gravel for driveways, irrigated and maintained lawns, and maintained grassy paddock ground surfaces. Vegetation models representing larger shrubs and trees were placed manually, based on both contemporary vegetation locations and historical photographs. Heritage features interpreted from the geophysical data were modelled and added to the scene in their correct locations.

The final Unreal Engine scene was displayed within The Void on the large LED screen and explored in person using a game controller to position the camera at a range of locations throughout the digital landscape.

Results

Geophysical Results

The gradiometer data are, as might be expected at a site with so much metal infrastructure, extremely noisy. Nonetheless, a feature of interest can be observed northwest of the survey. This feature is made up of several discrete magnetic anomalies positioned in a regular polygon shape. This feature is adjacent to an area which is known to have previously contained a Glass House and a Rock Garden.

The GPR results are dominated by shallow linear features that are interpreted to be modern services, such as power, water and sewerage lines.

Photogrammetry Results

The photogrammetry of the property produced a detailed DEM which provides important terrain context to visualisations. Removing contemporary vegetation allows visualisations to add these in or experiment with models of past vegetation based on historical or archaeological evidence. This approach is important for continued investigation of the site.

The photogrammetry of the Hall and coach house buildings generated detailed models of both features with a detailed and photorealist appearance. The dimensions of these models were verified based on RTK GNSS measurements and found to be accurate to an average of 0.07 m for the length, width, and height of each building.

The photogrammetry of the Smoking Room provided a complete record of the interior surface. A range of distortions can be observed in the final model which vary across the model and remain difficult to empirically assess. The visual representation of this model remains highly detailed and has an advantage over two-dimensional records as it has an accurate scale allowing a detailed three-dimensional record of the room and its contents.

Modelling Results

The combined modelling allows the photogrammetry models of Martindale Hall to be explored virtually externally and internally. The combination of landscape and detailed building records allows the exploration of these spaces to occur digitally within the context of the surrounding landscape. This record is explorable in an intuitive scale for a human observer within The Void facility.

Discussion

Our case study of Martindale Hall (the buildings, the interiors, the objects, and its grounds) highlights the rich, dense, and variable nature of data produced by contemporary archaeological and heritage field practice. In the contemporary digital era, this intersection of cultural landscape and material culture has evolved to take on new dimensions. The advent of virtual exhibitions and visitor experiences has accompanied a transformative era for heritage preservation, interpretation, and research. In recent years, the development of cutting-edge 3D scanning and modelling techniques has revolutionised the process of digitising architectural structures and their contents (Pratisto et al., 2022). High-resolution interior scans, such as those performed by us at Martindale Hall, meticulously capture the intricate details of architectural elements, furnishings, and other objects such as artworks and artefacts, preserving them for future generations. Supplemented by geophysical and drone data, such augmented and virtual reality digital representations not only capture and archive landscapes, buildings, and artefacts, but also serve as repositories of cultural knowledge and, as such, can contribute to sustainable conservation measures (Mendoza et al., 2023).

These digital platforms enable individuals to engage with cultural landscapes and material culture in novel ways, bridging geographical and temporal divides. Final products, such as virtual exhibitions, can not only showcase tangible artefacts but also contextualise them within the broader cultural landscape, weaving narratives that resonate with the sense of place. Further down the line and supplemented by storytelling from our 'slow digitisation project', this holistic dataset which we have gathered through our fieldwork and post-processing in The Void can provide a platform to develop virtual tours of Martindale Hall. Such tours, which are often accompanied by informative narratives and multimedia presentations, can provide a dynamic platform for engaging with heritage. In addition, they can enhance accessibility and protect the site's record for future generations in event of its destruction or change of use.

In a broader sense our data can serve as an example of how to promote a deeper understanding and appreciation of sites of cultural significance. Through immersive virtual tours, such as one that can be run in The Void,

visitors can explore digital reconstructions of buried or ruined parts of sites (especially relevant to archaeological sites), enabling them to experience the cultural landscape in ways previously unimaginable. In this digital realm, the interrelationship between cultural landscape and material culture is vividly portrayed, fostering a deeper understanding of heritage and its intrinsic connection to the human experience.

Virtual environments such as this immersive and rich, cultural heritage environment with such clarity of the interior Smoking-Room display, and within its surrounding landscape, also proffers opportunities for greater access for those who may not be able to physically travel to the regions, or who may not be physically able to enter this historic building (Figure 14.4).

Though use of The Void, the immersion and clarity of the display are possible at a scale that better communicates the reality of the landscape. This work shows two novel archaeological uses for the display and engagement of virtual cultural landscapes within a virtual production facility. The first demonstrates the ability to strengthen archaeological interpretations of abstract geophysical data by viewing it while immersed in a digital space and displayed at a large scale. The second use demonstrates a detailed and immersive way to model, visualise, and experience archaeological reconstructions of the past that are informed by a combination of contemporary materials recording, historical documentation, and geophysical interpretation. It is difficult to quantify the benefits of the immersive use of The Void facility to aid in archaeological understanding, as the impact of greater phenomenological impact on the cognitive understanding of place is an intangible aspect of the archaeological

FIGURE 14.4 A 3D model of a suit of Samurai armour recorded as part Martindale Hall's collection of historical objects. Image credit: Jarrad Kowlessar

process. This does, however, form a much more coherent and agreed model of the archaeological evidence, and facilitates direct exploration and collaborative discussion of this model.

The photogrammetry results range from an artefact to a landscape scale and capture a perfect visual record of site conditions from the day of acquisition. The geophysical data are equally dense but reveal a landscape invisible to the naked eye, created by the physical properties of the sub-surface. Bringing these together, and considering them in combination with the textual, photographic, and oral history records from this important historic place provides exciting new insights into how people lived at Martindale Hall. This immersive simulation allows not only the relocation of past heritage features such as the Glass House and Rock Garden but also the modelling and visualisation of the property with these features included. Other such features include the visualisation of past garden configurations and elements currently only accessible via archival photographic evidence.

