BEYOND REALITY:

Bringing a cinematic sound approach to the development of immersive audio for an environmental conservation 360-film.

An exegesis submitted
by
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to
GRIFFITH FILM SCHOOL, GRIFFITH UNIVERSITY

Submitted in partial fulfilment of the requirements of the degree of
BACHELOR OF FILM AND SCREEN MEDIA PRODUCTION (HONOURS)

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October 29th, 2018
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“It's the same storytelling mentality from a sound perspective. How do you best tell the story?

Except now the story's all around you”.

Mike Lange (Cutting Edge)\(^1\)

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Acknowledgements

This research and the 360-film associated with this exegesis, *Afraid of the Dark*, was made possible by the work of many talented and dedicated people. Their commitment to this project and their undying patience and love while working alongside me, despite my somewhat ridiculous belief that I could juggle an honours year while maintaining my freelance and teaching career, is more than anyone could hope for. To my family, friends and colleagues who have been a part of this work – I cannot thank you enough.

To my partner and family – thank you for your unconditional love and support and for making this year possible.

Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, this paper contains no material previously published or written by another person except where due reference is made in the paper itself.

Ethical Clearance

Ethical clearance was granted before this research was undertaken, and the research was conducted in accordance with the approved protocol.
Creative Work Details

CREATIVE WORK:
Name: Afraid of the Dark
Type: Stereoscopic over/under 3D 360-video with spatial audio (live-action video footage with animation)
Duration: 5:12
File Size: 2.5GB
Kind: MPEG-4 File
Codecs: H.264, AAC
Dimensions: 3840 x 3840
Spatial Audio: 3rd order ambisonic (16 tracks) + head-locked stereo channel (+2 tracks)

VIEWING DETAILS:
Viewing Platform: Designed for the ‘Oculus Video’ app available on the ‘Samsung Gear VR’ headset or the ‘Oculus Go’ headset.
Headphones: Designed for the ‘Bose Quiet Comfort 25’ noise-cancelling headphones.
Media Access: For assessment purposes, Afraid of the Dark is available via three methods:
   1. Preloaded Samsung Gear VR headset available as part of submission portfolio
   2. HD file on accompanying USB for loading onto personal mobile device
   3. Private Facebook link (please see submission portfolio for link)

All access methods require headphones for spatial audio playback. The recommended playback platform is the Oculus Video app on the Samsung Gear VR or Oculus Go headset with Bose Quiet Comfort 25 noise-cancelling headphones.

Figure 1: Poster for Afraid of the Dark. Alicia Eames
Research Project and Creative Work Credits

ACADEMIC:
Research Supervisors: Professor Trish FitzSimons and Dr Leah Barclay
Research Consultant: Dr Tim Marsh

360 FILM CREW:
Director and Producer: Alicia Eames
Writers: Alicia Eames and Adam Harris
Editor, Sound Recordist and Sound Designer: Alicia Eames
Scientific Audio Field Recordings: Julie Broken-Brow
Director of Photography and Colourist: Mark Broadbent
Production Designer: Adam Harris
Drone Pilot: Kingsley Foote (Australian Drones and UAVS)
Animator: Simon Tiemroth (Activate Studios)
Music Samples: ‘Glass Knives’ from Audio Network, ‘Beautiful Ambient Atmosphere’ from Pond 5

CAST:
Voiceover Artist: EJ Campbell
Dog: Schmidt Von Rifflebottom

CONSULTANTS:
Concept Development: Alicia Eames, Mark Broadbent, Adam Harris, David Gaylard (a commercial sound designer), Adrian Diery (a commercial composer and sound designer), Tyronne Curtis (a commercial creative director), and Dorothy Fauls.
Virtual Reality Technical Consultant: Peter Mills
Script Consultant: Craig Proudley

SUPPORT AND SPONSORS:
Titley Scientific: Micro-Bat Ultrasonic Audio Field Recorders - the ‘Anabat Walkabout Active Bat Detector’
https://www.titley-scientific.com/au/
Australian Drones and UAV’S: Drone Services and Equipment https://www.ausdrone.com/
Activate Studios: Animation Services https://activatestudios.com
Griffith University: Provided ‘Insta360Pro’ Camera and ‘Sennheiser Ambio’ Ambisonic Microphone
Abstract
In the rapidly developing field of spatial audio for cinematic virtual reality films, sound production practices from traditional cinema may have a lot to offer in terms of creative design and setting an audience’s mood, emotion and expectations. There are, however, some crucial differences between the two mediums (such as an audience’s freedom of view), and what hasn’t been covered in the literature is a practical exploration of how traditional cinematic sound practices and sound design principles can translate and be expanded for 360-film sound production. This research explores cinematic sound practices and principles within 360-film through the production of a 5-minute, live-action and animation, 360-film entitled Afraid of the Dark that specifically tackles environmental conservation themes. My role in the project was as director/producer, writer, sound recordist and sound designer, and my practice-led research was supported by a contextual survey including unpublished interviews with a series of cinematic sound designers who have worked on high-end 360-film productions – Tom Myers from Skywalker Sound, California (Collisions), Joel Douek from Ecco VR, Los Angeles (Under the Canopy), Roland Heap from Sound Disposition, London (My Africa), and Mike Lange, Michael Thomas and Heath Plumb, who are a team of experienced virtual reality sound designers from ‘Cutting Edge’, a production company in Brisbane, Australia. The outcomes of this project make a significant contribution towards the adaptation of cinematic sound practices for the rapidly developing field of 360-film production and this approachable and practical research will be beneficial to virtual reality producers and sound designers who are shifting into immersive story-telling.

Preamble – My Background
I completed a Bachelor of Film and Screen Media Production through Griffith University in 2007 and have since been working as a freelance location sound recordist in Australia and globally, on projects ranging from award-winning TV shows to feature documentaries. I also lecture in film sound production at the School of Audio Engineering. In 2015, I was the location sound recordist on a commercial 360-film, shot on a Go-Pro rig, and found the challenges involved with working in an emerging field to be both mentally stimulating and very enjoyable. The spark that started with my first venture into 360-film took me on the journey that has resulted in this research project.

Suggested Order for Engaging with Afraid of the Dark and this Exegesis
To get the most out of this work; begin by reading chapters 1 and 2 (the introduction and contextual survey), watch Afraid of the Dark, and then read the rest of this paper. Afraid of the Dark is best viewed in the ‘Oculus Video’ app within a ‘Samsung Gear VR’ headset or the ‘Oculus Go’ headset, with the ‘Bose Quiet Comfort 25’ noise-cancelling headphones.
Chapter 1: Introduction

Over the past century, filmmakers have been refining their craft, and the mutual development of technology and creative practice have often driven each other forward to create emotionally rich and compelling experiences through the manipulation of vision and sound.2 These experiences offer audiences a chance to connect with stories, ideas, characters, and subjects, and are often designed to make people feel something – whether that is joy, sorrow, anger or fear.3 Due to the nature of human perception, the sound design often goes unnoticed by audiences and consequently is an incredibly powerful tool in the hands of filmmakers, subtly setting the mood of a scene and subconsciously affecting the audience’s understanding of the story, and their emotional state.4 The creative decisions a sound designer makes, to include or exclude atmospheric recordings, sound effects and dialogue, and the manipulation of audio characteristics (like EQ, reverb and other effects), ultimately affects the way an audience perceives, and reacts to, a film.5 Consider how an audience might feel watching a night-time street scene including the sounds of crickets, a distant television and gentle traffic. Now, consider the same scene with a far-off siren, a distant argument, and a close rustling in the bushes. The sound design can guide an audience’s expectations and mood, sometimes before a picture is even on screen.

Thanks to a rise in affordable and accessible virtual reality technology, a new and interesting form of filmmaking is currently being born - the 360-film. As in traditional film, the soundscape is a critical element in virtual reality, but for cinematic sound designers, tackling the new spatial sound tools, dealing with the incredibly rapid pace of development, and finding the most effective way to craft sound for this uniquely immersive medium can be a daunting challenge.6 Recent advances in audio software, technology, and distribution platforms are utilising ambisonic audio, originally developed in the 1970s, which until now had little application in mainstream media7 (for a definition, please see the glossary in Appendix 1). Ambisonic audio is a spatial sound technology that provides 360-film practitioners with the ability to include simulated spatial sound through a regular set of headphones, allowing the accurate positioning of sound cues all around a viewer and helping to guide the audience’s gaze, focus and attention around the 360 degree environment.8 This is just one of the benefits gained from spatial sound in 360-film but what is little understood is how cinematic sound design principles, namely, the ability of sound to influence an audience’s

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8 Candusso, “Designing Spatial Sound”, 3.
mood, emotion, and perception of the story, translate into the unique 360 environment. The past few decades of research and development in audio for virtual reality have primarily focused on overcoming the many technical challenges posed by reproducing a highly realistic, spatial sound environment through a set of headphones. What seems to be currently lacking in the literature, and what a number of academics are now calling for, is a practical exploration of how creative sound practices from other disciplines can be used and adapted within virtual reality production to create more emotionally compelling and engaging virtual reality experiences. The discipline of cinema seems like a natural starting place for the exploration of sound for live-action cinematic 360-films which have been shot on a 360 camera. These films are distinct from interactive or ‘room-scale’ virtual reality, that is built in a game-engine and is composed of 3D objects, as live-action 360-films are large flat videos that get wrapped around a viewer and can be created using traditional editing and audio production software with the addition of specialised virtual reality tools and plugins. As more and more filmmakers engage with this medium and produce spatial soundscapes for 360-films, the question is, how can the principles and practices of traditional cinematic sound be used, and adapted for, the 360-film environment, and how do we best plan for, record, and design cinematic spatial sound to achieve the greatest impact on our audience?

To address this gap in the literature, this exegesis details the learnings gained from a practical exploration of how the principles of cinematic sound recording and design could be borrowed and adapted during the production of an original, 5-minute, live-action 360-film project with spatial sound. The 360-film, entitled Afraid of the Dark, tackles environmental conservation messaging in a narrative format. Through a collaboration with a larger eco-acoustics project being conducted at Griffith University by Dr Leah Barclay, the film was based around scientific field recordings of ultrasonic micro-bat echo-locations. These recordings were captured by an environmental science PhD candidate at the University of Queensland, Julie Broken-Brow, with specialist equipment from Titley Scientific. The film aims to enlighten the viewer about the importance of the preservation of micro-bat habitats.

Looking to industry, there are a number of high-end environmental virtual reality experiences and 360-films that have been produced in recent years. Through a series of virtual reality experiences, researchers at Stanford University have shown that virtual reality has the capacity to increase long-term, pro-environmental behavioural change in individuals – demonstrating the potential of virtual reality as a pro-environmental

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10 ibid.

community engagement tool.\textsuperscript{12} Also aiming to address this issue, Conservation International has released three environmental 360-documentaries,\textsuperscript{13} and the Emmy award-winning Australian 360-documentary \textit{Collisions}, by Lynette Wallworth, also addresses some big environmental issues while tackling social and cultural topics.\textsuperscript{14} \textit{Collisions} and the 360-films by Conservation International received a significant amount of publicity, are exemplars in the environmental 360-documentary world, have complex spatial soundscapes, and their respective sound designers come from outstanding cinematic sound backgrounds.\textsuperscript{15} As a part of the contextual survey for this research, interviews were conducted with the sound designers of these films as well as an experienced spatial sound team from a Brisbane production company, ‘Cutting Edge’.

1.1 Methodology

After reviewing the available literature on sound for virtual reality and cinema, and looking to past relevant work, the task was to produce a short environmental 360-film to explore how cinematic sound principles can be translated and adapted for cinematic 360-film. My role in the production of the creative work was as director/producer, co-writer, editor, sound recordist and sound designer. The crew included a co-writer, director of photography, drone pilot, production designer, and animator, as well as many consultants and advisors. Starting with Julie Broken-Brow’s field recordings of microbat echolocations, a concept development team (consisting of myself, the DOP, production designer, co-writer, a cinematic sound designer, a composer, and a friend) came together to brainstorm and develop several ideas for the 360-film. One of these concepts, the idea that became \textit{Afraid of the Dark}, was selected and developed from pre-production through to post-production. The film was made with an iterative review and implementation process and as part of this, a work in progress version of \textit{Afraid of the Dark} was shown to attendees at the international Eco-Acoustics Congress 2018, and the feedback and insights were incorporated into further


drafts of the film. After completing a first draft, and with a fresh understanding of the processes, challenges and complications involved with spatial audio production, the contextual survey sound-designer interviews were conducted. The insights gained from these interviews were then incorporated into the final version of the film and are discussed in this exegesis. The audio-recorded interviews were conducted via Skype or in person, and full transcripts are included in Appendix 4.

The following chapters will review the literature on sound for virtual reality, study the sound of the Conservation International 360-films and Collisions, discuss the learnings from production of Afraid of the Dark, and suggest areas for further research in the field of sound for virtual reality. The outcomes of this project make a contribution towards the adaptation of cinematic sound practices for the rapidly developing and fast-moving field of 360-film production and will be beneficial to virtual reality and 360-film producers and sound designers who are shifting into immersive storytelling.

1.2 Important Terms

In the discussion of sound for 360-film and virtual reality, there are a number of terms that benefit from defining. Definitions and an explanation of ‘360-film’, ‘virtual reality’, ‘ambisonic’, ‘head-related transfer function’, ‘binaural’, ‘5.1’, ‘7.1’, ‘Dolby Atmos’, ‘head-tracked’, ‘head-locked’, and ‘diegetic’, can be found in the glossary in appendix 1.0.
Chapter 2: Contextual Survey

2.1  Recent Technological Advances and Their Impact on 360-Filmmakers

It is worth mentioning that it is only in very recent history that the rise of powerful mobile phones, cheap headsets and affordable spherical cameras has put 360-film tools and viewing devices in the hands of independent filmmakers and the public alike. While some of the spatial audio technology (for instance, ambisonics) has been around for decades, before 2016, video authoring and audio software had limited support for spatial audio workflows, major distribution platforms did not support 360-films with spatial audio tracks, and Facebook had not yet taken over and freely distributed the previously very-expensive ‘Two Big Ears’ spatial audio plugins. These obstacles meant that it is only in the past couple of years that we have seen a significant number of filmmakers producing spatial audio for 360-films. Additionally, the field is still developing incredibly rapidly, with frequent changes to software, plugins, and headsets, and there is a lack of format standardisation between the major distribution platforms which contributes very significant levels of difficulty to the production of spatial audio. Today’s filmmakers and sound designers are now in the unique position of developing the language of virtual reality sound in a rapidly changing and technically challenging environment. In the unpublished interviews conducted for this research, all of the sound designers discussed the practical challenges and great difficulty involved in creating spatial soundscapes for virtual reality.

2.2  Prior Research’s Focus on Sonic Realism and Fidelity in Virtual Reality

Aside from the practical challenges of working with software and file formats, there are many technical challenges involved in reproducing high fidelity, convincing, and realistic spatial audio. While it is beyond the scope of this paper to examine the challenges involved, Stephen Schutze, the author of the 2018 text *New Realities in Audio: A Practical Guide for VR, AR, MR and 360 Video*, discusses the “uncanny valley” of spatial audio reproduction and how slight discrepancies in the simulated audio environment (from the atmospheric absorption of sound waves, to the reflection of sound off a range of different surfaces and textures, to how an individual’s head and torso alters the frequencies of sound) can easily be picked up by the human brain,

18 Candusso, “Designing Spatial Sound”, 2.
19 Lange, Thomas, and Plumb, interview; Douek, Joel. interview by Alicia Eames. Audio Recorded and Transcribed. Skype, September 6, 2018, Full Transcript Appendix 4.1; Roland Heap, interview by Alicia Eames. Audio Recorded and Transcribed. Skype, August 30, 2018, Full Transcript Appendix 4.2; Tom Myers, interview by Alicia Eames. Audio Recorded and Transcribed. Skype, September 7, 2018, Full Transcript in Appendix 4.3.
pulling the viewer out of the experience because it ‘just sounds wrong’. Over the past few decades, these problems have been discussed and explored, and an ongoing range of solutions are being developed in industry, research and literature. In spite of these technical issues, Schutze discusses the tension between the pursuit of technologically-possible realism and the creative craft, saying, “I am also constantly amazed at how often very basic, age-old techniques such as those we have been using in theatre for hundreds of years are not just still relevant, but in some ways, they are more relevant than ever... I think a mix of bleeding edge technology and established narrative techniques may be the best approach for many things.” Similar to this observation, and calling for an “experimental, aesthetic approach” to sound design in virtual reality, Angela McArthur, Rebecca Stewart and Mark Sandler, draw together ideas and research from diverse fields of artistic practice, arguing that the research focus on sonic realism and fidelity is falling short of sound’s potential in the 360 environment and crippling 360-films in the process. They posit that unrealistic and artistic sound design may be crucial for audience engagement and emotional response in virtual reality.

While there are a range of creative sound disciplines to borrow approaches from, an obvious place to start for the consideration of best practice sound design for cinematic 360-films would be an exploration of cinematic sound practices. In 2017, cinematic sound designer and academic Damian Candusso, published a conference paper at SMPTE (Society of Motion Picture & Television Engineers) titled Designing Spatial Sound: Adapting Contemporary Screen Sound Design Practices for Virtual Reality, in which he discussed the workflow challenges faced by traditional sound designers as they move from 5.1 or 7.1 surround-sound mixes, to the new spatial sound mixing tools, and how a lack of documentation and file format standardisation is creating significant challenges for sound designers. Candusso’s work focuses on the post-production workflow in regards to the software, plugins and technical considerations. What seems to be missing from the literature is a practical exploration of how creative sound principles and location sound recording practices from traditional filmmaking can be used and adapted in virtual reality and 360-film. As film-makers develop content for this new platform, the question that needs to be answered is, how can creative cinematic sound design principles translate or be adapted for the 360 environment, and how can audio be best captured on-set, to enhance an audience’s emotional response and engagement with a 360-film?

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20 Schutze and Irwin-Schutze, New Realities in Audio, chap. 3.
24 ibid, 26.
2.3 Cinematic Sound Design and its Role in 360-Film

Sound for cinema has changed dramatically throughout the decades – from silent films, through the talkies, to the birth of ‘sound design’ in the 1970’s and the accompanied upscaling of cinema sound systems to a much higher quality surround-sound experience, and now to today’s Dolby Atmos which has incorporated an even greater level of spatial sound in cinema and film experiences. Defining what constitutes contemporary cinematic sound design is not simple and as noted by Mark Ward (a cinematic sound designer and film academic) and Linda Leung (an interactive media academic), the literature on cinematic sound design is scarce, however, they go on to say, “Arguably, the primary function of sound in both film and interactive media is the structuring and communicating of an emotional truth. This function harnesses the pre-attentional ability of sound to create mood... It happens before rational logic, is pre-conscious and visceral and therefore has the capacity to affect us in a primal way.”

That cinematic sound is focussed on emotional truth, rather than literal truth, is not an isolated thought in academia or industry, with many academics and practitioners discussing this concept. Walter Murch, an award-winning sound designer and one of the ‘fathers’ of sound design, has discussed the power of departing from literal truth for cinema sound, “I think the greatest thing that sound can contribute to a film is a metaphoric tension between the sound and the image. If you produce a sound that has no creative tension, which simply reproduces what we are looking at, it adds something, but it doesn’t add very much...”

That harnessing sound’s full potential often requires less of a focus on realism and more of a focus on emotional truth is important to consider when evaluating prior research’s focus on the development of highly realistic sound for virtual reality and 360-films. As we look to develop the new language of 360-film sound, and attempt to impact and move our audiences, borrowing the wisdom of cinematic practice would suggest a move beyond a focus on realism, and an exploration of how to communicate the emotional truth, and truth for the story, through sound.

In the new 360 environment, and with a consideration for Schutze’s ‘uncanny valley’ of high-fidelity spatial audio, a question that hasn’t been explored is how virtual reality sound practitioners can find a balance between realistic sound and creative cinematic sound design that is effective at setting mood and guiding emotion without distracting a viewer from an experience with poor fidelity audio.

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30 Holman, Sound for Film and Television, chap. 10.
32 Schutze and Irwin-Schutze, New Realities in Audio, chap. 3.
2.4 Stanford University Virtual Reality Experiments

The Virtual Human Interaction Lab at Stanford produced a number of virtual reality experiences between 2011 and 2016 that incorporate head-tracked, but simple, realistic sound. The studies were looking at issues ranging from coral reef acidification, to paper use, to energy consumption, and all of these experiences were shown to encourage pro-environmental behaviour and in some cases, this change had a long-term impact on the viewer.\(^{33}\) None of these experiences made an attempt to use cinematic sound design and instead focussed on a realistic and simple soundscape, but the level of personal engagement viewers had with the subject matter does serve to demonstrate the potential of the medium as a way of raising environmental awareness, and even behavioural change, in the public.