The visualisation of the property and the Smoking Room provide a framework to build an immersive space to continue to add historical and archaeological data. This framework holds a way of recontextualising future records in the collective space and a model of the past.

A unique aspect of this research is the use of next-generation geophysical instruments which facilitated the collection of high resolution GPR and gradiometer data at a landscape scale. These data products are, in contrast to conventional geophysical data, ideally suited to immersive data visualisation outputs.

This research aimed to provide a framework for future use of the immersive virtualisation of archaeological models within The Void. This will allow engagement with new data to be added to the virtualised landscape. For the Martindale Hall project this will include records of the interior rooms as well as 3D models of discrete objects. This also forms a new way to facilitate discussions and explorations around the cultural stories attached to these objects, allowing integration within the larger virtual cultural landscape.

Conclusion

This case study of immersive visualisation of geomatic and geophysical data from the iconic Martindale Hall has demonstrated the use of a range of highly detailed three-dimensional data collected as part of a larger archaeological landscape and cultural heritage project. This data includes prospection data in the form of geophysical data, as well as permanent records in the form of models of the buildings and their surrounding landscape features, and movable cultural heritage items. The combination of these elements within a virtual cultural landscape is complemented by the facilitation and exploration of this landscape within The Void. This combined approach works as a framework for

the organisation and contextualisation of future archaeological and historical data collected to tell the many stories of Martindale Hall.

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15

SONNY

The Unreal Affordances of Real-Time Game Engine Technologies for Screen Production

Kristen Coleman

This chapter will discuss the development of *SONNY*, a short cinematic virtual reality film (CVR) being developed in consultation with The Void and department of Visual Effects and Entertainment Design (troubleshooting and asset creation) at Flinders University. Emerging from a broader creative research project, *SONNY*, built in Unreal Engine 5 (UE5), revisits the historic use of computer graphics engines in virtual production practices. By making use of already established machinima (machine cinema) practices, the production of *SONNY* demonstrates how game engines and VP can expand the parameters of traditional screen production in terms of creative practice for the individual artist.

Introduction

Due to its ease of access, asset libraries, rapid prototyping, in engine cinematic sequencer, relatively straightforward interface, and cost effectiveness, Unreal Engine (UE5) (Epic Games) provides an opportunity for screen artists to independently develop virtual productions like *SONNY*, traditionally a costly exercise, with little to no experience in game development. By revisiting older and evolving processes of virtual production (VP) like machinima, independent productions such as *SONNY* are able to be achieved within a reasonable timeframe and limited budget. In addition, Unreal Engine allows for greater accessibility to and democratisation of the virtual production process through its open-source release, marketplace assets, and community-based public support forums. Additionally, the current licencing model for Epic Games removes any ethical concerns related to intellectual property (IP) rights and copyright infringements in the use of game assets for commercial

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purposes. While this chapter isn't an exhaustive account of machinima it will point to the parallels that have emerged between the historic use of computer graphics engines in machinima and the production methods of *SONNY*.

In recent years, virtual technologies have been thoroughly integrated into screen production. The incorporation of real-time game engine technologies into screen production, particularly in visual effects, has largely been driven by the demand for expeditious and more affordable solutions to cost and labour, ongoing improvements in hardware and commercial software, real-time rendering, the globalisation of virtual production, and, more recently, the requirement for remote production. Open and shared source gaming engines such as Unreal have also created ongoing possibilities for experimental screen production and alternative content development grounded in machinima practices. In addition, the production of *SONNY* may also contribute to screen production as an academic research discipline where development processes can become transferrable to other creative screen-based research projects. This can be in terms of machine requirements and what is necessary to make research projects like *SONNY* successful. How are the methodologies replicable for other projects, and finally, how does Unreal Engine offer a platform for artists/researchers to investigate the aesthetic potentials of evolving digital technologies?

Game Engines

Game engines are software frameworks for developing video games and provide the architecture for simulated worlds. Functionalities include rendering computer graphics, video game development, gameplay mechanics, physics simulations, animation systems, audio processing, motion capture (MoCap) and artificial intelligence (AI) frameworks. Their architecture supports broad accessibility and compatibility on a range of platforms, including PC/MAC, consoles (PlayStation/Xbox/Nintendo systems), mobile devices, and virtual reality (VR) systems. In addition, it is a marketplace for assets, plugins, and learning resources to aid in project development. Capabilities also extend to other fields, including film and television production, architectural visualisation, digital media exhibitions (gallery/museum), interactive narratives, immersive experiences, live performances, and transmedia and cross-platform storytelling.

The broad use of Unreal in recent screen-based practice is evident in the work of contemporary artists. For example, artists David Haines and Joyce Hinterding worked with Kinect motion sensors and UE4 in one of the three works that make up their installation *Geology* (2015) – a large projected real-time 3D cinematic computer-simulated environment. Electronic music composer, DJ, sound designer, Murthovic (MSR Murthy) and media artist Thiruda (Avinash Kumar) use Unreal Engine in their extended reality (XR) and electronic music cross-platform collaborations including *Elsewhere in*

India (2022–2023a) and multiplayer video game *Antara* (2022–2023b) (produced by Antariksha Studio and in collaboration with the British Council and Crossover labs). Video artist Liam Somerville experiments with Vicon MoCap software and Unreal to create his VR experience *ESCHATECH VR* (2022), developed during Somerville's artist residency in The Void at Flinders University (see Somerville's chapter, 'Explorations in Motion Capture and Digital Art)'. Visual artist and musician Ary Jansen combines footage from gaming titles such as *Grand Theft Auto V* (2013), *Red Dead Redemption 2* (2018), *The Last of Us* (initial release 2013), *Detroit: Become Human* (initial release 2018), *Final Fantasy 14* (initial release 2010), and *RuneScape* (initial release 2001) with live action footage (Dashcam) captured across Tāmaki Makaurau, Auckland in their single channel video work *Breadcrumb Trail* (2022).

However, community-based tools (engines) and the modification of engine code and game assets have been used for content creation and rudimentary animations since the 1970s. This is evident in early real-time render visualisations in digital subcultures of the demoscene, beginning in the 1970s, and machinima since the 1990s, and it is in these earlier convergences of film and gaming that the foundations of VP can be attributed (Harwood & Grussi, 2021). Of machinima specifically, the basic principles of using game environments, assets, animations, and camera actors along with Unreal's in-engine cinematic sequencer, has simplified, and made affordable, production solutions for the development of *SONNY*.

The Demoscene and Machinima

The demoscene is one digital artform that has emerged directly from gaming. Although not strictly defined, and at their most basic level, demos are self-contained real-time computer rendered animations synchronised to music. They are often restricted to specific systems, such as 8-bit computers like Atari 800 or Commodore 64, or 16-bit systems like Amiga or Atari ST (Silvast & Reunanen, 2010). Demos were popularised with the advent of, and ease of access to, the first home computers. The subsequent emergence of software cracking allowed modification of computer games to remove copy protection, make alterations to, and appropriate code for, experimentation. Demos are intended to push the capabilities of computer hardware and software beyond their original design and are required to be generated in real-time, the programs coded by the artist themselves. Demos are often collaborative ventures between programmers, graphic artists, and musicians and continue to be produced and distributed underground (Silvast & Reunanen, 2010). Future Crew's *FC2* Commodore 64 demo (1987), Share and Enjoy's (SAE) *Impossible Play Fields* Amiga demo (1990), Future Crew *Second Reality* Retro PC (1994), Ghostown's *Sushi Boyz* Amiga demo (2015), and Lavina, Exceed,

Gotu, Methabolix, Muffbusters, NST, Resource's *False Idols* Commodore Plus4 demo (2023) are all examples of early and recent demos that use game assets, scripting, and video capture to produce alternative screen-based projects.

Historically, machinima began as an extreme form of gaming; more recently, however, its production practices have broadened to wider artistic practice. Like the demoscene, machinima is also a community-driven movement using real-time rendering and virtual environments usually formed around specific games and/or engines (Kelland, 2011). Machinima are made with real-time game engines in game; live gameplay, either individual or multiplayer, is screen captured and later edited into linear narrative. Although gameplay had been recorded since the 1980s, machinima's infancy was more about competition and documenting gameplay and speed runs – completing games, or sections of video games as fast as possible – than it was about narrative fiction. As technology and game graphics progressed and screen capture software became more accessible, creators also began experimenting with narrative possibilities in derivative content. *Diary of a Camper* (1996) made inside id software's first-person shooter *Quake* (1996) is widely acknowledged (Harwood & Grussi 2021; Kelland, 2011; Lowood, 2006) as the first demo to contain narrative. Rooster Teeth's *Red V Blue* (2003 – present) is a machinima web series based on Microsoft Xbox Game Studios (originally developed by Bungie) *Halo* game series. Both illustrate the extensive history of animated filmmaking produced within real-time virtual 3D environments.

Game Engines

The evolution of game engines has been shaped by numerous discrete developments and from practices adopted and shared by digital subcultures. This chapter doesn't include a concise history of game engines, but it does point to their progression, and how their capabilities and open accessibility gradually disseminated tools which has allowed for unexpected content development and simplified practices (Lowood, 2006). Throughout the progression of game technologies, it is evident that digital subcultures have influenced software development, quality of gameplay, ease of use, and in simplifying, to a degree, in-engine virtual filmmaking processes.

Historically, prior to the 1980s, games and their underlining engines were usually coded individually by proprietary in-house developers. During the 1980s there was a shift towards developing engines that could be reused across multiple game titles of the same genre. For example, SCUMM engine developed for Lucasfilm Games' 2D *Maniac Mansion* (1987) was used internally for other titles (Toftedahl, 2021). Later, modifiable, and more universal engines allowed for developers to concentrate exclusively on game design rather than focusing on underlining code frameworks. In 1991 id software developed a

universal (not open-source) video-game engine, the *DOOM* engine, which powered their first-person shooter *DOOM* (1993). *DOOM* engine supported better quality graphics than previous engines (id's *Wolfenstein 3D* engine, for example), networking for multiplayer gaming, and third-party (restricted) level design; id later released the source code to the player community which allowed for further modifications (Lowood, 2006). The release introduced a more generalised engine where the separation of game source code from assets produced extensible software which could be used, without significant changes, as the foundation for any other game (Politowski et al., 2021).

Id software's *Quake* engine, *DOOM*'s successor, was developed to power their first-person shooter *Quake* (1996). Unlike the *DOOM* engine before it, the *Quake* engine supported true real-time 3D graphics rendering; compared to *DOOM*, the *Quake* engine supported advanced lighting, shading, texture mapping, and 3D graphics instead of sprites (prior standard of integrated graphics). *Quake*'s advantages were not limited to more sophisticated graphics and more complex tools; accessibility through the circulation of *Quake's* source code by id themselves and through online networks in the *Quake* community, made it possible to significantly modify environmental assets as well as the game itself (Lowood, 2006).