2.5 Conservation International 360-Documentaries

An interesting case study in spatial sound for environmental 360-films can be seen by examining three virtual reality films produced in the past three years by Conservation International, a global environmental conservation organisation with its largest offices in the United States. One factor that is interesting to note is the progression of their soundscapes in terms of complexity, spatialization and cinematic design.


*Valen’s Reef* is the story of a father and son who are working to preserve the reef in Indonesia. The 360-film features music, voiceover, dialogue, and atmosphere sounds in stereo without head-tracking.\(^{34}\) The lack of head-tracked spatial audio means that sound effects, for instance, a splash, often sound like they come from in front of you when the source of the splash is to your left or right – confusing your vision and sound and distracting you from the story.


*Under the Canopy* transports audiences to the Amazon rainforest. The 360-film took a big step forward in sound design, and uses head-tracked, spatial sound, incorporating music, voiceover, sound effects, and ambisonic sound beds.\(^{35}\) The sound designer, Joel Douek, has an incredible depth of experience in sound for virtual reality, having worked on 30-40 virtual reality projects since 2013.\(^{36}\) Douek is also the co-founder of an immersive media sound company ‘Ecco VR’ and has recently launched a university course at Columbia College Chicago on sound for immersive media.\(^{37}\) Before working on *Under the Canopy*, Douek had worked on many traditional feature films and documentaries including David Attenborough documentary projects.


\(^{34}\) Valen’s Reef, 2016.

\(^{35}\) Under the Canopy, 2017.

\(^{36}\) Douek, interview.

\(^{37}\) Douek, interview.
In an unpublished interview conducted for this exegesis, and located in appendix 4.1, Douek reflected on a key sound design difference between traditional documentary and 360-documentary:

We want to bring the flavour of the place, the setting, maybe a little bit more forcefully than we might do in 2D, because rather than just watching onscreen and being somehow separated from it, you're in it. And, in as much as you want it to represent the place visually as much as you possibly can, you really want to represent the sound of it as accurately as possible.  

Douek also spoke about how the sound needs to ultimately serve the story, how the soundscape needs to be considered in terms of how our brains filter and focus on sounds, and how as sound designers, we are responsible for doing the filtering that the brain normally does, but that microphones cannot.

An issue that shows up in the distribution of *Under the Canopy* is due to the film being distributed on YouTube which only allows first-order ambisonics, and until very recently, did not allow a head-locked stereo track. This limitation is evident where the voiceover and music are slightly off-centre and sound as though they are coming from an invisible person/source beside you. This means that occasionally you turn and look for the source of a voice, only to find no one, or, when looking a certain way, you hear the music only in your right or left ear. Douek spoke about the frustration of dealing with these issues, and trying to work around the distribution platform limitations, “...often with projects, we’ve been asked to deliver for YouTube which only allows first-order ambisonics, so we have to kind of collapse down all of our work to sound horrible.”

Douek also spoke about how much he is looking forward to the days when the technology can sink into the background and make space for sound designers to simply create.

2.5.3   *My Africa, Conservation International, April 2018*

Most recently, *My Africa* premiered in April at the 2018 Tribeca Film Festival and features head-tracked, spatial sound with music, voiceover, dialogue, sound effects and spatial atmospheres. *My Africa* can currently be viewed on the ‘Within’ 360-film app and is the cinematic story of an elephant sanctuary in Kenya. The main difference between *My Africa* and the previous films is in the technical realisation of a spatial soundscape with accurate positioning and a head-locked voiceover and music track. The sound is captivating and doesn’t distract from the experience – as a stampede of animals swell around you, you know where and how close those animals are, but aren’t distracted by sounds coming from the wrong direction.

Roland Heap, the sound designer on *My Africa*, is the director of Sound Disposition – a London sound design company – and has filled many roles throughout his career, including location sound recordist, sound designer, re-recording mixer, and scoring mixer, on feature films, documentary and TV.
In an unpublished interview, located in appendix 4.2, Heap discussed his desire, similar to Douek for *Under the Canopy*, to immerse the audience in the fantastic African sonic environment as much as possible. He incorporated location recordings of the dialogue and ambisonic atmosphere beds captured during the shoot, and then worked with a foley team and library sounds to re-create many of the sound effects - from the footsteps, to the breaths, to the branch rustles. For the wildebeest scene, Heap described having over 50 individual wildebeest sound sources positioned and automated in the spatial sound software, so their sounds moved with the stampeding wildebeests past the camera. Speaking about sound design, Heap said, “I think every aspect of a film soundtrack is an emotional trigger... Each element is something you are placing there for its impact on the narrative, and therefore its impact emotionally on the audience.” Tempering this, he also discussed a key difference between traditional cinema and 360-film, saying: 

> For me, when I’m in virtual reality, if I have sounds that I can’t lock to a device or a visual trigger, I can often find them distracting because part of me is going ‘where’s that coming from? That drone, what’s making that drone?’ The moment I’m questioning something, I’m pulled out of the story and it’s one of the big differences between virtual reality and 2D film making...

This thought from Heap is important when considering how to adapt traditional cinematic sound practices for virtual reality and calls for a potential scaling-down of the usage of ‘unrealistic’ sound effects in the medium.

### 2.6 *Collisions* by Lynette Wallworth, January 2016

*Collisions* is an Australian 360-film by Lynette Wallworth, an innovative Australian filmmaker, that won the ‘Outstanding New Approaches Documentary’ Emmy at the 38th Annual News and Documentary Emmy Awards. Combining 360-footage, CGI/animation and a spatial, head-tracked, cinematic soundscape, the film tells the story of nuclear testing in the South Australian desert from the perspective of indigenous elder Nyarri Morgan, and is currently available on the cinematic virtual reality distribution platform ‘Jaunt VR’ – a mobile phone app and website.

Tom Myers, the sound designer of *Collisions*, is a three-time Academy Award nominated sound designer from Skywalker Sound in Los Angeles. His career in sound spans 5 decades and includes credits such as Star Wars: Episode IV – VI, Up, Wall-e, Jurassic world: Fallen Kingdom, and many others.

What is notable about Myers’ work is that the sound design for *Collisions* was done in 2015, before spatial sound tools and distribution platforms were as available as they are today. In an unpublished interview, located in appendix 4.3, Myers discussed the process of designing sound for *Collisions* and that at the time, software developers were working overnight to write new code, ready for the next day’s work on the project. Myers describes himself as a “non-technical person working in a technical field” and spoke about

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42 ibid.


44 Myers, interview.
the immense technical challenges and how he was able to partner with technicians to take care of the software and technical side of spatial sound to allow him to focus on the creative sound design choices.\textsuperscript{45}

When asked about how he approached the creative sound design for \textit{Collisions} as opposed to traditional films, Myers said, "I try not to think of it as too different... the creative decisions that you make are 'how do I best tell the story? How do I bring across or help the filmmaker realise their vision?'"\textsuperscript{46} He also spoke about dramatic truth, saying, "There's the literal truth and then there's the dramatic truth, or the truth for the story. In filmmaking, there is a little bit of an artifice in all of it, so we try not to get too hung-up on everything being literally accurate because sometimes when you do that, it doesn't feel either emotionally or dramatically accurate."\textsuperscript{47} One difference between 360-film and traditional film that Myers did discuss was the necessity of using the sound to guide the viewer's attention around the 360-degree space. Myers also spoke about how he loved having ambisonic atmosphere recordings from the shoot and that he incorporated these recordings into the film. Myers and the team at Skywalker Sound then recorded foley and used digital sound effects (for instance, the ash rain), to add layers and depth to the sound design. Myers' work on \textit{Collisions} was technically ahead of its time and adds significant depth and meaning to the 360-film through the creative use of cinematic sound design.\textsuperscript{48}

What is clear from looking at the works discussed above is that spatial sound for virtual reality has developed rapidly in the past few years. The field is moving quickly and the language of sound in virtual reality is in its infancy. The sound designers interviewed all faced significant technical challenges and differed somewhat in the way they balanced realistic sound and a creative cinematic approach - with Heap from \textit{My Africa} outlining the way non-diegetic sound effects, for instance a drone, can distract an audience in 360-media, and Myers from \textit{Collisions} creatively approaching the film very similarly to how he approaches traditional films but with a deeper consideration towards guiding the audience's attention. All of the sound designers spoke of the way sound impacts the narrative and ultimately needs to serve the story being told.

These interviews were conducted after completing the first draft of \textit{Afraid of the Dark}, and the insights gained were incorporated into the final draft of the film. The ways in which these insights aligned with the learnings from production are outlined in the following chapter.

\textsuperscript{45} ibid.
\textsuperscript{46} ibid.
\textsuperscript{47} ibid.
\textsuperscript{48} ibid.
Chapter 3: Afraid of the Dark – Production and Practice

I found the importance of spatialized sound in 360-film to extend beyond what I had experienced in 2D media – from guiding the viewer’s attention in the 360-degree space, to the on-set recording considerations, followed by the complexities of the software and spatial sound files - sound for 360-film was demanding in new and often unexpected ways. Therefore, through an understanding that research in any field, including the creative arts, means “work undertaken on a systematic basis in order to increase the stock of knowledge”, I provide details here of my practice, process and problem solving, and assert that this is a vital part of my research achievement that can be useful to others in the field.

I started pre-production of Afraid of the Dark with a few concrete aspects – ultrasonic micro-bat echolocation recordings, a 360-film format, the limitations of a 6-month time-frame, and the budget of a self-funded short film which is distinct from the high-budget 360-films in the contextual survey. I established a goal which was to create an engaging, sound-driven, 5-minute, 360-film that introduced the audience to the concept of micro-bat habitat loss in suburban areas.

I gathered a group of creative practitioners (the DOP, the production designer and co-writer, a commercial sound designer, a composer, and a friend) for a brainstorming meeting where we worked on both narrative and documentary concepts. After this meeting I selected the narrative concept (differing from the 360-documentary films in the contextual survey) and entered into the pre-production phase to explore how cinematic sound principles can translate into narrative, environmental 360-film.

I engaged a number of external practitioners throughout production of the film and had many consultants provide invaluable wisdom and advice throughout the process. To gain a fuller understanding of the challenges faced by 360-filmmakers, and to deeply explore how spatial sound can contribute to 360-film production, I filled several roles - writer, producer, director, sound recordist, foley recordist, editor, and sound designer. As a sound practitioner, I had a distinct bias towards the importance of sound in 360-film and focused much of my attention on the sonic possibilities and audio production. Despite this focus, writing, directing and producing the film, problem solving the camera and drone issues, and wrangling the visuals in post took at least as much time as the sound production, even with the momentous support offered by the other visual crew members.

It is worth noting from the very beginning that microbat echolocations are very high frequency sounds with most microbat species emitting calls well above human hearing (the upper limit of which is generally 20kHz,

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depending on age and hearing acuity). A spectral frequency display of one of the echolocation calls can be seen in Figure 2. From the beginning of this film, we knew we would be transposing these recordings down into the human hearing range and, from the first, departing from a realistic representation of sound.

![Figure 2: Spectral Frequency Display of Microbat Echolocation Call within Adobe Audition. Screenshot 22/10/2018, Alicia Eames.](image)

It is my suggestion that watching *Afraid of the Dark* before reading the rest of this paper will provide the best foundation for the discussion of production learnings that follow.

### 3.1 Spatial Sound through Pre-Production

“I think this is a hugely important concept for any film-maker to realize – that sound is not something that you can only sprinkle over a film at the end of the process, but it’s a force that can be used from the beginning in the telling of the story. The more you can do that, the more powerful the effect will be on the audience.” Walter Murch

I found this thought from Murch about traditional cinematic sound to be extremely relevant to 360-film audio, though often in new ways. Through the process of producing *Afraid of the Dark*, and through my

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51 Costantini, “Walter Murch Interviewed by Gustavo Costantini,” 42.
interviews with Douek,\textsuperscript{52} Heap,\textsuperscript{53} and the Cutting Edge team (an experienced Brisbane spatial sound team composed of Mike Lange, Michael Thomas and Heath Plumb),\textsuperscript{54} I found bringing sound designers into early concept meetings, and also having a sound background myself, to be extremely beneficial. Ideally, a sound designer involved in 360-film pre-production would have experience in 360-film sound design (although this wasn’t the case for \textit{Afraid of the Dark}), and they would remain a part of the film all the way through to post-production.

Throughout pre-production, sound designers are able to guide the writer, director, and other pre-production team in ways that spatial sound can serve the goals of the film, and some of the key aspects of this role are detailed below.

3.1.1 Concept and Script Development

\textit{Afraid of the Dark} was developed, from the earliest concept, to give audiences an experience they have likely never heard before – the chance to hear ultrasonic microbat echolocation calls. Microbats live in our backyards but due to the ultrasonic nature of their calls, we simply can’t hear them, and potentially don’t even know they are there.

From the beginning, we knew spatial sound would give us the opportunity to include a scene where the bats swarmed in and flew around the viewer while emitting their echolocation calls. Working with the idea of this scene, one of the concepts that evolved at the initial brainstorm meeting was having a little girl who was afraid of noises coming from outside her window, who then experienced a magical flight over the city with the bats flying around her. The character of a child was important for the emotional reason of being afraid of the dark, but also for logical credibility of the story. Young ears typically have a higher hearing range than adult ears, a range which extends into the lower frequencies of microbat echolocations.\textsuperscript{55} One other key character in the story is a small dog who growls at something outside the window – this ominous and disturbing growling sound was the basis for including his ‘character’, and the much higher hearing range of dogs (up to 47kHz)\textsuperscript{56} added credibility to the storyline. These key story

\textsuperscript{52} Douek, interview.
\textsuperscript{53} Heap, interview.
\textsuperscript{54} Lange, Thomas, and Plumb, interview.
\textsuperscript{56} ibid, 313.
elements form the majority of the film and wouldn’t have been written into the story without an understanding of the sound from the beginning of the pre-production process.

3.1.2 Guiding the Viewer’s Attention

Unlike traditional film, the audience has 360 degrees of visual freedom and may often miss aspects of the story because they are looking the wrong way - one crucial benefit of spatial sound in 360-film is how it can guide the viewer’s attention and cue the audience to look in a certain direction. Douek spoke directly to this in his interview, ‘...for the director, they can’t really have the same level of control over what the user is seeing, what they’re choosing to look at, but sound becomes one of those very big tools that we can use in the form of attention directing, and we can use it subliminally.’ In Afraid of the Dark I used spatial sound cues, tied to the visual of a dog, to guide the audience around the 360-degree space, and before the transition, to cue viewers to look to the window ready for the move outside. Towards the end of the film, I used traffic sounds and bat sounds to guide the audience to look back to the city before the credits sequence played in that direction.

Additionally, spatial sound can guide the viewer away from something you don’t want them to see, which showed up in one of Douek’s projects where the VFX team needed to composite a plane into the 360-shot without the viewer seeing the sudden transition. Douek was able to use the sound to guide the viewer away from that space, allowing the sudden addition of a plane to flow seamlessly into the story.

One other aspect of viewer guidance that I used in Afraid of the Dark, and that was discussed by the Cutting Edge team, was the importance of not placing too many sound cues ‘behind’ a viewer (or rather, in the direction you don’t want them to face) to avoid distracting the audience.

An audience’s focus and gaze direction can be an inherent issue in 360-film production and spatial sound offers a subtle way of guiding the audience around the space, essentially doing the framing that the camera used to do in traditional film. This was invaluable in Afraid of the Dark and provided a seamlessness to the viewing experience by helping to eliminate periods where a viewer is trying to find what they should be looking at.

57 Douek, interview.
58 Douek, interview.
59 Lange, Thomas, and Plumb, interview.
3.1.2.1 Guiding the Viewer at The Ecoacoustics Congress 2018

Through existing ecoacoustics virtual reality research at Griffith University, I was given the opportunity to include *Afraid of the Dark* in an exhibition at the international Eco-Acoustics Congress 2018. The congress was scheduled for a mere two weeks after our shoot dates and so I took a work-in-progress version of the film to display. This version included the first scene of the film in the girl’s bedroom and a transition to a static outside shot.

During production of *Afraid of the Dark*, I had a very lucky accident. After recording a clean ‘safety’ shot of the little girl’s bedroom, we attempted to use an untrained dog to ‘growl’ at something outside the window. The chances of the shot working were very slim. The dog performance was average - he started the shot looking out the window and then in the middle of the take, ran out of the room. He returned to the room thirty seconds later, ran up to the window and jumped up. We didn’t know it at the time, but it turned out to be a crucial element of the opening scene.

The shot was edited into the film and it worked well enough, despite the break in the middle where the dog left the room. At the congress 18 viewers went through the experience. What I had never anticipated was that viewers would mostly focus forwards for the opening of the film and wouldn’t look around the space at all. It wasn’t until the dog (aided by spatial foley sounds) ran out of the room, that many of the viewer’s turned their head for the first time and realized they could look around the space. Additionally, when the dog ran back into the room (again, with the aid of spatial sound effects) the viewers followed his movement and looked back to the window, just in time for the transition to outside. I couldn’t have planned it better and hadn’t considered the need to teach a viewer they can look around a space. During the interview with the Cutting Edge team that was conducted months after this discovery, Lange mirrored what I had discovered by accident, “It’s probably the most important at the beginning of the project, but to orientate the viewer to give them an indication that they do need to move around and look around… using visual cues and tying audio cues onto those visual cues to get the viewer to move around."

![Figure 5: Two viewers watch Afraid of the Dark at the Ecoacoustics Congress 2018. Photo. Alicia Eames](image)

3.1.3 Production Design, Cinematography and Sound

One beneficial traditional cinematic sound practice used in *Afraid of the Dark* was including potential sources of diegetic audio in the script to give the sound designer more flexibility in post-production.

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60 Lange, Thomas, and Plumb, interview.
It was decided to include a nightlight which could serve as a music box, allowing music to be placed in the scene rather than inside the ‘head’ of the viewer. The production designer and director of photography worked together to create a large turning lamp that lit the room and spun. The soundtrack features a short and creepy cue of lullaby music which emanates from this nightlight and when one particular viewer saw the film for the first time she exclaimed, “the creepy doll music is so scary!”.

Douek discussed the possibility of including a radio or a TV as potential diegetic sources\(^\text{61}\) and the Cutting Edge team wrote an alarm clock into a scene to help draw the attention of the viewer and to communicate that it was morning.\(^\text{62}\)

By working together with production designers and by planning ahead, sound designers can help to plant visual sources for key audio elements. Considering Heap’s view that non-diegetic audio cues can be distracting to the audience, and as virtual reality sound designers try to balance realism and creative cinematic sound, this practice of including diegetic sound sources may prove to be more important in 360-film than in traditional film.

### 3.2 Spatial Sound through Production

#### 3.2.1 Ambisonic Atmos and Room Tone

Heap noted that it is crucial to record ambisonic sound, as opposed to mono or stereo sound, from the camera perspective during filming.\(^\text{63}\) Depending on the quality of the room environment and the fan noise from the camera, these recordings may not be useable for the final film, but, even so, they are essential as a guide track for the sound designer. In *Afraid of the Dark*, the on-set recordings from the camera’s built in ambisonic microphone were unusable except as a guide track because the camera fan, and a hidden desk fan used to blow the curtains, were far too loud in the quiet environment of the little girl’s bedroom, and the extremely loud drone obliterated all sound during the drone shot (loud enough that it drew attention from a good section of the neighbourhood). This required all of the sound to be replaced with either ambisonic atmosphere recordings, foley recordings or library sound effects. Ambisonic atmos recordings taken when the camera

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\(^{61}\) Douek, interview.

\(^{62}\) Lange, Thomas, and Plumb, interview.

\(^{63}\) Heap, interview.
wasn’t rolling (traditionally known as ‘room tone’ and a practice from traditional film sound recording) were invaluable, and the importance of these recordings was discussed by all of my interviewees where due to a lack of ambisonic libraries available in the marketplace, these recordings can be even more critical to set a scene than in traditional filmmaking.