Importantly, included in the original and later variations of the *DOOM* engine, and subsequent engines, was a rudimentary form of video capture which allowed players to record and share demonstrations of gameplay. Prior to the release of *Quake* demo files could only be distributed as discrete files among other players with a copy of the game (Lowood, 2006). In *Quake*, community programmers could exploit a section of code that allowed for camera positions to be separate from first-person point of view and more importantly, demo files could be converted to Mpeg files which allowed for video files to be shared with audiences outside of those with the game (Lowood, 2006). One *Quake* community group, The Rangers, made use of this and produced the first machinima film *Diary of a Camper* (1996). Where machinima like *Diary of a Camper* relied on gameplay recordings similar to earlier demo films and recorded speed runs, *Operation Bayshield* (1997) by Clan Undead produced a linear narrative with customised *Quake* content and post-production sound, etc., which was more along the lines of filmmaking than documented competition between players. However, even with community-based sharing of modifications and tools, a certain level of knowledge in programming was still necessary to produce machinima (Harwood & Grussi, 2021).

The rise of multiplayer online games (MMO's) such as *Second Life* (initial release 2003), *World of Warcraft* (initial release 2004), and *Fortnite* (initial release 2017), with their expansive virtual worlds and customisable content and graphical fidelity, saw a continued player practice of machinima. Yet even with the progression of engine capabilities, creating content within massively multiplayer online games still requires sophisticated modifications. Content

creation is also time-consuming. For example, *A Test of Your Reflexes ft. Saucey Noodle* (Magitek Productions, 2023) produced inside MMO *Final Fantasy XIV* (initial release 2010), uses in-game character animations and posing alongside frame-by-frame screenshots. Documenting in game content typically requires secondary applications, as some platforms such as Nintendo Switch, PlayStation, etc. have video capture capabilities available on some game titles, but often third-party applications like Bandicam and VLC.

Unreal Engine

The first generation of Unreal Engine was released by Epic Games (previously Epic MegaGames, Inc.) in 1998 along with their first-person shooter *Unreal*. The engine was, from the outset, designed to be extensible over multiple generations of games (McDonald, 1998). Epic also gave players the ability to modify its games with the release of their scripting language, UnrealScript, which allowed players to program alternative gameplay. The engine supported high-level graphics which the second version (2002), and all subsequent versions, continued to improve. Unreal has continued to evolve to where it now facilitates the convergence of various artistic disciplines, merging gaming and filmmaking into a consolidated medium. There is also a large and active development community where creators can request features for future builds, as well as creating and sharing various plugins, assets, and tools that can further enhance the engine's capabilities.

Unreal Engine 2 included a cutscene producer and editor which prompted Epic to host a machinima competition with player made content (Harwood & Grussi, 2021). With Unreal Engine 4 (UE4) (2014) Epic released the full version via a monthly subscription model for developers and to educational institutions for free, further democratising VP practices. Unreal Marketplace was also opened for purchasing assets, all of which made content creation more accessible. Cinematic tools continued to evolve and enable animated and cinematic sequences to be produced in engine; camera actors can be placed in, or piloted through, environments. Sequences can be captured, then edited, and rendered out similar to other film editing software. Later versions of UE4 had become open source. The release of UE5 (2022) continued to improve engine capabilities in terms of cinematic sequencing and by 5.2 a panoramic rendering option allowed for sequences to be rendered out in 360°, which has been significant for the production of *SONNY*; this tool has significantly aided the creation of 3D full 360° scenes.

SONNY

SONNY is a short cinematic VR film, currently a work-in-progress, which combines durational film aesthetics with game environments and VR.

Games are by design durational but are typically driven by a mission-based gameplay model and forward momentum. *SONNY* in comparison is experiential (an interest in what happens after action) and is not game centred. While traditional machinima content is typically made in real time, usually involving action-based game-play footage, *SONNY*, is a first-person point of view spatial experience with little to no action. By adapting the durational film aesthetic to VR films and game aesthetics, the project hopes to form new aesthetic practices for screen-based projects at the intersection of gaming and filmmaking. In addition, by utilising the unique spatial capabilities of VR, I'm hoping to encourage a deeper engagement with virtual film environments, foster a greater sense of presence and immersion, and promote a more contemplative and reflective mode of spectatorship within their experience. It is intended that this approach will have the potential to challenge already present VR experiences (e.g. spectacle-based game/thrill experiences) by exploring the experiential possibilities of the medium.

Production

In the initial concept and planning for *SONNY* the general production requirements were as follows:

Pre-production

- Concept artist
- Previsualisation artist

Production

- Modelling artist (3D digital modelling)
- Animator (movement)
- Texture artist (realistic surfaces for 3D CG models)
- Environment artist (CG environments)
- Layout artist (virtual camera: camera position and angle, framing, composition, scale, rough lighting)
- Lighting artist (cinematography, depth, realism)
- VFX and simulation (fire, smoke, natural element simulation)
- Compositor (final image: combine frame, shot, VFX sequences)
- Illustrator
- Spatialised sound design

Sourcing the required talent to complete *SONNY* proved too expensive and out of reach for a creative research project with a very limited budget. My own

lack of knowledge, skill, and experience in these processes, and with no real funding, meant potentially, and significantly, altering the project (switching to live action filming – a process I was capable of doing but would no longer align with my research into the virtual image) or shelving *SONNY*. Neither of these options were desirable so an alternative route needed to be found if the project was ever going to be fully realised. This began through learning resources: a vast array of online tutorials and community forums (Epic Games/You Tube/etc.). Through this shared knowledge I tried to learn the necessary skills to produce content. While helpful, attempting to build environments from the ground up was time-consuming and a little overwhelming as I have zero experience in the field. However, the affordances of Unreal in terms of digital accessibility and low barrier entry meant the production of *SONNY* could go ahead. This was made possible through third-party assets available to purchase in Unreal marketplace, which has allowed me to kit-bash high-quality environments that come ready-made with high-resolution textures, detailed 3D models, lighting, complex materials, animations, and visual effects like fire, explosions, smoke, and water simulations, to fast track *SONNY*'s build.

In this sense, through the gamification of in-engine film/animation processes the construction of environments used in *SONNY* is comparable to player content creation in MMO's like *Minecraft* and *SimCity* where players create 3D environments from buildable assets. Being able to purchase fully rendered assets means individual artists are no longer limited by the high costs associated with traditional VP processes or, as previously outlined, needing to crack code, script, or be well versed in gaming. Further still, most of the environmental asset packs that have been purchased for the project come with complete demonstration levels. This meant that building the environments was no longer a necessity; minor aesthetic alterations could be made to existing environments by adding/removing elements to customise existing assets to suit *SONNY*, falls actors could then be placed directly inside the showcase levels, a sequence created, and each scene rendered out in 360° (Figure 15.1).

While the term 'machinima' has traditionally been associated with game-centred content based around specific games and/or engines (Kelland, 2011), and *SONNY* falls under a broader definition of machinima that doesn't reflect this, the project still engages in a form of low-cost machinima-type practice. This, in conjunction with the affordances of UE5 for screen-based practitioners, has permitted more simplified, low-budget VP tools and techniques that have helped to make *SONNY* a possibility.

Finally, the implementation of a marketplace for legitimately acquiring assets also means any copyright infringements are sidestepped; the use of digital assets from copyrighted games have always had the potential to create legal ramifications concerning authorship and potential violation of copyright laws. While historically, most developers encouraged machinima, the generation of derivative content based on material licensed under various copyright laws

FIGURE 15.1 *SONNY* (alley scene) panoramic render of altered Cyan 3D (2022) environment asset pack purchased from Unreal Marketplace. Image source: Kristen Coleman

have always had the potential to contravene those laws and leave machinima creators open to possible liability. This is not a concern in relation to the use of marketplace assets because all content sold on Unreal Marketplace is licensed to the buyer (individual or company) for the lifetime right to use the content in any project (Epic Games, 2023). Similarly, content created in *Second Life* converts ownership of IP resulting from content generated by players and users to be transferred to the creators rather than being possessed by the developer (Harwood & Grussi, 2021). This means the distribution and exhibition of *SONNY* will not be problematic in terms of authorship.

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16

A GAME OF RHETORIC

Creating an Interactive Plato's Cave with Performers and AI in The Void

Lauren Woolbright

> The aim of argument, or of discussion, should not be victory, but progress.
> (Joseph Joubert)

Introduction

Games involve their own special brand of uncertainty. Uncertainty is chosen, an elective experience that adds to the fun and exhilaration of play. Described by game developer Greg Costikyan, games are 'a series of elaborate constructs that subject us to uncertainty – but in a fictive and non-threatening way' (*Uncertainty in games*, 2013, p. 2). We are in need of non-threatening spaces to engage with the very real, often terrifying uncertainties we face in life, everything from hotly contested identity politics to helplessness in the face of environmental change. Like all designers of serious games, I am on the hunt for ways to express the troubling realities we inhabit in the medium of games in a way that is enjoyable in the moment but also leaves players with something to think about when play is done.

I've been thinking that it may be time to breathe life into the Cave. Teaching first-year composition in the US in the midst of a social media landscape rife with misinformation compelled me in my first-year seminar to teach Plato's Cave (*Republic*, 1992, pp. 186–212), a staple of Western education in the Humanities. Many of my students were already familiar with it from high school but hadn't recognised the depth of the metaphor for their everyday lives. Escaping the shackles of what we think we know and encountering new ideas, both beautiful and painful, encompasses so much of human experience,

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and this resonates with students who are forming their own ideas and opinions about the world. While the famous Cave has been endlessly reinterpreted over the centuries across many scholarly disciplines, for student readers, it can be about coming to university, becoming a critical thinker, growing up, coming out, having an epiphany, facing mental health struggles, recognising mis- and disinformation and the power of media, and examining what it means to be educated. Exploring those depths has made for some of the most interesting class discussions in my teaching career. Going in, I always feel a sense of excited nervousness about what will come of our discussion, and I am always surprised by where the students lead us. It feels like a game of rhetoric: who will say what in response to whom and how I can build a structure for class discussion that opens possibilities while preventing too much drift. It's a game all teachers – and game developers – play: what can I do to bring about the best outcomes for my players (students)?

In light of this, I propose an immersive experience that invites participants to enter the world of Plato's Cave and, as escapees who have seen the light outside, to work together to persuade the others to break themselves free. They can accomplish this through strategic planning with each other, discussion with performers acting as the prisoners, and engagement with the Cave itself, represented by artificial intelligence (AI) that reacts to the participants' actions. Hopefully, this will result in a meaningful experience that illuminates what it means to build empathy and community in a playful, mediated space. It also promises to dig into those sticky issues I mentioned at the beginning, with no guarantees that all will emerge unscathed (metaphorically speaking).

I do recognise the utter irony of this: creating a virtual Cave depicting the fictional Cave, allegorising how difficult it is to move from belief to understanding in a world where we can never quite reach the Forms. However, I mean to open conversation about the many possible meanings of the Cave rather than insisting on some 'pure' (impossible) interpretation of Plato or allegiance to any one theorist or disciplinary perspective. With its emphasis on performing persuasion and possibilities for group cooperation, in all its challenges and frustrations, I hope that this will be an intellectually exciting approach to teaching and learning with/in the Cave that will yield many interpretations and experiences rather than a monolithic One.

Drawing from my students' expressions of mental health and environmental well-being as some of the defining issues in their lives, I collect research from Psychology and Environmental Humanities to provide the theoretical framework for the direction of this project. I am interested in how virtual technologies have been used to represent mental health and encourage well-being and mindfulness, as well as in thinking about the Cave as an environment in a world eroding from human activity. Drawing on research in the Environmental Humanities, the Cave itself may be given 'voice', may have a 'say' in how the human lives existing within it impact it. While this initial

project only proposes to ask participants to convince others to choose freedom, in the future, I hope that we can more directly address environmental impacts on mental health. To that end, the following literature review considers the work taking place across these relevant themes.