3.1.2 Labelling and Notes
During production recording and foley and atmosphere recording sessions, I took notes and made a sound report the way I do for traditional film. What I didn’t realise until later was that these notes were not detailed enough to account for the increased requirements of spatial audio. In the interview with Myers, he drew attention to an issue where due to the complex nature of ambisonic recordings that have four tracks and multiple formats, the sound report needs to document the direction of the microphone and what ambisonic format the tracks are in for the sound designer to be able to line up the recordings with the picture.64

I also didn’t consider the need to record the dog’s distance from camera (in cm/m) during production and it wasn’t until my interview with the Cutting Edge team that I realised the benefit these notes could offer. These distance values can be entered into the Facebook 360 plugin for each sound source and the plugin will automatically change the characteristics of the sound to simulate the source’s distance from the viewer. If these distance figures are not documented, as in the case for Afraid of the Dark, the sound designer has to make a best guess and use trial-and-error to get an accurate-sounding distance simulation.65

I was both the sound recordist and sound designer on the film, so I was able to recall (somewhat) the information I needed in post-production. It would have been better to record these notes on set, especially if my recordings were to be handed over to a sound designer not present at the shoot. To facilitate this, I have developed a template for a virtual reality sound report which can be found in Appendix 2. Some notes that should be recorded are:

- The direction of the ‘front’ of the ambisonic microphone and how the audio recording lines up to the visual recording.
- The ambisonic A-format track arrangement (FLU front left up, FRD front right down, BLD back left down, BRU back right up) and the microphone used.
- The distance from the camera of any talent who generate sound (dialogue or foley).

64 Myers, interview.
65 Lange, Thomas, and Plumb, interview.
3.3 Other Production Processes

3.3.1 Shoot Timelines and Equipment Sourcing

One key consideration for any 360-filmmaker is the difficulty that can occur in sourcing replacement equipment. The post-production timelines for *Afraid of the Dark* got condensed dramatically when a few days before the shoot, another production crew destroyed the Insta360Pro camera we were hiring. The camera is hard to source at short notice and the shoot had to be delayed by several weeks. Additionally, a week before the new shoot dates, our original drone pilot crashed (and destroyed) his drone, requiring the recruitment of a new drone pilot. Flying a large virtual reality camera at dusk required a fully licensed pilot with a large drone and significant rigging to ensure safety, and so the drone shoot was delayed further before Kingsley from Australian Drones and UAVs came on board and saved the day. This had a large impact on the post-production and spatial sound design timelines.

3.3.2 Lighting and Shooting Day-For-Night

In 360 film-making, Directors of Photography (DOPs) are limited in what type of lights they can use because everything is going to be ‘in shot’. Furthermore, *Afraid of the Dark* is entirely composed of two very dark shots and early camera tests revealed that the Insta360Pro camera generates significant noise in low light, requiring day-for-night shooting and the use of colour grading to bring the exposure down.

Balancing the lighting level in the little girl’s bedroom required an extensive pre-light and careful use of LEDs and cutters. The overhead ambient light (that would be deleted in post) flared all of the lenses on the camera and so a ‘cutter’ was required to eliminate these flares – the best cutter was a perfectly sized dinner bowl that sat on top of the camera, just out of view of the lenses.

Both shots required a large amount of setup and testing. The shoot ran over 3 nights with a total work-time of 12 hours. Shooting in virtual reality can be extremely time-consuming, and many practitioners are unfamiliar with the equipment, so my best advice to productions is to allocate a significant portion of time to the planning and testing phase.
3.4 Spatial Sound in Post-Production

3.4.1 The Software and Plugins

For 360-film that uses live-action 360 footage, sound designers can work in traditional film audio software with the addition of new spatial audio plugins. It is beyond the scope of this paper, but interactive virtual reality experiences and room-scale virtual reality films that are constructed in a gaming engine and allow the audience 6DOF (6 degrees of freedom - freedom of movement around the 3D space rather than just freedom of a 360-degree view) require audio to be developed in a gaming engine. Interactive virtual reality projects developed in gaming engines typically involve 3D objects that sounds can be attached to, so the mix changes in real-time as the viewer moves around the space. 360 live-action film is a big 2D video that gets wrapped around a viewer – this video doesn’t have ‘objects’ and sounds have to be automated to track any visual source (currently often by hand, or by somewhat competent automatic trackers in audio software). 

Afraid of the Dark is a live-action 360-film and so I used traditional audio software with spatial audio plugins. After reviewing several options and seeking advice from 360-film sound designers, I decided to use the Facebook360 Spatial Workstation (a well-supported and powerful suite of free virtual reality sound tools), within an audio program called Reaper (which costs $60USD for students and individuals), as these tools are currently widely used in the marketplace and suitable for low-budget 360-filmmakers.

Many of my interviewees also use the Facebook 360 plugins (previously known as the ‘Two Big Ears’ plugins) and were able to offer comment on how far the tools have come in recent years. Despite this, the process of mixing and outputting spatial audio for 360-films is not simple or straightforward, and as said by the

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66 Schutze and Irwin-Schutze, New Realities in Audio, chap. 2.
67 Lange, Thomas, and Plumb, interview.
68 ibid; Douek, interview.
Cutting Edge team, “If anyone says it’s easy, they’re a liar.” Heap said “there are problems at every stage with VR audio software...” My own experience was one of frustration, a few tears, and much trial and error.

The main issue encountered was in relation to the software stability. When working with the Facebook360 Video Player which allows you to preview and pan the video on screen while previewing the spatialized audio in your headphones, the program crashed every 5 minutes or so and would take a minute to reopen. This slowed down work significantly, until through research and experiments, the right combination of video format and dimensions was identified for the computer and graphics card being used. Weeks later, after an update to the plugins, the functionality changed significantly, which brought back the initial problems and required a second round of experiments to find a new stable video format (documented in the ‘Post-production Workflow’ in Appendix 3).

Figure 12: The Facebook 360 video player. Screenshot. Alicia Eames

Additionally, a lack of backwards compatibility between versions can result in the inability to work on old project files. The only solution I identified for this issue was keeping a backlog of old software and plugins. The Cutting Edge team and Heap also discussed the issue of the rapid rate of change meaning that every time they start a new project, it almost feels like starting from scratch and having to learn the process all over again.

Despite spending as much time troubleshooting software crashes as designing the sound, the Facebook 360 spatial plugins have a relatively intuitive user interface. There is also reasonable how-to documentation, and a very responsive online community who work together to solve the many issues that crop up. The online

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69 Lange, Thomas, and Plumb, interview.
70 Heap, interview.
71 Lange, Thomas, and Plumb, interview; Heap, interview.
community is accessible through the ‘Facebook 360 Spatial Workstation’ Facebook group https://www.facebook.com/groups/audio360support/.

3.4.2 Cinematic Sound Design in Afraid of the Dark

I approached Afraid of the Dark with a cinematic sound approach, looking to use sound to emotionally shape the experience of the viewer, and using realistic sound where it best served the story rather than as an end-goal in itself. My sound design mindset most closely reflected something said by Myers in our interview, “As a filmmaker or sound designer, you have to make decisions to support the ideas that you’re trying to get across. In some regards, I think the literal stuff is either overrated or there’s something greater than that, and it’s the story and the idea that you’re trying to tell.”72 The goal of the film was to tell the story of a little girl who was afraid of strange sounds coming from outside her window, but who was transformed by a magical experience with the creatures making those sounds – microbats. The film was a memory from the point of view of an adult, and as discussed by Myers in regard to Collisions, “…when somebody’s talking about a remembrance of something, it does give you dramatic licence to move outside of the literal image, because the images aren’t literal, so the sound doesn’t have to be literal either.”73

I used a combination of mono voiceover recordings, my own ambisonic atmosphere recordings made with the Sennheiser Ambeo, mono foley recordings, mono and stereo library sound effects, and stereo stock music samples. The majority of the sounds heard in Afraid of the Dark are mono audio sources that have been positioned with the spatializer plugin.

For the first scene in the bedroom I wanted to create an eerie and unsettling mood to convey the little girl’s state of mind, and so used a number of classic and somewhat cliché Hollywood horror sound elements to do this: wailing wind sound effects, the growling of the dog, a creepy music box lullaby cue, and a synthetic sound effect build to cue the transition to the outside shot. I also sourced stock music called ‘Glass Knives’ that had an atmospheric eerie quality and blended this music with synthetic builds and accent sound effects. These sounds served to set the mood before the scene even faded into view and each was chosen for its relationship to an audience’s emotional response. At the Eco-Acoustics Congress, where I showed only the first scene, I received feedback when 8 of the viewers commented on the film being creepy and that they were legitimately scared. 11 gasped or made-an-exclamation at the transition to the outside shot where they immediately looked down and around realizing they were suspended in mid-air.

For the drone shot scene, the bat echolocation recordings were transposed down from ultrasonic range and after some heavy noise reduction, EQ was applied to boost specific frequencies. This scene uses a separate music sample, titled ‘Beautiful Ambient Atmosphere’, to help sell the little girl’s transition from fear to wonder. These story transitions are rapid and allow the viewer little time to process what is happening and

72 Myers, interview.
73 Ibid.
so these music cues were used, rather heavy-handedly, to help communicate this change. Toward the end of the film, the script discusses the disappearance of microbats. Here the music cue fades out to be replaced by the sound of the traffic below. This traffic sound effect cue was essential for the story – before it was added to the film, several independent viewers commented on the need for something obvious to better communicate the loss of the microbats.

![Figure 13: The drone shot after the bats disappear. Screengrab from Afraid of the Dark. Alicia Eames](image)

3.4.2.1 The Need for Clarity in the Mix

From my own personal experiences in virtual reality and 360-film I was aware of how overwhelming the experience can be on a person’s senses. When designing the sound for *Afraid of the Dark*, I was conscious of a need for clarity in my design. Douek spoke about this consideration in his own sound design:

> We realised over a little bit of time that everyone perceives virtual reality experiences as very intense, and that if we want things to work well from the sound point of view, we can't overdo it... If you spatialize 100 different things, then it just becomes a big mush... The way we like to think about it is, as humans, in our daily lives, our brains filter out all kinds of noises... In virtual reality, that doesn't happen because the human brain doesn't know what's supposed to be important, and it's immersed... It becomes our job, as the sound designers, to be the filter, to make those decisions about what's important. Now, we do that in film as well, to some extent, like you bring something in, and you cheat it out. In VR we do it a lot, and we make harsher decisions...\(^4\)

While this was a consideration from the beginning, as feedback was gathered throughout the design process, I found there was a deeper need for clarity and prominence in the mix for any particular sound to be noticed as the viewer adjusted to the virtual reality environment. After viewing the film, I would often ask the viewer if they noticed a particular sound effect (for instance, the bats) and adjusted the mix until viewers consistently heard what they were supposed to. Throughout the evolution of the sound design, the bat sounds became more and more dominant in the mix through volume and equalisation (EQ). EQ was also

\(^4\) Douek, interview.
applied quite heavily to many of the other sound effects (for instance, the wind) to carve out some space in the specific frequency range the bat sounds occupied.

3.4.3 Animation Software Considerations for Spatialized Object-Based Sound

*Afraid of the Dark* was written to incorporate a scene where animated micro-bats flew around the viewer while emitting their echo-location calls. I realized ahead of time that trying to track the fast and numerous animated bats manually in Reaper would be a terribly time-consuming and frustrating process. It was uncovered, with research and advice from game designers, that the most efficient way to achieve this scene would be to animate the bats in a game design program (e.g. Unity) rather than an animation program. The Unity-based bat ‘objects’ could then emit the sound and automatically generate spatial audio within Unity. The spatial audio can be exported from Unity and simply dropped into the sound design in Reaper (the audio software), thereby eliminating the need to manually and painstakingly track the sound to the animated bats in Reaper. A virtual reality production company was engaged to complete the animation component and notably, they too entered into a research phase to discover how best to use the software to achieve this purpose. Unfortunately, the solution they landed on was manually tracking the bats in Reaper using the Facebook 360 plugins... I uncovered this detail too late in the process, and without budget to spare, manually tracked the bats in Reaper. The newness of the field and a lack of game engine expertise and experience in the traditional cinema industry can create unanticipated problems during production and as cinematic sound designers brave this environment, the experience and skills of game sound designers are going to be essential.

![Figure 14: The manual keyframing/tracking of one of the bats in Reaper. Screenshot. Alicia Eames](image)

3.4.4 Delivery for Various Distribution Platforms

Another of the main issues with 360-film delivery, which was discussed by all of my interviewees, is the lack of a standard amongst the different platforms and formats. The various platforms support different ambisonic orders with YouTube only supporting 1st-order ambisonic files and Facebook/Oculus supporting the much higher resolution 3rd-order ambisonic files – the difference is somewhat relatable to the difference between standard definition and high definition footage so is akin to YouTube only supporting standard definition video. Additionally, while Facebook has, for some time, supported an additional head-locked
stereo channel (often used for music and voiceover), it is only since September of 2018 that YouTube has also supported this.\textsuperscript{75}

The process of delivery involves exporting an ambisonic master file (in the appropriate ambisonic order), a head-locked stereo master file, and the video file from the video editing program. The Facebook 360 encoder combines these three files into one file for delivery for the various platforms. This encoder has not, as yet, been updated to allow a head-locked track for YouTube. Artefacts in the audio can crop up with each file type and platform-specific format, so testing and adjusting of every output should be completed to ensure the audio sounds as expected. This process is time-consuming and does blow out post-production timelines significantly.

Chapter 4: Discussion

4.1 Considerations for Low-Budget 360-Films

Spatial sound design can be time-consuming and consequently expensive, and the difficulties and challenges involved may make low-budget filmmakers consider ditching spatial sound in favour of a simple mono or stereo sound-track. I would caution against this temptation and argue that spatial sound in many 360-films is essential to achieving a film’s goals. Heap said, “I think a non-spatial mix for a VR experience undermines the experience to make it almost worthless.” While this is a strong statement, when considering the ability of spatial sound to guide a viewer’s attention – essentially doing the ‘framing’ the camera used to do – the importance of a spatial soundtrack probably cannot be overstated. Additionally, to convey a sense of ‘reality’ and to avoid distracting the audience, having a sense of where sound is coming from is critical – the spatial sound confusions discussed in the contextual survey from both Valen’s Reef and Under The Canopy (for instance, the splashes coming from the wrong direction or the voiceover emanating from an invisible person beside you) serve to demonstrate how distracting non-spatial sound can be.

My best advice for low budget 360-filmmakers would be to bring sound practitioners in early in the planning and to allocate significant time to the sound design process. The benefits are many and it will help achieve a 360-film’s goals.

4.2 Where to From Here?

The combination of my own reflections from production of Afraid of the Dark and the insights from the interviews with the sound designers above, have only scratched the surface when it comes to sound in 360-films and virtual reality. In traditional filmmaking, sound design considerations differ for specific genres and audiences and as 360 audiences become more comfortable and familiar with the environment, I suspect the sensory overload impact will be lessened. More practice and research is required to investigate how the sound design impacts audiences and how viewers respond to different sound choices. Additionally, my background as a location sound recordist with broad on-set experience offered a unique viewpoint to the discussion, but a practical exploration conducted by a cinematic sound designer would shed more light on the creative choices used in the sound design phase of post-production.

An area requiring further research also lies in the deep dark trench between film sound practitioners and game sound practitioners (and also between animators and game designers). In Afraid of the Dark, it would have been far more efficient to animate the bats in a game engine with attached sound effects so that as the bats moved around the ‘camera’, the sounds tracked with them automatically. I, and the animator I employed, lacked the understanding and skills to do this and so the sounds had to be painfully and manually tracked to the animated bats. While this seems like a simple problem to fix (by collaborating with a

76 Heap, interview.
practitioner familiar with Unity or other gaming engines) my interviews with the Cutting Edge team revealed that this collaboration also creates a new set of problems and that the process is “like mixing by email”.77 As they developed sonic assets and handed them over to sound implementers and game developers to incorporate into a scene, the feedback process dramatically impacted the timelines. Heap discussed this “mission creep into programming”, saying “you can’t work in a game engine in a meaningful sense without knowing some programming. You need to be able to code. So that’s a real stumbling block for a lot of people I think.”78 With hope for the less technical among us, Myers spoke about his personal experience of this issue, “I sometimes feel like a non-technical person who’s in a technical field... I rely on other people for helping me understand how that works... I’m, as I say, a big believer in the technology just being a tool and not an end in-and-of-itself. So, I try and not overthink it and focus on the more creative decisions which I think is more where my strengths are...”79 Finding efficient and effective workflows and processes for collaboration between cinematic and game sound practitioners, is an area for future research and will enable an even greater and more efficient use of spatial sound in 360-films.

4.3 Conclusion

There is a significant and obvious difference between traditional film and 360-film. Lange from Cutting Edge put it this way, “It’s the same storytelling mentality from a sound perspective. How do you best tell the story? Except now the story’s all around you”.80 Placing the audience in the story requires a change in the way we think about sound for 360-films and requires an expansion of traditional cinematic sound practices.

Through production of ‘Afraid of the Dark’ and by incorporating into my work the insights from the interviews I conducted with leaders in the field of cinematic 360-film sound design, I found some cinematic sound practices took on new importance, and some needed to be expanded, adapted or rethought, for the unique environment of 360-film. The practices that took on a new importance in 360 included incorporating diegetic sound sources such as a night light and a dog, and using atmospheric recordings from the shoot environment. The cinematic sound practices that needed to be expanded on or developed for Afraid of the Dark included: the critical need to use spatial sound cues to guide the viewer’s attention and ‘frame’ the action, using ambisonic microphones for atmosphere recordings and a guide track under the camera, the increased documentation requirements of a production sound report, the use of new and specific software and plugin packages to create spatial sound, a significantly increased allowance for the timelines involved in spatial sound post-production and delivery for 360-film, and due to the overwhelming nature of virtual reality experiences, a greater need for clarity in the mix. My creative sound approach for ‘Afraid of the Dark’ was similar to traditional film and was from the position of ‘what is best for the story?’ - using sound elements creatively to guide an audience’s mood and shape their understanding of what they see and hear,

77 Lange, Thomas, and Plumb, interview.
78 Heap, interview.
79 Myers, interview.
80 Lange, Thomas, and Plumb, interview.
however, I did consider unrealistic and non-diegetic sound effects with a new level of appreciation for their potential for distraction.

Additionally, my background and focus on sound, and the inclusion of sound practitioners in the first conceptual brainstorm meeting, significantly influenced the development of Afraid of the Dark in terms of the story, the script, the shots, and the production design, and contributed significantly to the film achieving its goals. Including sound practitioners from early conceptual development can help filmmakers develop creative solutions to problems and can open up the sonic possibilities of 360-film.

The field is developing incredibly rapidly and throughout the course of this research there have been significant developments and several related publications. The pace of change is as exciting as it is challenging, and it is my hope to continue in this field and deepen this research through a PhD exploring the collaboration possibilities between the disciplines of game sound and cinematic sound for virtual reality.

This research was designed to make a contribution towards the adaptation of cinematic sound practices for 360-film and to benefit 360 filmmakers and sound designers who are shifting into immersive storytelling. As well as exploring the principles of cinematic sound, Afraid of the Dark was created to increase community awareness of microbats in our suburban spaces by giving audiences the chance to hear something they have likely never heard before – microbat echolocation calls. The scientific community widely acknowledge that our environment is in a state of ecological crisis and that without novel approaches to increase public awareness of, and engagement with, environmental issues, our world is in serious trouble.81 In an effort towards this, the creative work will be disseminated through film festivals and then distributed widely on the Jaunt VR platform (who expressed interest in distributing the project before it was made), YouTube, Facebook, Oculus VR and also through microbat conservation networks. It is the hope of the filmmaker that this work will inspire viewers to engage with, or consider, microbat habitat conservation in their own world.

As 360-filmmakers and sound designers, we are responsible for the development of a new sonic language for 360-film sound design. The medium is ripe with potential for societal benefit and I hope, as a discipline, we use this power for good.

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Appendix 1 - Glossary

1.1 Virtual Reality or 360-Film
For the sake of clarity, this paper notes the difference in definition between ‘360-film’ and ‘virtual reality’ as one of the depth of interactivity. In ‘360-films’ a viewer can look around a 360 degree space from a stationary point while the media plays from beginning to end, whereas, in ‘virtual reality’ the viewer can move around, walk through or interact with the environment, affecting the media in real-time. Both can utilise a headset (or head-mounted display) to replace the viewer’s full visual perspective, and regular stereo headphones to include spatial audio. Live-action 360-film refers to 360-degree videos that have been captured with a camera, as opposed to animated 360-films.

1.2 Mono Audio (Monaural)
“A single track audio signal from a single sound source.”

1.3 Stereo Audio
Having two channels of audio. Stereo audio in playback often refers to a left channel and a right channel, for instance, a left ear and a right ear in headphones, or a speaker to the left of a screen and a speaker to the right of a screen.

1.4 Surround Sound (5.1 and 7.1)
“Any of a series of stereophonic sound systems that uses at least left, center, and right screen channels and one or more surround-sound channels. One popular variation uses L, C, R, left surround, right surround, and a dedicated extra low-frequency channel. This system is called 5.1-channel sound.” “7.1 adds left center and right center front channels to the 5.1-channel standard.”