Literature Review

Mental Health and Virtual Production

There has been quite a bit of work exploring intersections of digital technology and mental health. Much of the work of Scientia Professor Jill Bennett at the University of New South Wales has involved experimenting with virtual reality, augmented reality, and mixed reality technologies as tools for assessing mental health and for seeking positive outcomes for participants. Her edited volume (2022) and associated arts festival, both called The Big Anxiety, use community engaged methods to foreground mental health through art. Bennett's felt Experience & Empathy Lab (fEEL) has pioneered a number of immersive projects seeking to create a better understanding of subjective experiences of trauma, ageing, and mental health. Made possible through an Australian Research Council Australian Laureate Fellowship, the Lab has pioneered projects that '[provide] a robust knowledge base for the design of creative tools to support psychosocial wellbeing'. Projects range from practice-focused tools such as *EmbodiMap* and *Edge of the Present* to expression-focused art pieces such as *Perinatal Dreaming* and *Hard Place/Good Place*.

EmbodiMap is a virtual reality 'therapeutic/research tool that enables users to engage with and map their feelings, thoughts, and emotions and how these are experienced within the body'. *Edge of the present* (Habak et al., 2020) utilises the human affinity for natural beauty to encourage future thinking for people who are struggling with suicidality. The mixed reality experience positions participants in a room with doors and windows, and each time they open one, they are greeted with a different, beautiful landscape. Opening to these virtual spaces causes bits of them to become incorporated in the participant's room, customising it with decorations that reward them with what they have seen already and implicitly encouraging them to explore more. Isbister, Kaho, and Karlesky's work (2019) on wearable tech describes the virtual reality (VR) game they developed called *Hotaru*, which requires two players to work together to sync their different wearables (one a backpack and one an armband) to remove pollution so that fireflies can thrive. All of these examples involve the human body as a vehicle for the experience; the latter two leverage the power of the human affinity for nature. I am interested in following this route and imagining what role these technologies might play in examining our new Earth realities in the face of climate change, and how they might help people who are suffering from environmental grief and loss.

Related to a discussion about the value of using virtual, mixed, and cross reality technologies to examine and help improve mental health is the robust field of art therapy, which encompasses many theoretical foundations and approaches. While this project will not be positioned as art therapy, which must be guided by a clinical professional, it shares the notion accepted across the various approaches to art therapy – that artistic expression is a meaningful method for examining and working through mental health struggles. Gatto et al. (2020) propose situating participants in a museum setting to help them feel more comfortable and open to inspiration than they would in a hospital or clinic, and offer mindfulness sessions and opportunities to socialise in a creative virtual space. Similarly, I intend to invite live interaction in public, though with a goal of promoting community building and creative expression.

Environmental Mourning and Solastalgia

Australian psychologist Glenn Albrecht coined the term 'solastalgia' to describe the increasingly widespread alienation and depression people feel at the loss of their sense of home, even when they have not moved at all. This loss happens when human activity destroys a previously healthy environment, such as when a mining operation carves a mountain down to a nub, forests are logged, and the trees hauled away, or fire wipes out entire neighbourhoods. He describes solastalgia as 'the pain or distress caused by the ongoing loss of solace and the sense of desolation connected to … the existential and "lived experience" of negative environmental change, manifest as an attack on one's sense of place' (Albrecht, 2018, para. 1). Individuals suffering from solastalgia describe a trauma akin to becoming homeless including feeling profound grief, anxiety, and hopelessness about the future.

Indigenous communities are particularly susceptible to solastalgia. In his book *Red alert!: Saving the planet with indigenous knowledge*, Daniel Wildcat (2009) explains that changing climate and its terrible effects on the lands and creatures with whom indigenous peoples are deeply tied, constitutes the most recent colonial theft White culture has perpetrated on indigenous peoples. Rather than focusing on loss itself, he uses it as a frame for his argument, proposing strategies for thinking and being in the world drawn from indigenous American ways of knowing. Wildcat explains that indigenous peoples' attitudes about the human relationship to the non-human natural world uniquely position them to innovate solutions to the climate crisis. He calls this quality 'indigenuity.'

There is scientific basis for a holistic sense of place and the entanglement of the human in the global ecosystem that is the Earth. James Lovelock and Lynn Margulis developed the idea of GAIA Theory in the 1970s, positing that instead of seeing the Earth as a collection of distinct and separated ecosystems

whose abiotic elements have little effect on local biotic inhabitants; it can instead be understood as an actively modulated, self-regulating mega system whose organic and inorganic elements actively and deeply affect one another, regulating the conditions supporting life on this planet. Considering the Earth as a whole proves helpful in understanding the global impacts of climate change. Initially treated with scepticism, the idea has become integral in areas of study such as Earth Systems Science and helpful in determining whether other planets such as Mars may once have been habitable.

Besides the rise of solastalgia in those who have witnessed extreme environmental loss, psychologists report increasing numbers of patients seeking help for environmental anxiety and environmental grief. The ecological crises we face seem too enormously daunting to handle, but mourning environmental loss is made more difficult by trying to situate the mourning. Where should it take place? What if there is no 'body' to mourn? Further complicating this is the sad reality that suffering grief over environmental loss is not socially acceptable. In their edited volume *Mourning nature: Hope at the intersection of environmental loss and grief*, Ashlee Cunsolo and Karen Landman (2017) entreat their readers to see their feelings for what they are – a form of mourning – and to make that mourning public, rather than suffering alone. They write:

> [This collection] is about decentering subjectivities, healing environmental grief, and living connectivity and interdependency. It is about mourning that resists the artificial separation between bodies that can and cannot be mourned. It is about asking what counts as a mournable body (and what does not), and it is about thinking beyond the human to extend the work of mourning to non-humans to think about other possible futures, other possible mournings. It is about recognizing our shared vulnerabilities to human and non-human bodies, and embracing our complicity in the death of these other bodies – however painful that process might be.
>
> *(Cunsolo & Landman, 2017, pp. 3–4)*

Taking ownership of these losses and recognising openly how they affect us, not just individually but collectively, begins to position the human in our natural place: embedded in the ecosystems on which we depend for life.