1.5 Dolby Atmos
Dolby Atmos is often referred to when talking about the latest cinema sound technology evolution. 5.1 and 7.1 surround sound formats require a commitment to channel panning for a predetermined number of speakers in a particular speaker layout, whereas Dolby Atmos adds object-based sounds that “contain meta-data that is used, based on each individual cinema configuration, to calculate the panning of these

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4 ibid, chap. Glossary.
5 ibid, 224.
additional objects during exhibition.”

This allows these spatial object-based sounds to be played back spatially over any number of speakers, in any layout of surround-sound speaker setups. In virtual reality, “Dolby Atmos VR tools provide linear timeline based object panning for sounds in 360° video, before being rendered to an ambisonic file.”

Dolby Atmos VR tools are an alternative to the Facebook 360 Spatialiser Plugins, used within traditional audio software, to create object-based spatial sound for 360-films. The Dolby Atmos VR tools are only for Pro Tools and cost $299USD.

1.6 Ambisonic

Ambisonic audio was first developed in the 1970’s and is a multichannel audio format that represents a full 360-degree sphere of sound, or ‘sound field’. These channels can be decoded to reproduce a surround sound experience to any number of speakers, including headphones. First-order ambisonic audio has four channels – left-right, front-back, up-down, and an omnidirectional channel. Second-order ambisons increases the number of channels to 9, increasing the spatial resolution of the sound field. Third-order ambisonics increases the channel number to 16, and so on up until sixth-order ambisons with 49 channels. Ambisonic audio has recently seen a huge uptake and use in audio production thanks to its application in virtual reality.

1.7 Binaural

Despite having only two ears, humans are able to localise sounds in space due to a number of physical factors including the slight difference in timing (and phase) of a soundwave hitting each ear depending on its location, and the changes to the frequency of a sound signal caused by the shape of an individual’s shoulders, ears and head. Binaural hearing refers to how humans use “information relating to the differences of the signals at the two ears”. Binaural recording often refers to a method of recording audio where two microphones are placed in the ears of a dummy head (one is each ear) so that the recording simulates how a human hears. For headphones, ambisonic audio is decoded to simulated binaural audio through the use of a pair of HRTFs or head-related transfer functions.

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7 Candusso, “Designing Spatial Sound”, 5.
9 Schutze and Irwin-Schutze, New Realities in Audio, chap. 2.
10 ibid, chap. 2.
11 ibid, chap. 2.
13 Schutze and Irwin-Schutze, New Realities in Audio, chap. 2.
1.8 Head-Related Transfer Function (HRTF)
HRTF or ‘head related transfer function’, refers to a computer-based set of parameters, or a ‘description’, of how a particular human perceives spatial audio. The ‘HRTF’ allows software to apply filters and decode ambisonic audio into binaural audio - spatialised, surround sound for a regular pair of stereo headphones, simulating the way humans perceive spatial audio in the real world.\textsuperscript{14} Though HRTF’s are individual and describe the specific differences between the sounds hitting a particular person’s two ears, general HRTF’s are used (with varying degrees of accuracy for each individual) to simulate binaural audio in virtual reality.

1.9 Head-tracked and Head-locked
Head-tracking in virtual reality refers to the technology that tracks a viewer’s head movements, so they can look around a 360-degree space in real-time. For audio, head-tracking enables the software to rotate the sound field in sync with the visuals and is necessary for any sounds that need to be located in a particular direction in the 360-film. In contrast, head-locked means the sound does not rotate as the viewer turns their head. A head-locked channel is commonly used for the soundtrack and voiceover in 360-film.

1.10 Diegetic and Nondiegetic
Diegetic sounds exist in the narrative or the story-world, whereas nondiegetic sounds don’t originate from the story-world. For example, music playing from a music box in a scene is diegetic music, whereas a score with no source in the story-world is nondiegetic music.\textsuperscript{15} These terms apply to sound effects as well as music.

\textsuperscript{14} Schutze and Irwin-Schutze, \textit{New Realities in Audio}, chap. 2.
\textsuperscript{15} ibid, chap. 2.
1.11 Reference List for Glossary


Appendix 2: Location Sound Report for 360-Film

See the next page (p.45) for an example report and p.46 for a blank template.
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Appendix 3: Post-Production Spatial Sound Workflow

COMPUTER SPECS:

Macbook Pro (Retina, 15-inch, Late 2013)
Processor: 2.3 GHz Intel Core i7
Memory: 16GB 1600 MHz DDR3
Graphics: NVIDIA GeForce GT 750M 2048 MB

AUDIO SOFTWARE:

Download and install:
- Reaper (version 5.961 OSX 64-bit) https://www.reaper.fm/download.php
- Facebook 360 Spatial Workstation (VST) – macOS – v3.3 beta3
  https://facebook360.fb.com/spatial-workstation/

VIDEO CONVERTER SOFTWARE:

FB360 can play back a number of video formats but they recommend DNxHR_LB. This was the only format that was able to be successfully used on this project. To convert videos to DNxHR_LB on a Mac you need the following.

Download:
- ff Works v1.1.7 http://www.ffworks.net/download.html
- FFmpeg 3.4.2 64bit http://www.osxexperts.net/ffmpeg/ffmpegexperts.html
- FB360’s FFmpeg preset https://s3.amazonaws.com/fb360-spatial-workstation/Knowledgebase+assets/dnxhr_lb_4k.prf

Note: ffWorks is the program, FFmpeg is a binary the program needs to complete the conversion. Ffworks don’t distribute ffmpeg for legal reasons and the FFmpeg needs to be downloaded from an external source. Ffworks do not guarantee any of the external sources.

Install Video Converting Software:

Tutorial: http://www.ffworks.net/tutorials.html

1. Install ffWorks
2. Launch ffworks
3. Click on the button ‘Install FFmpeg’ from within the ffworks program.
4. Locate the FFmpeg file (if the file you downloaded is zipped, unzip it first. The real file looks like a terminal file)
5. Click ‘Open’
6. Click ‘Ok’
Converting your video file for playback in Reaper:


1. Launch ffworks with the installed FFmpeg file.

2. Go to Preferences/Preset Manager. Click ‘Open Preset Folder’. A finder window will pop up. Drag and drop the FB360 FFmpeg preset file called ‘dnxhr_lb_4k.prf’ into the ‘ffWorks’ folder.

3. Drag your video into the ffmpeg window on the big ‘import media’ icon
4. On the ‘Target’ dropdown menu, choose the user preset ‘dnxhr_lb_4k’.

5. On the right hand side of ffmpeg, click on ‘edit’ next to the ‘General Options’ section.

6. At the bottom of the edit window, in ‘Custom Encode Options’, copy and paste one of these codes depending on your source media. **Do not** include the ‘a.’ or ‘b.’
   
   **A. is for monoscopic source media. (This may already be there, if so, just leave it)**
   **B. is to crop stereoscopic source media to monoscopic (better for playback in FB360)**
   
   a. `-profile:v dnxhr_lb`
   b. `-profile:v dnxhr_lb -vf crop=iw:ih/2:0:0`

7. Click the ‘x’ to close the window.

8. On the right hand side of ffmpeg, click on ‘edit’ next to the ‘Video (DNxHD) section.

9. Set the video size and/or other settings. For my computer to playback without crashing, I needed very small video dimensions. These are listed below. Facebook recommends a max of 3840x2160 and a max frame rate of 30FPS.
   
   a. Video Size: Choose ‘1280x720 (HD 720)’ from the dropdown menu
      AND THEN enter ‘320’ x ‘180’ in the dimension boxes beside.
   b. Frame Rate: 15fps

10. Click ‘Start’.

11. The video will export.
SOUND DESIGN IN REAPER WITH FB360:

Tutorial: https://facebookincubator.github.io/facebook-360-spatial-workstation/Documentation/SpatialWorkstation/SpatialWorkstation.html#getting-started

1. Launch Reaper
2. Open the spatial project template that was installed during installation.
   /Users/Shared/FB360 Spatial Workstation
3. The project includes spatial tracks and stereo head-locked tracks. More info and a detailed step-by-step how-to guide can be found at the above link.
4. You will load your video file, exported using ffmpeg, into the FB360 plugin within Reaper (not into the FB360 Video Player app).

EXPORTING AUDIO FROM REAPER:

Tutorial: https://facebookincubator.github.io/facebook-360-spatial-workstation/Documentation/SpatialWorkstation/SpatialWorkstation.html#id46

You will be exporting both an ambisonic file and a stereo file (the types of files exported depend on your distribution platform requirements – see the tutorials above and below). These then get put together with the FB360 Encoder.

COMBINING THE VIDEO AND AUDIO FILES WITH THE FB360 ENCODER:

Tutorial: https://facebookincubator.github.io/facebook-360-spatial-workstation/Documentation/SpatialWorkstation/SpatialWorkstation.html#encoder

This tutorial covers how to use the ‘Facebook 360 Encoder’ app (installed during the FB360 installation), to combine your files into one file for each distribution platform.

PREVIEWING YOUR VIDEO:

When working with a ‘Samsung Gear VR’ headset, the best app to use (as of October 2018) is ‘Oculus Video’. This has the best visual playback and supports higher orders of ambisonic audio. You can play back files prepared for ‘Facebook’ in the ‘Oculus Video’ app. Oculus video also supports the ‘focus’ mode.

Other apps currently don’t support spatial audio, don’t allow access to local media on the device, or have a poor visual decoder resulting in excessive visual noise.
Instructions for Oculus Video.

1. Copy the video file (exported from the Facebook Encoder), to the device you will be using with your headset. For ease, the file can be copied into the ‘Movies’ folder on the device.
2. Put the device into the ‘Samsung Gear VR’ headset.
3. Launch the ‘Oculus Video’ app, inside the headset.
4. On the bottom left, click on ‘My Videos’.
5. Click on the thumbnail/title of your video. The video will play.
Appendix 4 - Unpublished Interviews

4.1 Joel Douek - Sound Designer on ‘Under the Canopy’ by Conservation International

Alicia Eames: Hi Joel, can you please start by introducing yourself?

Joel Douek: Yeah, my name’s Joel Douek. I’m a film and television composer, and I’m also the co-founder of ECCO VR, which is a company wholly focused on music and sound in the immersive media space, so augmented reality and virtual reality. My background is actually a scientific one, so my degree is in neuroscience and human sciences. I've had various different careers over time, but it’s all come together in some sense with this virtual reality stuff. So, that’s me.

Alicia Eames: That’s such an interesting background to come into composing from.

Joel Douek: Well, I come from a fairly academic family, and I think, while I was encouraged to do music as a kid as a way of, they used to call it, rounding out one’s personality, it was never deemed to be an actual career-type thing. Then I ended up writing music. I used to work for the UN, believe it or not, for about eight years, between Paris and New York. I was a specialist in Chernobyl and land mines and a bunch of different things. I started writing music for some of the little documentary advocacy pieces that we'd do. They're called UN in Action because they were using library music, and since I was producing them, I thought, well, I'd like to write your music. That’s where I found my calling because I was never super comfortable as a band person on stage. I'm way too shy for that. Then I decided at some point I wanted to make a go of it, and I quit my job. I had no proof that I could earn a living from music, but my wife stuck by me. We made a go of it, and over time, it’s worked out.

Alicia Eames: Yeah. Wow. That's cool.

Joel Douek: Yeah.

Alicia Eames: So, you used to work for the UN?

Joel Douek: Yeah. Yeah.

Alicia Eames: That's quite a different background.

Joel Douek: I used to wear a suit. Grudgingly. But, yeah, my job there was to, in large part, be a vulgariser of science and some of the issues of, contentious issues, to do with toxicity or radiation in the Chernobyl era, all kinds of different things, and make it understandable to politicians and diplomats so that they would engage and they would raise money for it and take action. We would design and try to get projects funded by governments to remedial projects. That was my job there. Yeah.

Alicia Eames: Wow. Wow. That's very serious work.

Joel Douek: Mm-hmm (affirmative).

Alicia Eames: Although, you've worked on quite a lot of social or environmental projects in music composition as well.

Joel Douek: Yeah. I've leaned towards that. Yeah, I have because I've never been ... Well, when I left the UN and went full-time into music, I've never felt completely comfortable with the idea of being in the entertainment industry. When you have to fit into something, like, what’s your profession? And you think, well, I'm not a lawyer, and I'm not a doctor, and
I'm not this and I'm not that. I'm not an accountant, the different areas, and I have to put entertainment because I guess that's the catchall, but it always makes me squirm inside because I've never really felt that my calling was to put on a red nose and jump up and down in front of people and entertain them. It was more ... It was always more to use music and sound as a vehicle for making the world a better place, if that's a possibility. That's why I've always skewed that way, and I did a stint, as you probably know from my resume, I did a fairly long stint doing cartoons when I left the UN. That's just... yeah, that's the way it went. It's one of those ironies of life. When I was working at the UN, I used to... I had a little bit of that, the arrogance of people doing humanitarian work, and I would say something like "well, at least I'm not selling shampoo to children". Guess what my first job was when I left the UN?

Alicia Eames: What?

Joel Douek: I landed a L'Oréal kids' shampoo, so I was literally selling shampoo to children. That was, yeah, that was a disappointment. But, anyway, I think it's healthy to have to eat one's own words, so I did a long stint... I was one of the composers for Pokémon, and Yu-Gi-Oh, and the Ninja Turtles and Sonic X and F-Zero and a lot of different Japanimations and stuff like that. Then burnt out from that, and then got into the documentaries, which is where I found much more of, 'yes, this is what I want to be doing much more.' Yeah.

Alicia Eames: Just give me a run down, in your interview, of some of the documentaries you've worked on?

Joel Douek: Well, I started off doing Discovery Channel, History Channel, National Geographic type things. They weren't all good. Of course, the music was amazing, but... No, they weren't all good. There were things like Tutankhamun's Tomb Revealed. Everything said revealed at the end. Something like Nefertiti Revealed. I got to do better and better ones, working a lot with one or two British companies out of London. I was based in New York at the time. Eventually a pretty good one came around, which was called The Wildest Dream. It was a documentary, a dramatisation of the first attempt to climb Everest. That one then gathered some traction and then became an IMAX movie, and then had Liam Neeson and others attached, and so that put us all at a slightly different level.

The same company that I'd done all these projects with, the head of that company, Anthony Geffen, had managed to talk Sir David Attenborough out of retirement. His wife had passed away, I think, 20 years before, and he'd basically stopped. He got re-engaged, largely through the medium of 3D because Attenborough had always been a real champion of new technology, new visual and sonic technology and how it could help enrich our sense or understanding of the natural world and the history of the natural world. The story has it that at one point in his time, he was the commissioner of BBC Two when colour television was coming in, and that a lot of people around him would say why do we need colour? I mean, black and white's fine. You can imagine them with their English accents. He was the one that would say, "no, we need colour. We need colour. We need to show people the world in as real a way as we can." So, when 3D came in, he became a real advocate for that and would speak about it. Then when VR came in, the same. He's been an absolute champion of VR, and he's done some great things. So then I embarked on doing a lot of those projects with him and that crew. I think I did about ... I think I did about nine Attenborough's over a period of time. Then I've done a few documentaries on different issues, and then more recently getting more into narrative stuff as well. Yeah.

Alicia Eames: Yeah. Cool. And your background in virtual reality or 360 film, some of the projects you've worked on in that space?

Joel Douek: Just to let you know, how that all started, myself and a very old friend of mine, we grew up together, about 12 years ago, we were dabbling in binaural audio. At the time, the tool sets, particularly for digital audio work sessions, were not very deep, but we still could do
some things. We got some jobs creating sound only immersive environments, 360 environments. They wouldn't head-track, but they wouldn't need to because there wasn't any head-mounted display. Then it was about five years ago, VR started coming up, and we heard people talking about binaural sound and realised that we knew about that. This is something maybe we should investigate. Maybe there's something there for us.

Very quickly, we found that the world of virtual reality was largely populated and run by people from visual effect houses and visual editing houses, and they had no knowledge nor real interest in sound. So, we'd walk into these meetings, and very often it was, "We are so happy to meet you. Here, you do it." That's how it started. We realised that there's a real niche for this. It was early days, but we had some good tool sets. We were able to link up with the creators of those tool sets, so that we could give them feedback based on real world experiences. Then link up gradually with the general community of VR people, and then the more focused community of VR audio people.

As you might know, as you probably know, I hope, is that it's at least, still now, it's a very collegiate bunch. Everybody really helps each other. It puts you in a different frame of mind. I don't know if I would have ever consented to an interview if it was just about my music or something, but it's that sense of, well, the sound side of it, and the music side of it, needs support. It needs people to understand that it is 50% of the available experience, for the most part, and that by ignoring it, it's a huge oversight. There's so much that we can do, but it remains an afterthought for a lot of people.

You're a sound person, I don't know if you're a music person as well, but I take a page out of my neuroscience background to usually tell sound people, we have to make our peace with the fact that sound is always an afterthought. It's just the way our brains are wired. It's because it's subliminal. It's not a conscious thing that we do. We also don't remember to do it. We don't remember to budget for it and schedule for it, and all those different things. A large part of our jobs is to be these advocates and to wave the flag and evangelise for the importance of sound and thinking about it early. We push our way into even concept level meetings and say, "You don't know that you need us, but trust us, just have us there. We can help. We can help you figure out really creative solutions to some of the issues that we face in 360."

Alicia Eames: Thank you.

Joel Douek: You're welcome. Yeah.

Alicia Eames: Speaking through experience, how has your passion for sound worked in VR? How have you been able to push forward in the projects you've been working on?

Joel Douek: Well, coming straight off that thread, one of the things that people realise fairly early in this incarnation of VR, is that in 360, the user has total freedom. They have agency. They have free agency, and so for the director, they can't really have the same level of control over what the user is seeing, what they're choosing to look at, but sound becomes one of those very big tools that we can use in the form of attention directing, and we can use it subliminally. So by creating sounds that can move to the other part of the 360, the 180 behind you, we can get people to turn around. Then they can see something there that the director wants them to see. We can re-establish a form of influence on the user, and by doing that, we can open up the creative space for the director and for the set designers, if you want, to use. It's because a lot of the time, they would bunch things in the front because they had no real way of getting people to go behind them.

That's one of the things we would come to the table with, and say, well, what if we did this? And then you can spread everything out more, and you can then turn people around. Meanwhile, you can change the stage on that side, and using attention directing to great effect.
There's one piece that we did, called 'A Brief History of Flight', that was between the sound and the visuals as well, they did an amazing job, was a real textbook example of how to use attention directing really well. No one who's ever seen that thing has looked in the direction that they're not supposed to be looking. It’s compelling enough that they're there. The sound, everything supports it. You watch it, and the flow of things as an aeroplane goes by, and then there’s an aeroplane there, on the ground, ready to take off on the tarmac. But if you'd looked over 10 seconds before, there wouldn't have been anything there. It just appeared. It opens up all of those creative possibilities.

Fundamentally, we want to support the experience, the perception that this is real, and we can't do that if so... doesn't correspond. That's a very big part of it, it's just propelling that sense of the reality.

Another quirk, but a very important one that’s come out because of the way we generally experience virtual reality, which is through headphones and HMD, is that we can make a distinction between the head tracked diegetic experience, which is the out there in the world, the things that are happening around us, and the in here, internal, head-locked experience, non-diegetic experience that we can have inside our heads. We can propel that as a tool to reinforce a sense of presence by having body sounds and heartbeats and breathing and all those things. We can use it for voices in your head. We can use it for having split narratives. One thing is basically being narrated in one's head, and another thing is being narrated out there. Again, we're giving a tool to film makers, to VR film makers, a narrative tool that goes well beyond what you can do in cinema or television.

Then I think because I’m a composer, I always have that ear for where can I ... How can I think about the music and the sound as a more integrated thing? What opportunities are there to think about the music immersively. The project that I think you found me through, maybe, is the Amazonia one, ‘Under the Canopy’ - very unfortunate name, I think, but anyway. There, myself and my partner, our job was not only to record the sound for the film and the sonic and everything else, but to record as much total sound of the jungles as I could find and use that as an element in my score, in the orchestral score that I then wrote for it. Then discovering all of these fascinating things about the way the jungle was tuned, and going with that, going on this parallel journey of the sound of the natural world and how we could bring that in to support what is ultimately an advocacy piece.

So, yeah... a lot of different ... yeah, a lot of different tools there. That's really just a very top line look at it, but we go into a lot of depth with these kinds of things. As I said, we not only insist that we be at meetings early on, we always tell all our colleagues, “just ask”. Just push your way in because we want to be there at the ... really, when it's on the storyboard. Then we want to be there through the various discussions, and we honestly believe that it makes for better VR, better experiences at the end of it, if it's all thought through together.

Alicia Eames: I’ve certainly found that myself. I've been a recordist for VR and 360 film before, but this is the first time I've been doing it as a sound designer. Getting in early, into that concept development phase, it changes the way you shoot. The way we shoot things is completely different to how we would have worked considering what we can do with sound, so I totally agree.

Joel Douek: I mean, one of the big ones is the camera sees everything, so you have to get really creative with how you're going to record this. That's number one. Right, so we find ourselves often hiding under bushes, and, I mean, in the Amazon, it was ‘that's a scorpion’, or ‘that's huge spider’ or ant or something like that.

And yeah, just finding interesting places where we could hide but still have some connection and earshot or eyeshot of what's happening. We would change the choice of recording equipment. So, we started to sell some of our Sound Devices stuff in favour of the Zoom F8, where we could have some bluetooth control. In other situations, where we
would use Zaxcom lav kits, receivers that have a built in SD card, so if we were, as one time, Barry, my partner, was recording inside a mountain in the north of Italy. There's this cult there called Damanhur. They have this entire cathedral, temple complex built into the mountain. He knew, in advance, there's going to be big concrete walls in the way. We're only going to have one chance to get this, so those kinds of things in terms of the recording side of things. Rethinking how we're going to do it.

Also, one of the other things that comes up all the time that directors never think about, that becomes our job to tell them before they shoot it, before you record it, is if you want to spatialize these actors, speakers, whatever it is, you need to have separation. Overlapping, on the same microphone, I can't then separate them out. We go through the scripts with them and say you're going to need to tell the actors, take a beat, take beat, take a beat. If they don't do that, because sometimes they'll just get carried away - they're acting, that's fine, whatever they need to do - then we need to make sure that we'll get some wild lines as quickly as possible on set, before they lose the angle, do wild lines.

We also do our own foley on set because when you're going to the jungle, somebody's paying for you to go there, you want authentic sounds. You don't want to come back ... We actually told, in this case Conservation International, 'can we guarantee that the sounds that are in the final piece are geographically appropriate?' The answer was 'yes, absolutely', because they knew they were going to play it for the villagers that we'd filmed and worked with in the Suriname jungle, and that they would recognise their own jungle, as opposed to the Ecuadorians that would recognise their own jungle. The other thing is that there weren't a lot of ambisonic libraries, and there still aren't. We'd do a lot of our own foley. We got into the habit, and we always do that. That's on the location recording side.

Then on the post-production side, we realised over a little bit of time that everyone perceives virtual reality experiences as very intense, and that if we want things to work well from the sound point of view, we can't over-do it. There're diminishing returns. If you spatialize 100 different things, then it just becomes a big mush. It just doesn't really work. The way we like to think about it is, as humans, in our daily lives, our brains filter out all kinds of noises. Air conditioners, street noise, just so we can have a conversation, so we can tune into something. In virtual reality, that doesn't happen because the human brain doesn't know what's supposed to be important, and it's immersed. It's not like a movie where it can still tune out people talking behind me. You're immersed, and you don't know, your brain doesn't know what's important around here. What am I supposed to be listening to, and what am I supposed to be looking at? It becomes our job, as the sound designers, to be the filter, to make those decisions about what's important. Now, we do that in film as well, to some extent, like you bring something in, and you cheat it out. In VR we do it a lot, and we make harsher decisions about we don't need that, or that can sit as a head-locked ambience. We're not going to make that a distraction. We need people to focus on this and to really support the story line, whatever that's going to be.

Alicia Eames: Yeah. That's really interesting. I haven't actually heard anybody speak about that before. I've read a little bit about attentional deficits just because it's so overwhelming to the senses and stuff, but I haven't heard a sound designer talk about that before, so thank you. That's very interesting. So, what I'd love to talk to you about now is how you find cinematic sound design principles translate? You work in a lot of documentary, which does tend to have a focus on realism in sound design, making the sound realistic, but even in 2D documentary and film making, as you were saying, you make choices about what you include and what you don't include. Some of the cinematic sound design principles, like thinking Walter Murch, that sort of thing, where you actually end up with sounds that are quite different from reality, sometimes to make a point or create some tension between what's going on. How do you find that translates into VR?
Joel Douek: Yeah, I think to some extent, we have to use as a basis, those filmic conventions that Walter Murch and others, over time, created because that's what we expect. In a sense, when it's a voice in my head, or it's a dream voice, then you'll add some reverb and stuff like that. I think we do start with those conventions rather than throw it all away and start from scratch. We bring a lot of that onboard. Then I think that sense of what is the reality? What is, sound-wise, what is the reality? I think, maybe, we've been a little bit more purists so far - but it's early days - in the virtual reality world than you might be in a 2D documentary, where you'll create a soundtrack from scratch.

Again, because we've got all the way out there, the sound libraries that are available maybe are just not relevant in the same way. I couldn't live with myself if I put a, whatever it is, a wrong kind of tiger roar in that particular country. For me, it's as offensive as writing some music for the wrong region, for that country, or the wrong instruments or something like that. I think we tend to be a little bit more purist, so far, but maybe that'll change as the volume of ambisonic libraries increases and stuff like that. But it's really, we want to bring the flavour of the place, the setting, maybe a little bit more forcefully than we might do in 2D, because rather than just watching onscreen and being somehow separated from it, you're in it. And in as much as you want to represent the place visually as much as you possibly can, you really want to represent the sound of it as accurately as possible. I think we're trying to depend much less on music libraries, which is why we tend to do our own foley on site - crunching feet in the jungle where we're shooting in Africa or wherever we are, we try to do it there.

And then I think there's a whole lot of stuff that we take onboard from both a location recording side and from the post production side from film, but then there's a whole other level and there's a whole other language that we are developing, that we need to develop to take advantage of this much broader palette, a much broader tool set. And there are very different needs of it. I'm sure I can think of some examples, but if you want to keep going, I'm sure some examples of that will come up.

Alicia Eames: A lot of people speak about developing the language of sound for VR, that we're right at the beginning of this thing.

Joel Douek: Yeah. One of the ideas, okay. I don't know whether you're looking into AR or mixed reality?

Alicia Eames: I'm focusing on 360-film but it is definitely within the scope of comment.

Joel Douek: Okay, so let's not go too deep into that. Obviously there, there is this whole new field that I guess magically is called spatial computing. It's not just about experiencing something. It's about the way we will be and the way we are beginning to interact with machines, with computers. And in order to facilitate that, sound can play a very important role. And the same roles indicate to us kind of user interfaces but in a spatial sense by helping us understand that this particular object in a mixed reality or virtual reality field does this. We can help kind of explain the function.

But then, there's a whole other level, like going back to virtual reality, there is a whole other level that I think is possibly one of the most exciting areas of virtual reality. Not strictly speaking, only related to the 360-film, but I'll give you an example, some of the work that we've been doing and what that led us to.

We were asked, I think it's maybe two years ago now, to provide the sound and help conceive the sound for a virtual reality experience to help stroke victims regain mobility of limbs, loss in ability. In this case it was an arm. This was done as a unity-based kind of interactive experience in 360 where we used sound as a way to give the patient feedback of the position of their arm and to gamify it so there would be a system of incentive and reward that was fed back to them through sound, through pitch and sound and a sense of achievement and that kind of stuff. In the process of working on that, we came across...
some really amazing research that's being done at the moment with paraplegics - you may or may not know about. There was kind of a parallel programme that was being done where they took a group of paraplegics completely paralysed from the waist down and similarly, they created a virtual reality experience, so it's a combination of a beautiful setting that calms them down in various ways and kind of engages them in the moment. And in this case, it was to use the virtual reality connected to the brain impulses to help them gain control of these robotic exoskeletons. They would wear these kinds of exoskeletal legs. And then through the VR, they were able to train them to start to move these robotic legs. And it worked. That was amazing in and of itself. But about a few months into the study, they started noticing that these patients during their downtime when they're lying in their beds, they just started wiggling their toes. And then some months later, they started moving their feet. And then somewhat later, they started to be able to move their legs. And the patients that participated in that study are no longer classified as paraplegic. They're classified as part paraplegic.

In that case, VR, our entertainment and gaming thing, whatever it is, has achieved something that neither neurosurgery nor any conventional type of physiotherapy has been able to do. The question is, just because that's happening to them, doesn't mean it's not happening to us. And in a way that we're experiencing VR, it's influencing us in much more profound ways than we might know that is giving us a sense of our reality. It's giving us a sense of empathy - they call it the empathy machine. But it's quite feasibly rewiring our brain, even 360 videos. That was quite deep. Here's one for you. You're welcome to...

This is an idea of what we've been working on for awhile. It's a little bit out there but again, I can kind of back it up.

Arguably in human evolution, the thing that has really defined us is the development of the frontal lobe. That's why our heads grew. That's why we start to walk upright and support these big heads. And in the frontal lobe is one particular area called the prefrontal cortex. Do you know what the role of the prefrontal cortex is?

Alicia Eames: Not really - I certainly couldn't tell a neuroscientist.

Joel Douek: Okay. Colloquial people will say, well that's for higher decision making. That's why we're humans, right? And that is true. But if you go into it a little deeper, the role of our prefrontal cortex is as an experience simulator. Does that sound familiar? It's an experience simulator. By simulating experiences, by having a preview of experiences, we're able to make better decisions, whether it's, "Oh, I like it in Galapagos so I think I want to go there in person" or "I like that hotel" or "I understand what it is to be in this person's point of view and be on the receiving end of prejudice" or all these different kinds of things.

My argument is that VR, in a sense, is in the direct line of evolution, of human evolution, through developing experience simulation as a primary tool for our argumentable dominance as a species, but then we're able, now through VR, not only to experience our own simulations but I can experience your simulation, your imagination. You can experience mine. And what that can do is pretty robust as I think we're starting to find out.

It's not just a question of watching a movie anymore, it's living somebody else's life. It's stepping into somebody else's shoes. A philosopher would say the basis of all human ethics is the ability to put one's self in the other person's position. And now we can do that even if the person is morally challenged or imaginationally challenged. We can still bring them there. We can give them that experience and we can change fundamentally their experience of life and the world around them through this relatively innocent technology.

All that to say that you know, I think it exists through all these different levels. I just gave a talk a couple of weeks ago at AES in Seattle on augmented virtual reality, all about how as sound designers, as we see virtual reality enter into so many different walks of life, so
many different industries, we go with it. We find ourselves called to do sound design work in the health sector, in the industrial sector, in architecture and in all of these different areas and it kind of potentially multiplies out the jobs, the job opportunities, but also the innovation that we can create, that we can start to figure out in our entertainment VR experiences but then roll deeper into these different areas of life. That’s a little way of saying, yeah, we use film stuff as the basis, but it goes so much further and we have to follow that by necessity and constantly create.

Alicia Eames: I feel quite a burden of responsibility in that as well, because it’s such a powerful experience and it affects people in a big way. I just feel quite burdened by the responsibility of not doing damage.

Joel Douek: I get asked that question actually quite a lot. If it’s so powerful, can’t we damage people and the answer is, yes, absolutely. But at the end of the day, I think the way, we don’t have to get too deep and dive in the philosophies of life, but I think what we always want is for the good to outweigh the bad. We want to dilute out the bad with good stuff, good creative stuff, and the only way to do that is by being prolific and by doing it and getting it out there and exploring that side of things. And yes, people can put it to negative use and torture and all kinds of stuff and power to them. If that’s really what makes their life meaningful, then there’s not a lot of discussion that we can have. It’s our job. I wouldn’t say it’s a burden. I think it is kind of a calling to be creative in doing positive things with it.

Alicia Eames: That’s great. Thank you Joel. I wanted to talk to you briefly about the technology because the technology is developing so rapidly and obviously, the technology side of things is only valid for a very short period of time. But if you could speak to the development of technology and the difficulties you have in that, how many VR projects have you done now?

Joel Douek: I don’t know actually. I haven’t counted. Some of them were like grouped together. I probably would say 30 or 40.

Alicia Eames: Wow. That is a lot of VR projects.

Joel Douek: Yeah. Not all of them are in the public eye, like the one we did in Africa. That was specifically done for world leaders at Davos to convince them about the importance of supporting maternal health and mitigating maternal mortality in Uganda. A lot of projects that haven’t seen the light of day for one reason or another, some narrative pieces, but we’ve done a lot and we’ve stayed busy. Really from the get-go which is kind of amazing. As composers you’re like “throw me some scraps” at the beginning. But we got... again, because there’s a need. Also, I don’t know if you know this, but we’ve actually, we just launched last week, we created the first online course on audio and music for immersive media, which was.. We’re teaching out of Columbia College Chicago Online. It launched last week and we have our first students. And we’ve written effectively the makings of a book. I think there’s a couple of books out there. I heard there’s one really good one that came out recently. I have to remember the name of it to pass it on to you, written by some real top people. And we hope to kind of put ours together, but in the meantime, we’re basically passing on everything we know and hopefully continue to build that knowledge and put it out there for people to use.

Alicia Eames: That’s fantastic. I will have to look into that.

Joel Douek: Yeah. Obviously, we need things to sound and represent our sphere, our reality sphere as accurately as possible. And we often do butt up against the technology in different ways. For example, while we want to have the maximum spatial resolution, often with projects, we’ve been asked to deliver for YouTube which only allows first order ambisonics, so we have to kind of collapse down all of our work to sound horrible. And we lose on YouTube
and some of the other platforms, we lose the head-locked channel. It doesn't allow for that.

We've been very actively pushing for at least what we call four plus two which is the four channels of spatial but the two channels of head-locked. And we've been pushing that with DTS, with YouTube and with many others. It's put us in a role of not just being advocates of sound but advocates to adopt better sound technology, so with a lot of the companies that we work with, that bring us in as just the sound guys, we often find ourselves saying, "You need to bring in at least second-order ambisonics. You need to move away from Dolby, Dolby VR atmos", which, you know, ended up shutting down anyway, and advocating for the best technology because otherwise, then we don't get to deliver our work in the best possible way.

Now we're all moving towards third-order ambisonics and we're pushing that pretty hard. And we find ourselves advising people because they don't necessarily know. For a lot of VR filmmakers, there's so much camera stuff they need to know - this new camera and that new camera, how's the light for the Sony versus this and that, and how well do they stitch - there's a lot they have to deal with. We feel we have to kind of really be team players in this way, much more than you might be in a regular production by helping them figure out the right technology and thinking through how ultimately this scene is going to be played.

The technology is a huge part of it. Where we come from as creators is always trying to have a really good balance between, a friend of mine called it the holy tri-factor which is the technology plus the idea, the creativity and then the productization of it.

I think all of us who are working in virtual reality from any perspective, whether it be sound or visuals or writing, we should all have a good grasp and keep a good grasp throughout the whole process of those things so that we're harnessing the technology and not getting swallowed up by the gimmickry of it. And we're thinking creatively about fundamentally, what do we want people to experience and why do they need to experience it in VR? And if it's in VR, what are we going to do with that? What are the opportunities that we can take advantage of? And then what's the product going to be in a sense? Is it going to be a film or is it going to be interactive? What makes sense and sometimes how is that going to be monetized and how are people going to get to see it? Are they going to get to see it on their phones or on an Oculus Go or on a Vive? We'll often think that through and try to advise. On our post production side, we deliver every project. We're ready to deliver every project in every format for every platform. And fortunately because of the tool sets, that's become very, very easy. We really just do the work once in the Facebook 360 Spatial Workstation and then we can take those stems and encode it for YouTube, this, that and the other.

Sometimes the little quirks that we need to do, if for example the head-locked experience is very important for a particular VR piece, you know, you've got a narrator in your head or even music, you want it to be everywhere. You don't want the music to kind of head-track, so we have to come up with creative ways of using that technology to effectively collapse the spatial and preserve even in first order ambisonic only, just four channels, the sensation of there being diegetic plus non-diegetic and we were able to figure something out to do that.

And it's incredibly fun to be part of some of these Facebook groups where we all just confer all the time. It's like, how would you do this? Or I need to turn this into a 7.1 and then turn it into a third order ambisonic and how would you record that? And this constant backwards and forwards.

We've seen a lot of frustration among the traditional film and TV sound people. It was like, we've been doing this for years. We know how to do this. And the answer is no, you don't. Yes, you've got some chops and you've got some equipment, but the reason we
post-production people and composers, the reason we started to do location recording is because we weren't getting what we needed. For example, we weren't getting separation. We weren't getting the spatial audio. Whatever it was, we were not getting what we needed, so it's that old adage of you want it done right, you do it yourself, and that's how we started doing it. And then we discovered that it's quite fun to step out of the studio every now and then.

Alicia Eames: One other thing that people have mentioned with the location side of things is getting distance tracking, like as in having an understanding of how far away people are. And I actually spoke to a game sound designer, and she was like, there has to be a piece of tech coming out soon that will do that for you, because in game design, they just have objects that move around in space that have all of that information. We just need some sort of motion capture on the cameras that does that...

Joel Douek: Yeah. There are also technologies coming out. I actually have one I was about to patent it and then found out that someone else was, that Sennheiser was working on one. Well, I can't compete with Sennheiser and they're ahead of me, so I let it go, but it was basically using a system of trackers, Rf trackers and then taking their meta data and plugging that into the spatial plugin. Still, nobody's come out with it. What Facebook 360 has done, now they have at least visual tracking, so it can - it's not working great but sometimes it works - track around the space but it won't deliver a sense of distance.

Distance is a whole thing because at the end of the day, again, it's about creating a perception that works for the story, the story even being a documentary. And by observing the true physics of the true distances, more times out of any, it won't work. It'll sound too far away, even if it's accurate.

Now, that might be because the HRTF's are faulty or the plugins, they haven't really calculated distance in the psychoacoustics of how they deliver it, but you have to let your judgement ultimately be king or queen. And just say, "what sounds right? How am I delivering that sense of someone coming towards me?" And more than that, we have to fake it. We have to really overemphasise that sense of someone coming towards us. Like super quiet and then much, much louder.

And it's just like in mixing music. It's like your ears in the end have to be your guide, not the physics, and so you can spend as much time as you want measuring things and then translating that into 'that was at 7.2metres' but then it's not very useful. Just use your ears, but distance is a tricky one.

Also tricky is you know, up, also tricky is right behind you. And so again, these are the kinds of things we tell directors is when they're deciding about the orientation, we'll tell them, you know what, don't have that person come straight from behind you. Have them come from left shoulder or right shoulder because this was second-order. We can detect that much, much better, whereas if it's right behind you, it could sound like it's coming from right in front of you.

Third-order starts to improve upon that somewhat more. By the time you're like fourth, fifth order, we've heard, I think I can't remember what else we heard but pretty high. After third order, it starts to become kind of diminishing returns, but you can guess an amazing spatialisation in third order.

And I think that's the thing. It's like we don't, like with the visuals as well, we can go ultra 4K and then we can go this or whatever. But at a certain point, I think it is diminishing returns, retinas and stuff. I think we're close to being there already which is exciting on the sound side where, when we reach that point, it's just like, okay, now, let's just have fun and create great stuff and then the technology can kind of sink a little bit more into the background which I think is its rightful place.
Alicia Eames: Do you have some good case studies you can point me to of your work that you're really proud of, particularly if it's in an environmental or social space? My Africa is beautiful.

Joel Douek: Yeah. I mean, that would be the one I would probably, I think that was our best opportunity to kind of explore and experiment on all levels. We brought three ambisonic microphones because of the intense heat and humidity in the jungle, two of them didn't work and things would go wrong all the time. We faced all the challenges. By all indications, we shouldn't have succeeded but we did, somehow, where everything was stacked against us.

That would be my primary one. The other one is probably the one we did, which I could send you, on maternal mortality in Africa which is called 'All for Mothers'. There's a couple of other projects we did here in L.A. There's one that's called 'Save the Lions', I think. And it was part of a campaign to create a crossing for the wild animals in regions of L.A. so they didn't try to cross the highways. And when we launched it at the fundraiser, if I'm not mistaken, they raised three million dollars largely because we had it on oculus cardboard printed up, you know, with the face of a lion and stuff like that. People got to experience it first-hand.

That's a good one as well, so probably those three. And those are all strictly 360-video. But in a non-environmental side we're doing some pretty interesting stuff. For example, on the music side, we're also doing a lot in volumetric these days as well.

Alicia Eames: Can you tell me what that is?

Joel Douek: Volumetric is effectively being able to film, instead of inside-out which is your 360 camera, right? It films the sphere around you, you know, the sphere you're in - Volumetric is outside-in. You're usually in what's called a volumetric capture space, a green screen and there's systems of cameras around you, around the subject. It's not something you can take on the road. And you're able to film from every point at the same time.

You can then take that asset, which is not just a visual asset, but also a mesh that you can then do things to it. You can turn the head. You can do all kinds of stuff. It's almost like a mo-cap thing on steroids. And what you're actually capturing then is a hologram, a hologram of a person or whatever it is. And it was invented for the HoloLens by Microsoft but now it's rolling out and having a lot of use in VR.