Dominant modern societies could hardly have distanced ourselves farther from the material realities of our survival. We don't see where our food comes from or where our waste goes. We can shop in sparkling, air-conditioned grocery stores and export our garbage to the poorest parts of the world. In 'The eco-trauma and eco-recovery of being' (Amorok, 2007), Tina Amorok describes how human disconnection from the non-human natural world has harmed human consciousness, creating a cycle of traumatic violence that involves humans harming both nature and other humans. Feeling connected to

one another and our world constitutes a fundamental bliss that yields amazing creative potential, she claims, calling this 'eco-Being'; however, she explains:

> The experience of interconnectedness contains paradox, for we sense not just the profound beauty of life but also the pandemic of human violence and the existential anxiety that it causes … where our fear of annihilation and the felt sense of the suffering of others – including the Earth itself – are transmitted just as clearly as the joy of Being. We defend ourselves from this fearsome side of interconnectedness through separation ideologies and practices (war, religious fanaticism, racism, sexism), psychological defense mechanisms (denial, dissociation, psychic numbing), and an array of debilitating behaviors and responses that bear the signature of trauma, ranging from depression, anxiety, and addictive lifestyles to violence towards self, others, and nature.
>
> *(Amarok, 2007, p. 29)*

She names this feeling of loss 'eco-trauma' and advocates for a 'transformation of individual and collective human consciousness', 'eco-recovery'. She claims that 'not experiencing oneself as interconnected with life is arguably the greatest threat facing the Earth today' (p. 29). Reconciliation involves community, cooperation, and collective action. Amorok writes, 'The eco-Recovery of Being also requires community containers for expressing the anguish one feels for the world and sharing that experience with others' (Amarok, 2007, p. 31).

Acknowledging the emotional engagement many of us have with environmental problems in the world and the helplessness that so often accompanies it, one worthy approach here is to encourage developing an understanding of the human place in place, so to speak: how our presence and activities are integrated, impacted, and impacting the world around us and our co-inhabitants of Earth. We can start with the grief and anxiety many of us carry about the climate crisis and come to see that when the world suffers, so do we. We are the authors of our own trauma. The hopeful side to this is that we can be our own saviours as well – if we can join together to face the wicked problem of climate change.

Attuning to Nature's Voice

One of the biggest obstacles to taking meaningful action on the climate crisis – or any environmental issue – is that animals, oceans, trees, and soil cannot speak for themselves. Numerous scholars have written about this problem. In 'How to Speak the Unspeakable: The Aesthetics of the Voice of Nature', Christa Grewe-Volpp (2006) asserts that literary representations of nature's voice(s) can help humans empathise with the non-human natural world. She focuses on Barry Lopez's *Arctic dreams* (1986) as an example of

literary non-fiction that considers the experience of non-human agents such as whales. Rachel Carson also wrote from the perspective of various animals in *Under the sea-wind* (1941). More recently, Melody Jue has suggested that our terrestrial alignment causes us problems when our thinking needs to be more fluid. In *Wild blue media* (2020), she articulates how scholars might jettison the terrestrial and indoor metaphors and examples we use, and consider water itself as a medium for communication and what means we might need in unfamiliar environs to get the message.

Helpful in imagining how animals experience the world is Jakob von Uexküll's formative *Foray into the worlds of animals and humans* (2010), which famously advanced the idea of *Umwelt*, which has impacted many of the more recent writers I have discussed. *Umwelt* is the German word for world, but Uexküll emphasises the idea of a 'self-world', describing how each non-human species perceives the world very differently from humans, according to what he refers to as 'markers of significance' such as smells, chemical trails, colours our eyes cannot perceive, soundscapes, landscapes, and other creatures. *Umwelt* allows humans to come into an equal relationship with our co-inhabitants of Earth rather than supposing ourselves to be superior to all others, and the idea of expressing self-worlds could be instrumental in the design of this project and the conclusions it might yield for participants.

Inspiration from Games

There are several notable games that have guided the thinking around this project. *Everything* by David O'Reilly (2017), which is available to play on Steam, Nintendo Switch, and PlayStation 4, presents players with a procedurally generated universe in which interacting with objects in the world transforms the player's avatar into those objects. Players can become animals, rocks, plants – even land masses – to traverse the world in search of new experiences. Avatars do not move 'naturally' but exist as static objects within the gamespace, and players can move themselves by rolling end over end, regardless of what form they have taken. This comical visual nonetheless proved meaningful as each object the player might become speaks its thoughts, feelings, and experiences to them, encouraging them to imagine being that object and to consider the nature of being itself.

Another project David O'Reilly created is the lightly playable simulation game *Mountain*. Players respond to three randomly generated prompts by drawing, and then the game generates a unique mountain, which is floating in space within a bubble-thin layer of atmosphere. There is not much for players to actively do after that point, though experimentation will show that each keyboard key produces a musical tone and playing recognisable melodies might yield an environmental effect. The weather changes with various forms of precipitation and a day–night cycle, and random objects from space will

collide with the mountain. Every so often, a chime will sound, signalling that the mountain has had a 'thought', which appears as text at the bottom of the interface. The mountain's thoughts take on a range of emotions from gratitude to mindfulness to melancholy. The game is really more of a passive experience that experiments with the idea of a mountain having a consciousness and expressing itself in a form that human players can understand, even while it maintains an alien and aloof quality. Players may find themselves empathising with the mountain, wondering along with it, and impacted by seeing the mountain become increasingly covered in space garbage over time.