One of the big failings of video games is that the people in video games, they have those dead eyes. Now you can take real actors and you can film them in volumetric and you can put them into your video game. That's something to watch out for. And then on the sound capture side where we're currently working on a kind of a secret tech with Sennheiser to see if we can come up with new ways to capture the space where we don't have to depend solely Lavalier mics because lavs is everything for us right now because we can't hide mics everywhere. It's all about the lavs and lavs are not the most perfect solution because they rustle and they're annoying and get interference. We're trying to come up with new systems. And they're basically largely around kind of beamforming type ideas. I don't know if you know anything about beamforming.

Alicia Eames: Not really, no.

Joel Douek: Something to kind of look at, because that's going to be a big future for us sound people in the not so distant future. Effectively what it does is it uses multiple microphones, let's say pointing in the same direction and by taking all of the, you know, the sound recordings and comparing them algorithmically, it can then effectively steer you to one particular place and so you might have 32 channels of audio, but you'll end up with one, one channel that represents, and you can pull focus, so I can pull focus in the distance and I can bring it on there all in post-production.
Alicia Eames: That’s incredible.

Joel Douek: Yeah.

Alicia Eames: It sounds like that camera that they developed where you can change the focus in post.

Joel Douek: That’s Lytro - they were one of our clients until they closed. Yeah, that’s the same thing. Yeah, Lytro is ... We were the sound team for the Lytro.

Alicia Eames: Right. I’ve been wondering if they were going to develop something like that and do me out of a job onset.

Joel Douek: You’ve still got a job for a little while I would say, but rather than think of being out of a job, I would say start to come to understandings about the technology and what that might mean for a sound person because it'll still use a complicated array of microphones that we’ll need to understand, but maybe our job will become more of a software based thing because we'll have to understand algorithmically how it's working and how to get the best results. Yeah.

Alicia Eames: Interesting. Very interesting. That’s amazing. I don’t think I have anything else for you. Is there anything that you haven’t mentioned that you think’s important?

Joel Douek: Probably. It just kind of depends how deep one wants to go in all of this stuff. I’m just looking quickly at my course outline. Where’s my Dropbox? Just give me one sec. Oh, here we are. You know, I’m thinking in particular, there’s kind of a chapter that we teach which part of all the workshops we do as well which is the role and value of sound in VR.

Alicia Eames: Thank you.

Joel Douek: Okay. We talked about the subconscious world of sound, the fact that it is subconscious, but what I didn’t also mention is the fact that it’s principally linked to our emotional systems, our emotional brain systems. And that is evolutionary a good thing, right, it’s so that we can react quickly and emotionally to potential dangers or potential mates.

These are fundamentally very, very important things and so you know, when we look at the hearing system next to the visual system and we’re in this world of 360, of course for us, sound has always been 360. It’s 360 and our ears don’t blink. We’re in a sense not inventing something new and I like to remind sound people that in amongst all this super crazy technology, what we’re doing is bringing back a technology that has been around effectively since there’s been humans which is that of 360 sound and how it influences us and affects us.

And understanding that means we can harness it in better ways, understanding how we create the sense of danger and the sense of something ominous and how that works and how the spatial aspect of it becomes important. What are the other... There a few other things apart from attention directing and what I just talked about which is - I call it ‘emotion directing’. In emotion directing, you can do that with sound but you can also do that with music in the conventional way that you would, capitalising on the fact that sound is connected to our emotional brain.

We also use sound to set the dimensions of the space. We need someone to feel like we’re there, whether it’s in a tunnel or a canyon or in the boot of a car. Through sound, instantly, we can represent that through the acoustics of the space, so very often we’ll be taking impulse responses, or you’re just using these very elaborate reverbs that we have

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to help propel that sense instantly for the user that we're there. That's another important role, setting the dimensions of the space.

We've talked about internal versus external experience. The other one, we like to flag and what we do a lot is onboarding. Do you know what onboarding is as used in video games? It's basically that the human brain won't necessarily accept things automatically. For example, if I catapult you into a completely different location, completely different design of space, you're going to have a little bit of a hard time initially accepting that. The theory of onboarding is to say, what can we do to help like birth people into that new perspective?

That's done visually in various ways where you're transported to a desert through a wormhole or you walk through a portal or you go through a door, all these kinds of things, but we do it also with sound by introducing some of the sounds of the scenes that has come in advance. Also an old filmic trick - sound before picture.

Alicia Eames: A J-Cut.

Joel Douek: Yeah. And we kind of need to do that in a lot of situations for VR because it is very jarring otherwise. Onboarding is something, is a concept that we bring into sound and we try to flesh out what exactly that means. You do musical onboarding as well, where you have a little intro to the theme, whether it's Michael Corleone and the Godfather, you know something's coming, or you know Darth Vader is coming because you hear his theme.

We talked about less is more, not over-diluting it, and we talked about being the filter. We've talked about supporting the story is a fundamental thing. And we talked about yeah, some positions are better than others.

I think also the other thing we like to make a point of is you need to understand the genre of what you're doing and understand your audience. And what does that mean for the sound design and what does that mean for the extents of which we'll use spatial to an aggressive degree, whether you want to make it a thing as part of the gimmick. Sometimes when we do horror pieces in VR, then we'll go all stops out and like stttchchhh to scare people in all kinds of ways or bring in the creepiness. There's an enormous amount that you can do there.

When we're thinking about shoots, and I actually used to do this with films as well, not just VR, is of thinking in advance about sources of sound that can be placed in the shot diegetically, that will give you reasons to have spatial audio in there whether it's a TV or a radio or this or that, and so thinking about placing diegetic sources.

And then finally, we talked about that a little bit is workflow consideration. By understanding and knowing your post production process, so for example, knowing that you're going to have to have separation in order to spatialize these individual speakers and actors, that affects very much what you're going to do on location and the choices you're going to make with your microphones and all of that.

Having that kind of retrospective look, and I think it's very useful being the post production person as well as the location person because you're able to kind of realise that whole thing and what you're going to need to get because very often you're not going to be able to go back and get that, so really covering all your bases with wild sounds and all of those, every possible eventuality that might come up.

The last thing I would say, and it kind of goes back to the technology is ambisonic microphones, microphones in general. They are not human ears. They are microphones. They are not able to pull focus, not till we get to beamforming. No matter how fancy your microphone is or an ambisonic microphone, whatever it is, it still suffers from the same problem as all microphones which is proximity effect. In a lot of shoots, people would
imagine we'll just use the ambisonic mic that's built into an H2N or whatever it is, you plug the mic coaxially with the camera above or below the 360 camera, but your action is happening - if it's happening more than a foot away, which it always is, what you're going to get is a lot of ambience. You're never going to have that sense of presence. Let's say you're recording a band on the street where there's going to be a good signal to noise ratio. They're going to be loud. An ambisonic mic is great. The work is done for you. It's all pretty spatialized. That's very nice but that's really the exception. The majority of situations, what you've got is largely unusable. We have an endorsement from Zoom at the moment and they're just about to launch a new ambisonic mic. Everyone gets super excited about it but they just forget that fundamental thing, and that's why the lavs are so important because in traditional film, you'll have a boom. You can't have a boom in virtual reality. The lavs is all we got until we come up with this better solution. You understand why we're so keen to get that. We're still hoping for people to develop that.

I think that's everything from the point of view of the growing value of sound in VR.

Alicia Eames: Did you use the ambisonic mic? Did you use it for atmospheres in the jungle or...?

Joel Douek: Yes. Yeah. I did a lot. You want to know why? Because the jungle is really loud, really loud. I don't know how many decibels, I should have measured that. I probably did measure it. But it's up there. It's a cacophony and so in some sense it's perfect for that except for the fact that our ambisonic mics kept crapping out on us, but we used them a lot. Yeah, we created a lot of those atmospheres.

But then sometimes we'd just use like stereo-mics, two stereo-mics and then do them 90 degrees to one another and then we'll build a soundscape from that. Yeah. We'll see. We haven't got our hands on an OctoMic yet, the new second-order and there's a very cool third-order microphone made by company I think it's called something like Zylia. That's for 600 bucks. That's a kickstarter. And I tested it and it's freaking amazing.

Alicia Eames: Oh, wow.

Joel Douek: I'm going to send you a link. They're in Poland but they're selling it and I'm getting one.

Alicia Eames: For 600 bucks, that's crazy.

Joel Douek: Mm-hmm (affirmative).

Alicia Eames: That's amazing. That's going to put some people's mics out of business.

Joel Douek: What's the theme of the research and what are you trying to demonstrate or prove, disprove?

Alicia Eames: There's a couple of things. I've got a project associated with it. And what I'm planning on doing is weaving your interview through my own discoveries through doing this project. The film that I'm producing is an environmental film, a narrative piece, but we've developed it around sound possibilities rather than around visual.

Joel Douek: That's great. That's super.

Alicia Eames: We're using microbat field recordings, and so we've developed a short story around that. My research is going to be the processes of doing that, findings about the way that things work and a way that you can work with the cinematographer and the production designer to create sound possibilities. What you're saying about having diegetic sources of sound, so we have a little music box if we wanted to add diegetic music. And we had a little dog that runs in and growls to help guide attention and that sort of stuff.
And the other side of it is exploring how cinematic sound design principles translate into virtual reality and what works and what doesn't at least in this project, in this one project.

Joel Douek: I would love to read that comparison eventually because I don't think anyone's really captured it all.

Alicia Eames: Yeah. I'd like to capture a piece of it.

Joel Douek: A good piece of it and like a good analysis effectively of what you keep, what you throw away from conventional approaches and what we need as new.

Alicia Eames: Yeah.

Joel Douek: And where, what we need next, both on the post-production and the location side.

Alicia Eames: Yeah. One thing that's really interesting that's coming out of my research is the change in sound team on location and just throughout. Typically, you just end up with a location recordist, because if you're lucky you'll get a boom op and a utility but around here we don't often get that. And then it goes to post-sound which is a completely separate thing, whereas everyone is talking about like almost like a role of sound supervisor on location and throughout the process.

Joel Douek: That's us. We wear those different hats. You need that linkage between the location and the post-production. It ideally needs to be the same people. In a lot of cases, we've actually, we turned down things where they just wanted to hire us for location sound. Or I don't mean, I pass it on to friends. I just tell them, "We don't do that, because otherwise, we can't walk away from the project feeling like we've done a good job. I don't know who's doing the post. And so, all our efforts might be for nought and also, in the situations where we have consented to do it, there was one we did quite recently, we had to have just these exhaustive conversations with the post-production team who in this case were in Sweden.

And then the exhaustive preparation, so they would understand what the hell we put together and why, because we know why we do it, but they might have a different approach. That just seems like a big waste of time. We are always fighting to have two people on set because we are dealing with multiple recorders and a lot of stuff happening at the same time. And when we don't get given that, to be honest with you, what we do is usually comp myself. Ben, he's our lead location guy, but I'll often say, "I'll come along and I'll do it for free," which is cool because you also want to build those relationships and show goodwill, but it's because we need two people.

Alicia Eames: Yeah, wow. Thank you so much - you've been amazing and your insight and experience is invaluable, Joel.

Joel Douek: If you come up with any other questions or you want to do another Skype call, anytime, I'm totally open to it. Because we put this course together, we have to really kind of actually buckle down and focus these thoughts and so, apart from the role and value of sound and VR, there's another seven chapters that are all kind of, you know, they're used in various different ways.

There's one on location recording. There's one on linear post-production and there's one on interactive, so game-engine based post production.

Alicia Eames: That's fantastic. Thank you. Thank you so much.

Joel Douek: All right. Take care.
4.2 Roland Heap - *Sound Designer on ‘My Africa’ by Conservation International*

**Alicia Eames:** Roland, by looking at your CV – you have been the sound designer on a lot of feature films and quite a few virtual reality projects.

**Roland Heap:** We've done a few virtual reality projects, we've done a couple of augmented reality projects, and I also do a range of music projects. My career so far has spanned a bunch of different disciplines and I try to keep a hand in as many of them as possible because all of them, I think, for me have a different and unique draw to them. And in the example of VR, I find the technical challenge of actually of working in VR invigorating, and actually with each of them it exercises a different part of my brain. I find when I end back on a music session, the art of reading a score and being able to discuss in musical terms, is again a totally different area of my brain and to some extent they all need exercising to keep oneself fresh in them. So, it's the same with film mixing and sound design and whatever else. I try my best to maintain a skillset in all of them without ever going down any of them or trying to do something that I'm no longer skilled in or whatever else. I think it's like speaking lots of languages. I know a few people who can speak multiple languages and this one guy particularly can speak 14 languages. But you have to keep it up. You've got to read a lot in every different language to keep the vocabulary fresh and to keep it fresh in your mind otherwise you can find they drift out of your mind and I think it's the same with different sonic disciplines. I certainly miss any time we go on location now because location is something I've pretty much dropped entirely. Every time I go on location I have almost a panic because I have to relearn just how to speak to people. And the on-set hierarchy and all of that sort of thing which is the stuff you just forget.

**Alicia Eames:** You did do a fair bit of sound recording in the earlier part of your career. Is that right?

**Roland Heap:** In the early part, yes, I did a bit of location sound. I don't really miss it. I don't miss the long hours. I think the fact that the standard day on location is like 10 hours or 12 hours-

**Alicia Eames:** Yeah.

**Roland Heap:** Is mad. I think it's completely incompatible with family life and I don't miss it at all. That said, the time off in between jobs was always good.

**Alicia Eames:** That's true.

**Roland Heap:** So I guess there are things that make up for it. But yes, I think working in sound post, I think it's very very important to have had some experience of location sound because I don't think you can really understand the materials you're presented with otherwise. I think there's a great tendency in post for us to go 'ah you know they haven't done this because they're lazy or whatever, or they didn't try' and I think until you've been on set and fighting the good fight and really striving against all of the odds to capture decent sound, I don't think you are really in a position to criticise actually because so often it is so difficult to get good materials on set and you are faced with insurmountable challenges. I reckon, there's a lot, and everyone in post should spend at least a few days on a difficult shoot to understand why sometimes things might not have ended up being completely labelled or whatever else.

**Alicia Eames:** Ah, yes. I'm guilty of not completely labelling things myself on bad days. So, you'd been working in 2D feature films for a while before you stepped over to VR. How was that transition?

**Roland Heap:** It was interesting. I was experimenting with bits of VR stuff and looking at what was then the Two Big Ears suite of software and things like that, in a very hands-off sort of, fiddling around and seeing what was possible for a while before we actually did any serious work with it on the assumption that at some point someone would want us to do something in
VR, so I was keeping my eye on the tech. But it really all started when a client who we'd worked with in the 2D realm came to us and said, hey I've got a VR film, do you want to get involved? And we were like yeah sure. So we kitted up. We got ourselves a headset or two, and downloaded all the various things, set up a work station for previewing. We had to enter the PC world so we could actually play back a lot of stuff because working on a Mac for everything isn't possible sadly. Yeah, and then it all sort of took off from there really.

That first project was an enormous process of trial and error and exploration looking at the various different software. We pretty much downloaded every single available plugin at that point. We had a look into Reaper. We did end up using Protools because it's much much quicker for us mixing in Protools because it's what we know, but we investigated Reaper, we looked at Nuendo, we tried to look at the offerings by everyone before figuring out the workflow that eventually worked for us. It was a huge process of trial and error and the fascinating thing is that everything's moved on so fast since then that we couldn't replicate the same processes we did then. We can't even open the project anymore because the plugins have all moved onto new versions and it's almost impossible to open projects from two or three years ago even. In any other format you're fine. Protools is great at being backwards compatible but the VR tech moves on so quickly that you almost have to store a copy of all of the plugins as they were then to be able to reopen the projects now because everything's moving so fast. I mean upgrades and new versions, in our experience, we have had issues with that so we've had to keep installers for everything just in case.

Alicia Eames: Your first project, was that Garage magazine in 2016?

Roland Heap: So we did, now the Garage magazine, I think the first... was that 2016? I'm not sure exactly. I think the first VR project we did was ‘Life in the Time of Refuge’ which was a project for the UN and it's a little VR documentary and that was the one where we really started exploring.

With the Garage magazine project, they were all augmented reality which is a fascinating area, and actually one in which I think you can be, in some ways the gloves really are off with augmented reality particularly in something as creative as augmented reality sculptures. Really, it's whatever you can dream, you can create. I think whereas with VR I think there's a slightly more, you've got to be a little bit more respectful of the narrative and of the experience in the reality. The reality part is absolutely critical in a way that it isn't when you're working in arts and sculptures. The Garage magazine projects have all been very much art projects; they're surreal, they're weird, they're exciting but they're absolutely abstract and other than the fact that you're presenting an alternative reality the term reality doesn't really come into it.

Whereas with VR obviously, reality is the absolutely critical word. I guess, virtual reality is a tool for empathy and so for us to empathise with the character that is us, or whoever it is, for us to be in a position of empathy, we need to be experiencing, as viscerally as possible, what's going on, and the tool for that in VR is the believability I think, primarily. And so that believability is the factor that most often in the projects we've worked on thus far, has been something we've been striving for. Really, you place the audience there and you have to ask ‘do I believe I'm there? Is there any aspect of what I'm experiencing that is pulling me away from believing I'm there.’ I mean obviously you're using devices like music and other sort of standard methods of creating and stirring emotion in the audience as an additional element, but if the reality doesn't sell I think the empathy is impacted.

Alicia Eames: In talking about using music you said “standard methods of stirring emotion” - what are those standard methods that you use to affect the audience? Music being the obvious one.
Roland Heap: Well music being the obvious one. I think every aspect of a film soundtrack is an emotional trigger. And I think that's the way you have to think about film sound design, that you are, it is entirely impulsive, every aspect short of the dialogue, and even the dialogue in some cases, is something that has been created and being replaced and therefore is something that is an emotional tool to shape the audiences' appreciation and understanding of the narrative, and what the protagonist is going through so when you're designing sound for a feature film, each element has to be considered on that basis. Each element is something you are placing there for its impact on the narrative, and therefore its impact emotionally on the audience. And that goes for the real sounds obviously and it also goes for, more obviously, the sounds that are non-literally, your "sound design elements", and of course music. But really I think on so many projects we do, the boundaries between music and sound design are becoming blurred to the point of being almost indistinct from each other. And often we're working very very closely with composers, or sometimes these days not. We've got a feature film at the moment we're working on that isn't even using a composer. It's a horror movie and the soundtrack for it is entirely sound design and it's a very interesting challenge actually. We're not using music but we're not using anything that sounds like music either. So it's not like we're just using the term sound design as a cover for sneaking music in. We're absolutely not using anything that is musical either. Anything has to be derived from the environment in some way. That's the set of parameters we put on it for ourselves that we have to believe in some way there's something in the scene that could have been the originator of that sound, even if we're then taking that to a ridiculous extreme. So, for example if in the scene there is a fridge, that sound of the fridge might grow and become something that is in itself a sort of a terrifying sound. It might become a lot larger than it is.

I'm a great believer in setting parameters on creative sound design in any way. In the same way that Bach set tight parameters on his composition, I think the sound design, the more interesting it is for me, is when you set yourself a set of rules for a project. And they often evolve a little bit as a project goes along but I think you set yourself a set of rules, your canvas stays the same size, your palette becomes a little bit smaller, but through that I think we end up with more interesting, creative results often.

Alicia Eames: Could you give me an example of what one of your rules would be? On the horror film, what would one of your rules be?

Roland Heap: Well, for example we're not using music. Any sound has to be in some way tied into something that's actually on screen. So for example you can't just place a drone. You can't just use a sting. It's got to be something that is motivated by picture in some way.

Alicia Eames: Yeah, wow. That's really interesting.

Roland Heap: Yeah, I think it's almost more relevant in a way in VR although the rules for VR I think almost write themselves. For example on the 'My Africa' project, we knew that we didn't want to have anything that was again "outside of the space". You know you've got music obviously but beyond that we didn't want anything that was non-literal. We wanted to place the audience as much as possible in that environment because it is such a fantastic environment, and it does have a really fantastic set of sounds that inherently exist within the space. For us it was about trying to really place the audience in that environment as much as possible, rather than pull them out.

For me, when I'm in virtual reality, if I have sounds that I can't lock to a device or a visual trigger, I can often find them distracting because part of me in my mind is going 'where's that coming from? That drone, what's making that drone?' The moment I'm questioning something, I'm pulled out of the story and it's one of the big differences between virtual reality and 2D film making... Let's see if I can word this well. In a feature film you're being told a story and there's a set of rules we've developed over a hundred years of cinematic story telling that are there to be broken, but in general people adhere to them for the bulk of content. You're allowed to cut within perspectives, the audience accepts that and doesn't notice it, most people do not notice... So with 2D film making there's a set of
rules that have been built up over a hundred years that dictate what, it's a language that we've developed but rules are there to be broken, but in general people adhere to them. But we don't have that language yet developed for VR, we're still discovering 'can you move the camera? Can you cut? Do you cut? Do you fade? What works? What doesn't work?' They're the complicating factors. That is - some things that work on some formats don't work on other formats, but more interestingly in 2D film making, in traditional cinema, if you will, I think I prefer the term - in traditional cinema you're being told a story and the language for that is very well established, but in virtual reality you're discovering a story and your perspective in virtual reality is totally different from your perspective in a film.

Inherently the nature of VR is that you are present in it. You're experiencing it as someone that is present in it and there is different virtual reality film makers who have, I am using the term VR and 360 interchangeably even though they are strictly speaking different things-

Alicia Eames: Yes
Roland Heap: Ignore that for now. But in VR you are inherently present in the story and film makers found different ways to deal with that but we don't yet have an established language for it. We haven't yet concluded, or come to a consensus on what the role of the audience is in virtual reality. There's a lot of different ideas out there, a lot of people approach it in different ways. Sometimes the audience is present, sometimes the audience is sort of disembodied thing, sometimes you are expected just to sit and it's almost like you're being strapped into a ride.

I think different people approach it with different levels of success if I'm being honest. And I think that's an area where over time we probably will actually reach some sort of consensus, or we'll actually define what these different things are and branch out in different ways and maybe the tech will follow the branches a bit or whatever else. Doubtless some branches will end up dying away as tech fades and people decide that actually headsets weren't such a great idea or whatever else, which is probably correct. But, yeah, we're right at the very beginning. This is the infancy. Even though a lot of the technologies have been around for a long time we're absolutely at the infancy of the story-telling, the birth of the language of VR at the moment and I think it'll be very interesting to see how it grows up.

Alicia Eames: In ‘My Africa’, I've watched it a few times now and the sound is such a huge part. There were obviously some creative decisions to put people right in the heart of the action, like when the, what are they, buffalo? They stampede past. And you've got the elephant that comes right up to the camera and smashes the camera around a little bit?
Roland Heap: He does, yes.
Alicia Eames: But the sound of that is really really effective for a number of reasons. When were you involved in the process of development and planning?
Roland Heap: We're really lucky with the filmmakers we've worked with in VR in that they've all been very collaborative. As a company we don't do very many virtual reality projects actually. We do one or two a year at the moment, which almost means we have to reinvent the wheel every time we come back to one because the tech’s all moving so fast. Both with ‘My Africa’ and the UN film, and the current film we're doing, and with the Garage thing, with all of them we've been involved well before the project began. So, with ‘My Africa’ we were brought onboard well before the shoot and the location sound recordist is a very old friend of mine, a chap called Don Nelson who’s a great sound recordist, we spoke together about how he was going to capture the sound. We looked at what they were trying to achieve with all of the shots.
Obviously, in the heat of the location shoot, everything is always different but if you’ve got the principles in place - and actually I think that the principles in general for recording good sound for virtual reality are relatively straightforward, which are that you always need to have an ambisonic mic at camera perspective, whatever’s happening. And you cannot have too many radio mics spotted around a place on anything that makes a sound.

Obviously when you’re dealing with animals and things like that there were only so many radio mics you can put on animals, so for something like ‘My Africa’ it’s really all about making sure you’ve got that ambisonic camera perspective as your bed for everything. If you don’t have that it just ends up being a lot of recreation. For the UN film we did, we ended up having to - there was supposed to be audio coming from the camera but the camera was not working as it should be, so in the end we ended up with stereo audio, so the sync audio we wanted had to be clinically extracted from the stereo and then spatialized, which is a vastly more painful process compared to using an ambisonic mic as a bed.

Obviously you do end up redesigning a lot of stuff and with spatial mixes, so much of it is the foley and we’re blessed to have a really great foley artist who works in the company, and certainly on ‘My Africa’ a lot of work went into foleying literally everything that happened on screen, so every branch rustle, every animal footprint, all of those were mainly foleyed, but also gathered from sound effects libraries and extracted out from the things. The bed at the basis of all of that was generally the ambisonic core that Don recorded. And obviously the fact that we had clean voice recordings of everything that was happening, the singing wells, that sort of thing. That’s stuff you can’t recreate, you can’t ADR that.

Alicia Eames: I was wondering about the singing wells.

Roland Heap: So often the case with VR projects essentially, the notion of, particularly in the VR doc world the notion of ADRing everything is completely impossible, so if you don’t have clean radio mics you really are hampered in what you can do in the spatial world afterwards.

Alicia Eames: The guys in the singing wells weren’t wearing shirts either. I’m trying to remember now.

Roland Heap: No, they weren’t and actually that’s one area where we did use a little bit of trickery and it was a wild recording that we placed over the top of them. I don’t mind admitting. I wish we had captured exactly that but I think in the end we used a separate piece of audio because we had a really good recording of them that sounded better than what was happening in sync.

Alicia Eames: It’s beautiful.

Roland Heap: Terribly sorry.

Alicia Eames: No, no!

Roland Heap: But there it is. That’s entirely credit to Don for capturing such fantastic location recording. We had acceptable sync and then we had amazing wild tracks. And that’s the other thing about location sound for VR - wild tracks are critical. If you can’t capture at the time of what’s happening, what’s actually happening, then getting a wild track of it afterwards can absolutely save your bacon.

Alicia Eames: As a location soundo all of that stuff is really interesting for me because the project that I’m working on, the location audio isn’t important for a number of reasons. One, we’re using a drone, so it’s useless there. But also, the camera is actually quite noisy, so the camera fans were quite loud and the audio that we were capturing was very quiet, so-
Roland Heap: Isn't it unbelievable that we have camera fan issues in this day and age? I don't want to criticise companies, but I find the fact that some cameras have fans in them the most inexcusable piece of filmmaking. It infuriates me beyond all measure that in this day and age, like when we left the film world and the sound of sprocket holes and all of that sort of thing, and thought we'd actually got rid of that whole issue of having to clean out the rrrrrr in the background. Now we're cleaning out whines from cameras. It makes me so angry actually.

Alicia Eames: That is all amazing, thank you so much Roland. You've answered so many of my questions. With the spatial audio software, when you come back to it each time, what are the limitations, creatively for you? Are there any limitations creatively? Is it holding you back? Or is it pretty good?

Roland Heap: So, I would say it is, let me see what's the best thing to say about this. So, the biggest problem for us, I mean there's problems at every stage with VR audio software in one way or another. At the base end it's much better now that Protools have incorporated ambisonic bussing into the software. Before that happened, you were really having to make some serious fudges to make things work, using quad buses and that sort of thing, so that was a big step ahead.

Alicia Eames: When did that happen?

Roland Heap: It was, I think in the version that was released last year but it was pretty recent. So, they've got 1st, 2nd and 3rd order Ambisonic bussing inside Protools now which is great. It's still buggy. You know, there are still, it's one of those areas where there's so few people working natively in ambisonics and Protools, that it is still, if you're going to find bugs anywhere that's the sort of area you'll find it in, but it's not bad.

The plugin manufacturers are taking a while to catch up, but they are releasing plugins. There are some great things being released in the key companies that are really fantastic. Audio Ease, the 360-pan thing is still I think the best panner that there is out there. The FB360 suite is technically I think great, but it's not my favourite one to use simply in terms of user interface. I find it a bit clunky. Whereas the AudioEase interface is fantastic. The Blue Ripple plugin sounds amazing. I think that they're fantastic. There definitely aren't enough plugins by a long way. I don't think anyone's really nailed ambisonic reverbs. I'd love to be able to go higher than 3rd order in terms of bus structure from Protools. I think that would be fantastic. It would be great to be able to go 4th, 5th, whatever order ambisonics in Protools. I know you can in some other software but we're so familiar and so locked into Protools working here that it's very hard to leave that universe, and simply just in terms of speed of operating I can do a mix incredibly quickly in Protools. All of our hardware works with Protools and moving to another platform is painful for us. Halo now has got the up mixing to ambisonics which is brilliant although I haven't had a chance to use it on projects yet. We use Spanner a lot by Cargo Cult. We had to deliver in Dolby Atmos VR at one point, that was interesting and a bit funky, but did work, yeah, so there's all sorts of things.

Alicia Eames: Yeah. How do they tie into the distribution platforms? 'My Africa' went out on Within?

Roland Heap: Yeah, so distribution's another nightmare. Essentially, in my experience, there's no standardisation. I'm actually part of a spatial audio committee, a forum at the moment, with Abbey Road Studios and we're looking into things like standardisation and stuff like that. There really, at the moment, there isn't a set of standards for delivery and so, not only does every platform need its own deliverable specked out exactly correctly for that platform, but also quite often, it needs its own mix. Because quite often a deliverable is not simply about, you know, swapping the bus structure or whatever, but things sound different in different things and it might just be about levels, but it might also be, for example, you've got the focus mode that you can use on some platforms and not on others. You've got headlocked elements that you can use on some platforms but not others - level issues, just slight differences about the way things track.
In my experience we've found ourselves, when we transition, for example, from a Gear to an Oculus or whatever, we've just wanted to do things slightly differently each time, and so to cut to two, three years ago it really felt like the wild west. Now at least there is some standardisation, so for example, AmbiX is pretty much becoming the standard in terms of track order and that's progress of some sort. But, yeah, the delivery stage is one of the biggest challenges I think for VR, for spatial audio creators. Delivery is hard and it's always hard and there's no...

Also, the other thing - the delivery of the project is tied up in the delivery of the video, and so whoever you're working with on the picture front might be creating the final picture but that picture needs to be wrapped with the audio in the correct way and quite often that wrapping can involve an element of programming or certainly some very precise parametric control and so that often ends up coming back to us. So they'll have the final picture file that they will send to us for wrapping, injecting metadata whatever else and then sending out to the platforms. So, it's a funny way round. Like normally on a feature film for example, we would never be delivering a picture deliverable but in the audio world it does seem to be that that ends up happening sometimes. Which is not optimal if I'm honest. It's not a responsibility I want.

Alicia Eames: Fair enough too. Which distribution platforms do you usually have to work with?

Roland Heap: Well, the standard ones are Facebook and YouTube obviously, and then Oculus, Within, various app based ones, obviously The Igloo as well, the Igloo viewing tents which are a whole other kettle of fish really, and have their own unique sets of challenges and benefits. But every project is different. You start seeing repeats obviously. I mean everyone needs a version for YouTube and Facebook. It would be lovely to see some standardisation between those two guys. I don't think, bearing in mind TBE (Two Big Ears) is owned by Facebook. I think it's unlikely that YouTube are gonna completely adopt their format but I still don't think YouTube have got a headlocked component and I don't think they're using the same order ambisonics, so alignment just between those two would be a really good start. I think if you saw alignment between YouTube and Facebook you would actually, I think a lot of others would start to follow, but we're not there yet, certainly.

Alicia Eames: Stepping away from the tech side of things, which is a constant challenge, but just briefly, the key benefits of audio in virtual reality?

Roland Heap: The key benefits. I don't think it's a matter of benefits. I think... The best way to say this really. Spatial audio for VR is not a benefit, I think it is essential, I think it's what sells the experience. I don't think you can talk about it terms of benefits. I don't think the two should ever be separable. I think a non-spatial mix for a VR experience undermines the experience to make it almost worthless. Is that too strong?

Alicia Eames: Um? Is it too strong? I don't know. I don't know the answer to that question.

Roland Heap: I think if you're genuinely trying to make people experience reality, reality is not head locked.

Alicia Eames: It's certainly a strong statement. I agree with you Roland, a hundred percent I've watched some VR that was head locked - mono, stereo, whatever and you just don't know where to look, you don't know where the sounds are coming from whereas when you watch something that's spatialized, like in ‘My Africa’, it's just so much more powerful and stops that separation. You're not separated from what's happening nearly as much because it's just normal. It feels normal. So I agree with you. I don't think it's too strong.

Roland Heap: Okay. In all honesty we wouldn't take on a VR project that didn't involve spatial audio. We just wouldn't. There's no benefit for us, so it's not an issue we've come across yet though because no one's come to us with a low budget VR project and said can you just do us a
Alicia Eames: Yeah. In your experience, how do budgets differ between virtual reality and say a 2D film of equal length?

Roland Heap: Well, that's an interesting thing. I would say in general the budgets are higher. That said, we work on a lot of content for corporate entities and in doing a corporate film of a similar thing it would cost a lot less, but the requirements are just so completely different. Similarly, comparing it to a short-form drama budget-wise, I don't think we've ever done a full budget short film. Because short films are almost always calling cards for the filmmakers for festival submissions or whatever else, and so as a result they're always low budget. Everyone doing short films is working on low budgets because there's no market for them so again it's not a completely fair comparison. We're lucky in that we've worked with some great charities and filmmakers on the VR projects we've done and they've seen the value in making the films that we've worked on as immersive as possible I suppose. So, it is more expensive, it is definitely more expensive to do VR mainly because literally everything has to have a sound. In 2D filmmaking you're not worried about what's happening off-screen. In VR everything's on-screen, there is no off-screen. If someone turns around and something's walking around and you can't hear that thing, it pulls you out of the moment. On the flip side of that is, if you can hear something moving too loudly and as a result the audience's head turns when you don't want them to turn that's also distracting. So, there's a great balance in the mix in putting in just the right amount so that you're not trying to focus the audience on it, but I do think everything has to be there and as a result it's a lot more work.

You know, particularly foley-wise. In my experience you have to foley absolutely everything and foleying everything for something that is 10 minutes long is potentially a lot of work. Particularly when you've got hundreds of animals on the screen, it can become a huge job. On some of the 'My Africa' things we ended up with 50 plus objects that we were automating in a shot, which is what sells the sense of movement you know. So each of the wildebeest was an object that had movement, that was comprised of five or six elements, you know the feet, the breaths, then you compressed them together a bit and then you spatialized it and so you're working in an entirely object-based environment, which is inherently different to working in a TV environment, although actually I'm finding now that because I'm trying to push the filmmakers I'm working with into working with Dolby Atmos wherever possible and inherently within Dolby Atmos you're working in an object-based environment. There is some coming together of the two disciplines and even when we're mixing in 5.1 as a mixer, I am very spatial, I think. I like trying to really push the spatial nature of even of a 5.1 mix, and certainly when you go to 7.1, 7.1.2 in Dolby Atmos etcetera you have much more possibility to do that. There is definitely some interplay between the two. I've completely lost track of what I was talking about now.

Alicia Eames: You were saying that in My Africa you had 50 plus objects which was-

Roland Heap: Yeah, we did. There was a tonne of objects, it's an object and bed-based working environment, exactly the same as Dolby Atmos, so you're working in objects and beds. And the beds are mapped so they are shifting spatially, but they're globally moving, whereas the objects obviously are automated tightly. So everything's always in automation. There's an enormous quantity of automation data. Sessions got pretty heavy at points.

Mixing is slow. That's another thing to note because you can't mix on a headset obviously because you can't see the faders. So you're constantly sort of moving - you're doing something and then you're testing it, and then you're doing it and then you're testing it. And you sort of get a feel for how things are translating. We mapped the spatial environment to our 7.1 system in the mix room so that I could pan around with my mouse and get an impression of how the ambisonics would translate to headphones
whilst not having headphones on and then I'd place the headphones on. I think there's more work I could do in terms of perfecting that you know headset on headset off translation probably to the extent you could almost mix entirely without referencing the headset, maybe. I don't know. There's definitely an interesting... That process of translating to 7.1 on the speakers and back to a headset is very interesting.

Alicia Eames: Yes.

Roland Heap: Actually, I think we're about to upgrade both of our rooms to 7.1.4 which is gonna become even more interesting because then we'll have the height information. We'll be able to map as well. Plenty of stuff to do there.

Alicia Eames: Cool. That's very exciting. It is very frustrating working between a headset and a mix. We found it in the colour grade as well. Like colouring for a mobile phone is just a nightmare, it's different. Anyway.

Roland Heap: I know that was an issue. I was talking about delivery for various different formats for an audio perspective is difficult but it's also very difficult from a picture perspective because the colour tables for all of these different things are just completely widely different. And also, most headset screens still look a bit rubbish. You know, putting your face that close to the pixels is difficult. You know it's the one area where, it's like 2K versus 4K versus 8K in a picture sense, for most people it's absolutely meaningless but when you're shooting 4K footage, you know 4K for a 360, 4K really is the bare minimum people should be shooting much much higher because you can see the pixels when you're that close to them. It's the one area where that drive for pixel count actually genuinely matters is in the VR space.

Alicia Eames: Is there anything that you think that we haven't covered that you think you should cover? Anything else you want to say?

Roland Heap: I think we're pretty much there. Ah one thing that's interesting actually. The mission creep into programming that's required for a lot of stuff, even for some format's delivery, you genuinely need to have a technical ability to run command lines but furthermore, as soon as you venture into AR and doing anything in game engines you absolutely have to have programming skills. I'm very lucky in that we've got a really great programmer who's on our team and can handle that side of things. Technically it's still very very challenging working in VR and especially AR and I think as the notion of lateral movement in VR becomes more of a deal and people try and implement that, the only way you can do that is via a game engine. And to implement that well, you can't work in a game engine in a meaningful sense without knowing some programming. You need to be able to code. So that's a real stumbling block for a lot of people I think.

Alicia Eames: Yes.

Roland Heap: I think that's pretty much all I need to say. That's pretty good.

Alicia Eames: That's fantastic. It's wonderful. It's so nice to talk to you as well. I thought ‘My Africa’ was just beautiful.

Roland Heap: Ah great.

Alicia Eames: The sound design on it. The picture is beautiful as well, but without the sound design, particularly that stampede scene, and the elephants up close. Even the elephant at the end where he's drinking it the water and stuff, the sound really makes it. It's beautiful.

Roland Heap: I'm glad you liked it. Well, really good luck. Lovely speaking to you. I'll speak to you soon. Take care Alicia.

Alicia Eames: You too Roland.
Alicia Eames: Thank you so much for speaking to me. You have been working for decades as a re-recording mixer and sound designer on Academy Award nominated films and I feel very privileged that you've agreed to an interview, so thank you.

Tom Myers: Well, thank you. It's my pleasure. The "Collisions" project with Lynette was a real eye-opener, it was really amazing to me and that's as close as I've gotten to Australia so far, I hope to one day, but I mean, that's one of the things that VR does. What was special about it was it took you to some place that you could never, or it would be hard to experience. So I think that was one of the exciting things about VR, I think.

Alicia Eames: How many virtual reality projects have you worked on?

Tom Myers: Less than half a dozen. I've done a number. I did the "Collisions" one and then I did a couple of VR projects that were offshoots of Jurassic World. You know, I did one this year and last year, and I think they played at South by Southwest. Sometimes movies, there are certain movies now that they do an ancillary marketing thing, and I've done a couple of the Jurassic World or Jurassic Park movies over the last couple of years, where you're immersed in the Jurassic world of dinosaurs. So I've done less than half a dozen VR projects, but I'm aware that it's very cutting-edge and it's now becoming more and more... there are more and more opportunities for it. And now I've been giving a couple of talks where I encourage people who are starting to get into, looking to get into sound. But I think it's a good open space, a good area for young people to explore and get into this kind of work.

Alicia Eames: I think my stepdaughters have seen, I think they watched the Jurassic World ones, and they loved them actually.

Tom Myers: Have they? Oh good.

Alicia Eames: Yeah, yeah. I didn't realise you worked on those, so there you go.

Tom Myers: Yeah, yeah, exactly. And that was just some more VR experience. But actually in those instances, it was more the processing and the incorporating it into a VR experience was done elsewhere. I think there was a facility in Montreal or something like that. So we just did something and then I heard it back after they had done it, but the Collisions one was the first one I had done where we worked in that format and had these ambisonic recordings and were able to cut, and then play back, to gauge it in VR as we went. And even though we did that, it was still so new that they were literally writing code overnight for some of the stuff that we were doing, trying to figure out how it was going to get interpolated from our stage into the system.

Alicia Eames: I was wondering how that worked, Tom, because you did Collisions years ago and you were in Dolby Atmos, is that right?

Tom Myers: Yes. That was as close as we could come for us all to experience it together, with Lynette to be able to make creative decisions about how things sounded and levels of dialogue versus music and sound effects and stuff like that. So we mixed in Atmos and then through a Dolby plug-in, through an interpretation from Dolby and they were working with, I can't even remember, I think it was one of the phone companies. There were a couple of entities involved, so we mixed mostly in Atmos and then made files, VR files that we would then playback and listen to.