Flower (2009) from Thatgamecompany was initially released on PlayStation 3, but is now available on PC and has even become part of the permanent game collection at the Smithsonian Museum. Players control the wind and direct it to follow pathways marked by flowers across various landscapes. As players go, they collect flower petals, and when they 'complete' an area by tracing the pathway around it, the land turns from grey to bright green. Eventually, levels become more and more urban, characterised by industrial wreckage and dilapidated cityscapes. The game facilitates a flow state in players, who reported finding the game a beautiful and relaxing release from the stresses of everyday life. Some have even found it a helpful tool for coping with anxiety, depression, and panic attacks.

In 2012, indie designer Anna Anthropy produced a game called *Dys4ia*, which was made using Flash, and so is no longer available to play, but is accessible as a video. It consists of a collection of minigames, each dealing with a different aspect of going through gender transition. None of the minigames are winnable, but players only have a short amount of time to engage with each so the games do not become overly frustrating. They last just long enough for the player to realise they cannot complete the task before the next one pops up.

The Stanley Parable (2011) from Galactic Café is a rather Cave-like game; players are trapped in a seemingly uninhabited office building and find their every action given voice by a Narrator, who encourages certain behaviours and pathways over others. Though players have the choice of following along with what the Narrator says they should do, 'winning' or coming to some sort of ending often consists in actively going against the Narrator, defying his authority, as an escapee of the Cave might. Finally, Escape Rooms are of interest for this project, since the scenario posed is a kind of puzzle that must be solved collaboratively using the information participants learn from the space or the performers. Further research in this area is necessary.

Many of these sources inform where this work can progress, once we have a handle on the technical aspects of the project, and are only indirectly applicable at present. Nonetheless, the works discussed here have bearing on our thinking towards the potential impacts of the project on participants and future technology applications.

Design Ideas

Participants will be told that they are recent escapees from Plato's Cave who want to rescue their friends and neighbours by helping them see the Cave for what it is: a massive deception intended to keep them under control. In his famous example from *Republic* (1992 Grube translation), Plato relates a parable of how those in control of media messages can misuse their influence to deceive most people. The Cave positions chained prisoners so they must watch shadows cast by firelight on the cave walls, which they are taught represent universal truths about themselves and the world. Puppeteers situated behind them cast the shadows and are in full control of what the prisoners see. So deep is the psychological need of prisoners to believe this reality that when they are told that there is an outside world, they are likely to persecute, dismiss, or even kill the person trying to save them. Most people prefer the comfort of believing what they have been told rather than undertaking the greater effort of thinking for themselves.

It would take a persuasive person to navigate all the potential missteps in communicating what they have seen with the other prisoners, so this is the challenge to participants. AI is not (yet) capable of organically responding to all the possible tactics participants could take, and they will likely be quite creative in their attempts, especially since they can work together. Therefore, performers will take on the role of the prisoners. Each performer will have a different character to play with different beliefs, attitudes, and personalities for participants to navigate.

Testing with performers and participants will be essential. Certain prisoner personas may work better than others, and we will need to anticipate potential problems and then try to correct for them. The presence of performers actually makes correcting issues a bit easier, as they are a human element. Interaction is at the core of the experience and happens in three directions: participants interact with each other to form a plan of how to overcome the problem posed to them, with the performers as they attempt their plan, and with AI, which will show their progress and offer clues through the space itself.

I have been fortunate enough to have come across imaginative and knowledgeable collaborators in the fields of computers and engineering and performing arts. Our core interest is in bringing participants, performers, and AI into the same space and seeing what comes of it, and there are countless ways to explore this interaction. We intend to start small with simple ideas and then build up to tackling the wicked problems that we really want to address. We are starting with what AI can do now and scaffolding up to experiments with what it might be capable of. Our initial constraints are to use voice commands to trigger corresponding visual changes on the screen in The Void. AI will only respond to whoever is holding a microphone and will be able to

alter the visuals displayed. We hope AI will also be able to change the lighting and sound in The Void as well.

Technological Constraints

The design team will consist of experts in the technologies for motion capture and design in The Void as well as in Unreal Engine 5, which will be the program used to build the interactive environments for the project. AI development with be headed up by an expert in that field and collaborators in the performing arts, particularly Drama, will focus on determining how actors might embody the and non-player characters (NPCs) be present in the space.

As already discussed, AI is the most daunting technical element here and will hopefully move from a background role to one that is more active and obvious to participants. If possible, it would be exciting to have participants speaking directly to an AI avatar that could respond verbally, through environmental effects such as sound and visuals, and by becoming embodied. Imagining AI as the voice of a collective view of society or as the voice of nature itself could be a compelling jumping-off point for a next experiment in The Void that would deal more directly with mental health and other social, political, and environmental issues we hope to explore. For now, we are constrained by the technology, but this is where we plan to push.

The question of access looms large as well, and we hope to cast a wide net. The Void will be an excellent testing, exhibition, and demonstration space, but we intend to design the project to be playable with personal VR devices or even on a PC with scripted dialog from NPCs. The presence of performers is the trickiest thing to reconcile in a scenario outside of a live, in-person performance. There are a number of games that position players in adversarial or collaborative roles, so for a version of the interactive that would be playable online or on a console or VR platform, the part played by prisoners could be taken up by other players. There is also the potential for AI to take the form of one of the puppeteers, as a kind of narrator, tracking the players' progress, introducing urgency, or making changes in the scene.

Conclusion

This is very much in its early stages, so we are in a coming-together phase, assembling the team of developers and seeking grant funding to support hiring artists, programmers, and motion-capture performers. The project will hopefully work as an educational tool, as art, or as simply an interesting game. There are many possible ways to approach the core idea here, and I am excited to see how collaborating with colleagues in The Void and learning more about the themes that may emerge from this project and audience responses may guide how this moves forward.

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