So it was early on and it was a difficult process, so we were not able to mix in VR in real time. So we would have to do it and then make files and listen to it and then make notes and then make adjustments and then make new files. I've done that same type of work...
with some of the theme park stuff I've done where it's the same, where it's a specialty format or something where that's really the only way to do it. So it's different from normal film or TV mixing where you're making decisions in real time as you go.

Anyway, so it was a different experience, it was new and honestly, at the time, it was a little bit clunky because it was literally so new. We were never quite sure whether it was going to work properly and there was some latency in the tracking when you did head turns. I'm sure it's gotten better, that was only two or three years ago. So, I'm sure it's moved quickly.

Alicia Eames: Have you worked recently in creating that object-based sound design?

Tom Myers: Yes. Using Atmos we generally do 9.1 beds and then do objects for things that you want to move around. So I just did a Chinese adventure movie where there were flying creatures and arrows and spears, so you would make a bed of effects and ambiances and then you'd pick out the things, "Oh, we want this to fly from the left side of the screen through the ceiling and land in the right back." Or the other way around. And those things you would pick out and put those on object tracks and then pan them that way.

Alicia Eames: I'm not actually familiar with the Dolby Atmos plug-ins. I've been working in Facebook 360 which is a free plug-in. I'm looking at workflows for low-budget filmmakers as well, so looking at free software and stuff. I'm not familiar enough with how Dolby Atmos works in terms of the user interface - did you find it pretty easy to use?

Tom Myers: Yeah, it's gotten better. It was a little more intimidating in concept, but I find that with a lot of the new technology. We think, "Well, how is this going to work?" And then you realise well, it's just another tool and a way to figure out how to creatively use it and not have it get in the way or take over the process. I think, VR, Atmos, all that stuff, it all should serve the greater good of the story or the film or the project that you're trying to tell. I'm a big believer in the technology not being in front of the creative process but it should just be a tool for the creative process. If that makes sense.

Alicia Eames: It does, yeah. It does. I wanted to talk to you as well, I've watched some of the behind-the-scenes interviews and Lynette Wallworth is a big believer in the power of sound for virtual reality. How was the process of working with the Collisions team and where did you get involved in the process?

Tom Myers: I got involved fairly early on. I think they had shot the material and it was through a producer who knew by reputation, we had mutual friends, and I think they came to the facility here and they were looking for somebody and this is a big, new area. This company was, and still is, keen to work in VR. One of the things about Skywalker is they're very keen on cutting-edge and staying up with the technology and looking ahead for new opportunities to learn things and develop new technologies.

So I met Lynette through that. I think they'd come to the facility and the facility put me in touch with her. And she had shot most of the material by then and they were still in the editing process and they were editing here up in northern California. And so they shared some of the files that they had with us and showed us some of the material that they had shot, some of the drone shots that they had, and a very rough cut that they were still in the process of working on. So we looked at that and got very excited just about the concept of it. So we hit it off, I think, with Lynette and just got excited about the project and the prospect of doing something like that. Because again, at that point, we had done very little VR stuff. So it was, again, it was new ground.

Alicia Eames: Mm. Apart from the technology, when you were translating your cinematic sound design principles across to virtual reality, what challenges were there in that? What worked and what didn't? Was there anything you had to consider that you weren't expecting?
Tom Myers: I tried not to worry too much about it early on. It was basically just getting the pieces together. So again, I tried not to get too concerned about the technology early on. It was more like, "Okay, what's the story we're trying to tell? What's the environment? What are the creative choices we should be making?" And then one of the things of doing this, especially in VR, because the viewer can look anywhere at any given time, how do you drive the story, how do you get them to focus on the things that you want them to focus on? Or how do you get them to turn their head and... so there were certain spots where Lynette was clear, "I want them to focus over here, on this person. Or to look over here, at this person who's standing by a gate or something." So we would try and draw the viewer's attention using signal sounds to get them to focus on certain areas. So that was interesting.

In a film, it's two-dimensional and you have a set screen and people are all looking in the same direction because that's where the projected image is, but in VR, the viewer or audience has the freedom to basically look anywhere they want at any given time. So in terms of storytelling, how do you focus people? How do you get people to follow a given narrative or take in certain ideas that you want them to?

So that was the first thing or the main thing that was different, was that you had to take into account that the viewer or the audience could basically look anywhere and if you wanted them to focus on stuff, you had to give them audio cues to get them look in a certain direction or focus on a certain thing.

Alicia Eames: How does it compare to designing for traditional cinema or some of the animation you've worked on as well?

Tom Myers: Again, I try not to think of it as too different. It's basically the same process and then the tools are a little bit different. It's kind of the same thing with animation where I get asked a lot about how it's different. And it's different in certain ways that there's no production recording or something like that, but it's also basically the same because the creative decisions that you make are "how do I best tell the story? How do I bring across or help the filmmaker realise their vision?" So I don't think about it, at least initially, that differently.

Clearly in here, we have these ambisonic recordings that were done in Australia and we were using this Harpex plug-in which decodes the ambisonic recordings. So that was complicated in trying to figure out, well, is it decoding this stuff properly? So that was a bit of a challenge because again some of the documentation, it was so new and I hadn't done anything like that before. It was like the track recordings had to be in the right configuration to be translated correctly through this plug-in. You're never quite sure, "am I hearing it the way it actually was recorded? Am I hearing it the way that it was intended?" And then after a while, we have an expression here, one that Randy Thomas the sound designer used, which is basically "the simple thing is if it sounds good, it is good." So sometimes, again, not letting the technology get ahead of the creative or the purity of the experience. So after a while, just go, "well that feels right. It sounds right. And it works creatively."

It may not be decoding or have the track assignments in the proper configuration technically, but it seems to be working, so it's a leap of faith there. Going, "okay, well it feels right, so hopefully people will accept it." So you put the creative process and the aesthetic of the soundscape ahead of the technology.

Alicia Eames: Mm. So a lot of the academic research around sound for virtual reality has had a focus on realism and fidelity in the soundscape. It kind of stems from trying to make the experience as immersive as possible, so it's going to focus on realism. Where did you find yourself falling in terms of sound design - in the gap between realism and creative sound design?
Tom Myers: I mean, it's sort of like doing it. In doing, I've worked on a number of documentaries and it's kind of the same thing. There's the literal truth and then there's the dramatic truth, or the truth for the story. In filmmaking, there is a little bit of an artifice in all of it, so we try not to get too hung-up on everything being literally accurate because sometimes when you do that, it doesn't feel either emotionally or dramatically accurate. So you take some liberty. You get them with certain documentaries and stuff like that, where you can push it too far and if you get too heavy handed, it starts to undermine the piece and the integrity. So you have to keep it within a realm of accepted reality, but I try not to focus too much on everything being absolutely literally accurate. Because again, you're trying to tell a story and trying to get people to evoke certain ideas and thoughts and feelings. As a filmmaker or sound designer, you have to make decisions to support the ideas that you're trying to get across. In some regards, I think the literal stuff is either overrated or there's something greater than that, and it's the story and the idea that you're trying to tell. I mean, you're talking about your project with these bats and you're going to actually pitch down their echo-locations so they can be heard and that's, in some regards, it's not a distortion of reality but it's changing it so it can be understood in the context of the piece that you're doing. It's kind of like that same idea.

Alicia Eames: Yeah. Collisions is a bit special too, because there's quite a lot of animation in Collisions.

Tom Myers: Yeah, yeah.

Alicia Eames: With the kangaroos and the explosion.

Tom Myers: Yeah. That was the other thing, where it's like they're telling a story and it's this guy's remembrance of something that happened to him when he was a young man. So the only way to tell that story was to do it, again, not literally, because it's a remembrance and a thought was to do it dramatically with animation and with sound. So it's sort of coming from his memory. So obviously when somebody's talking about a remembrance of something, it does give you dramatic licence to move outside of the literal image, because the images aren't literal, so the sound doesn't have to be literal either. It can be more dramatic and it gives you licence to go farther than if you're looking at a literal image and trying to apply non-literal sounds to it.

Alicia Eames: Speaking of location recordings - is there anything that... because it's quite a new field, as a location recordist, you're sort of making it up as you go. There's not really established rules. Is there anything that you wished you had from the location recordings that you didn't get, or what did you get that you really loved?

Tom Myers: I just loved these recordings from this some far flung place on the other side of the planet that I would never have the chance to do. So it's just fascinating to listen to that stuff, to those recordings, they sound very, very interesting and exotic and so that was very exciting. I think the difference was again, these ambisonic recordings, this was the first time that we were dealing with them. I don't know for a fact whether the sound recordist, it was the first time he had recorded ambisonic - I think some of the documentation of the ambisonic recordings were again, I think that was new for him as well as well for us. My understanding is the track assignments of the recording, they have to be assigned in a certain way for them to be decoded properly and I was not clear whether some of the documentation or some of the, I might be wrong about this, it might have been our thing, so I don't want to throw this guy under the bus or anything like that. Because he did an amazing job. But I think, you were asking about what the sound recordist can do, and I think as much documentation about things is super helpful. And I know sometimes, you would know this, sometimes it's not always easy, especially if you're out in the field and 1500 miles from Perth, out in the outback, and so sometimes proper documentation is not always
easy, but it's helpful to figure it out, especially with these new technologies. So if I had to go back again, I would have asked for things documented potentially in a different way.

Alicia Eames: So talking about what sources you love to get on set - did you recreate all of your foley or was it recorded on set?

Tom Myers: We had our foley team here do that. So most of our recordings that we used are some of the field recordings that they had done as ambisonic recordings and the live dialogue. The other stuff was all created here, all the foley and sound effects. The backgrounds where we use some of the field recording stuff and the production dialogue that was recorded.

Alicia Eames: How did you create where the ash rains down all around you?

Tom Myers: Yeah. Yeah, and that was a light particle effect that we had in our library. And then I put it on a keyboard - I'm still using what was a cutting-edge 20... [the skype call disconnected] So I'm using it as a keyboard as sampler. So I put it in there and then can perform - I can take the sound effect and then perform it and then with a little processing, create that ash rain sound. And again, that was another opportunity, that's obviously an immersive thing. So some of those sounds we like to spread out and get the feeling that it's falling all around you.

And then the sound of the, actually, there was like the breathing of one of the kangaroos. One of the gentlemen who was in the movie who was here, Curtis, who is the, I think, the grandson of the main character, he actually performed that, the breathing of the dying kangaroo, because he was familiar enough with that sound. That's another thing, where it's not literally a kangaroo but it's somebody who is performing that and it's evocative, but again that's part of the process. You use what you can, and go for the emotional and dramatic truth, but it's not necessarily the literal truth.

Alicia Eames: Yeah. Did you have to recreate any of your atmospheres, the spatial atmosphere sound?

Tom Myers: We tried whenever we could to use the indigenous recordings that were done. But then we were always augmenting stuff, with wind or debris, or again we were trying to use the appropriate birds and insects and stuff like that that were in the recordings but then we were augmenting stuff with other things that we have here that would fill things out. So wind, wind in trees and some of the fire at the end, and then there were a fair number of drone shots in there, which are not, the drones are obviously not picking up any audio, so there were a number of MOS scenes as well that we had to fill out either by stealing some of the stuff from the production recording or just making it up with material that we had that seemed right. And as long as Lynette was happy with it and it seemed appropriate, then that was fine.

Alicia Eames: One thing I didn’t ask you about before as well, was the distribution. So I saw 'Collisions' on the Jaunt platform, but I imagine during the festivals and stuff it would have been distributed in quite a few different ways. What were the challenges about distributing virtual reality sound?

Tom Myers: One of the things was there did not seem to be a uniformity to the different platforms in terms of types of files and that stuff may have been worked out now, but at that point, there was different, we were doing one thing for Oculus and then another one for, god, I can't remember the name of the company. There's another phone company which was a different format, and so the files and the encoding and stuff like that seemed like at that point, there wasn't a uniformity for that. So each thing had to be translated and then once you do that and you’re encoding the sound for different formats and then that’s another spot where things can change. In the file making process, things can change, or pick up artefacts or you're never quite sure, you have to go through and check each one, each format. And I don't know whether that's, maybe you know, I don't know whether
that's something that's been ironed out, whether there's a uniformity of file format at this point.

Alicia Eames: No, it hasn't. So one thing that we still have problems with is that some platforms support a stereo headlocked track for music and voiceover and stuff, and some platforms don't. Do you remember your experience, whether your platforms had a headlocked track or how did you manage that?

Tom Myers: At that point, the tracking and it may have gotten better, I thought the tracking as they said, there was some latency in it so it was like you turn your head and there was a slight delay for the head tracking panning, and I found that a little bit distracting. I actually liked it better in a locked format, the head tracking at that point, I think the technology was not there yet. So it felt like it undermined, I felt like it distracted a little bit and undermined the story. It's a great concept and I liked that, but at that point, it was not working well enough. And again, again, as I said, I think they were still writing code overnight and they said, "Well, hopefully we'll have that tomorrow." And then somebody in some room somewhere would stay up all night rewriting the code for that processing. But personally, it felt to me a little distracting. So there's a tipping point with some of this stuff where if the technology isn't quite there yet, it becomes too artificial and then undermines the piece of the storytelling.

Alicia Eames: I think the tech is improving very, very quickly and so are all of the plug-ins and the tools that we have available, but there's still quite a lot of problems and it's still quite challenging for a lot of filmmakers. I think one of the considerations that we're seeing in Brisbane at the moment is just whether it's worth it for the problems that people encounter, with all the timeframes and the budgets just explode. What would you say to that?

Tom Myers: To the concept of the budgets exploding?

Alicia Eames: Oh, just the timeframes involved and whether the spatialisation of the sound is worth it in virtual reality, worth the process of going through the pain?

Tom Myers: Oh, geez. That's hard to say. I don't know. I think one of the other things which I'm still trying to understand is that VR is not a collective experience like sitting in a theatre, it's your isolated interpretation of that, so it is a different form of a storytelling. But I think if that stuff can get ironed out, it certainly would be worth it to be able to do new projects or things like "Collisions", or Lynette was doing another project which I was not able to work on where it was about a ... they went up the Amazon and shot an Iowaska festival and met a shaman there and it sounded amazing. And that's what I think is, to me what is exciting about VR is giving the viewer an experience that they couldn't have otherwise. And experiencing it in a very visceral way.

So I think that is really important and exciting and very basic, in terms of basic storytelling of having empathy for other people by literally putting yourself in their shoes. So I think that's really worthwhile and again, I sometimes feel like a non-technical person who's in a technical field, so I'm hoping that stuff will catch up and that you will be able at some point to have that experience and have it not be so. I know there've been other projects, I worked on one here, called "Carne y Arena" that the Mexican filmmaker Alejandro Iñárritu did, which was a VR experience which I think they had at the LA Museum and other places, where it was the experience of being an illegal immigrant and sneaking across the border from Mexico to the United States in the middle of the night and what does that feel like, which I think is the same thing as Lynette was doing. It's like giving the viewer some experience that they would never ordinarily have. And experiencing it in a very visceral way.
So I think that stuff is really valuable and more of that stuff should be done and hopefully the technology can catch up to that and make it that visceral experience where you're not aware of the artifice of it. Where you're not aware of the technology, the limitations of the technology undermining the story telling or the piece or the idea that you're trying to get across. I'm hoping that that will happen.

Alicia Eames: There's quite a few social impact VR pieces popping up, I think because it is really powerful for people to get that empathy and understanding of what people are going through. Do you watch much VR?

Tom Myers: I don't have an opportunity to watch much of it. There's stuff that goes through here and if somebody's doing something really cool, I have an opportunity to do it, they've done it. Some of the Star Wars stuff here has been done recently and their games and stuff that they're working on to expand the Star Wars universe, and so I've seen some of that stuff, and it's very, very impressive. But I don't have the opportunity to see everything that's coming out.

Alicia Eames: Yeah, sure. Tom, you said that you're a non-technical person. And yet you've tackled a pretty full-on technical project when it was very difficult to do so. At the moment, it's much easier than it was a few years ago. Much better documentation, much better plug-ins, the distribution platforms have how-to guides now, which makes it a lot easier than it would have been then. How did you find that process personally?

Tom Myers: I rely on other people for helping me understand how that works. 'How do we get this from here to there? How do we move this thing from here to there?' So, there's some very smart young people who work here who are on top of this process, so I have a lot of help figuring that stuff out. So I don't have to, I've been doing it long enough, I don't have to know how everything works. I just have to understand what I want it to do and then have people around me that can help me do that. Which is why I say, I felt as a non-technical person ending up in a technical field that you have to have some kind of technical grasp just to do this, but I'm, as I say, a big believer in the technology just being a tool and not an end in-and-of-itself. So I try and not overthink it and focus on the more creative decisions which I think is more where my strengths are rather than technological understanding.

Alicia Eames: Yeah. Is there anything that you would say to filmmakers trying to tell stories in this space, well, sound designers really? Anything you'd say to sound designers and filmmakers trying to tell stories in this space?

Tom Myers: I would push the boundaries of it. It's a new field and it's expanding and so I would ask what are the things that it can do that normal two-dimensional, the normal formats, their stories - what are the things that this can do that we can't do in other formats that accentuate that stuff and then put that together with interesting ideas? I mean, it's all about the ideas that you're using. But take advantage of the strengths of that and then use that to tell interesting stories, I think. Or expand interesting ideas that will help people understand things that they wouldn't ordinarily understand or have empathy for people that they might not ordinarily have empathy for. So it's that kind of thing.

Alicia Eames: Yeah, great. Is there anything else that you think you should say before we wrap up?

Tom Myers: I had a couple of notes. No, I think you've done a very good job of asking what are the appropriate questions. And I think again, this is a growing field so people that are looking, I think that there's a lot of desire for content. I mean, when we were doing "Collisions", there were a lot of new companies that were just starting out that were looking for content and new ideas, so if you're a filmmaker or a sound designer or a person with ideas, I think that there's an opportunity for you to do this. So the technology expands, but as everything else, they need content. They need stories to tell to use that stuff. So I think it's a very exciting time for people and you know, an open area. If you've got some
creative ideas, there's probably somebody that has some money or capital who might help you do that. I think it's an exciting time for people who are creative in that way.

Alicia Eames: Thank you so much, Tom.

Tom Myers: Sure, my pleasure. Yeah. Sorry about all the technological-

Alicia Eames: No, I'm sorry! Thank you so much for your time. It's been a pleasure talking to you. I would talk to you all day if I could.

Tom Myers: For me too. My pleasure. Feel free if you've got follow-up questions or something like that, and again, I would love to see your, I think there was something that I might have the opportunity to either see or read about your piece when it's finished, so I would love to see whatever it is that you come up with when you're all done.
4.4 Mike Lange, Michael Thomas and Heath Plumb – Cutting Edge Spatial Sound Team

Alicia Eames: Can you please tell me who you are and what your roles are here at Cutting Edge?

Mike: I'm Mike Lange. I'm the head of sound here, so if these guys stuff up, it's my fault. No, just joking. So yeah, I'm the head of the Sound Department here at Cutting Edge in Brisbane. That's my role.

Micky T: I'm Michael Thomas, affectionately known as Micky T. I'm a sound designer. I've been here for three years. Yeah.

Heath: My name's Heath Plumb, and I'm in the same position as Micky T. I do short form, as opposed to Micky T doing long form, and I've only just started getting into VR myself, and just delivered my first project. That's about it.

Alicia Eames: Yeah, cool. When did you guys start working with spatial audio for VR/360 film?

Mike: I was looking back at emails to figure out when that was, and it was the end of 2015, I think it was. It was September/October. September/October sort of thing of 2015.

Alicia Eames: That's early for spatial sound in this field.

Mike: Yeah, well the first mix that I did was actually a 5.1 delivery, so it wasn't spatial sound in the ambisonic sense, but it was a 5.1 delivery so it still had spatialization. You could look around and stuff like that, but it had no Y-axis stuff going on. And looking back at that now, it's like, "What was I thinking? What was anyone thinking doing 5.1?" But, you know, it was pretty unreal at the time. When we got that first thing, remember when I showed you guys that tour that we ... Was it the tour, or was it the Jailbreak little demo?

Micky T: Oh yeah, Jailbreak. Yeah.

Heath: I remember.

Mike: When we got the actual spatial stuff working and head-tracked. That was back then, sort of at the end of 2015. Got the perspective stuff going, head-tracking, yeah.

Alicia Eames: Yeah, cool. That must have been quite a process. What did you do that in?

Mike: It was more to do with the encoding process. We simply output a 5.1 interleaved mix, and muxed it with the video, and then wrote some metadata. I think it was just in the file name, even, some metadata in the file name, that told the playback engine, which was Milk VR at the time, that it's now Samsung VR. The Samsung VR app was Milk VR, and you were able to give it some, what is it? File suffixes, some metadata in the file name that told it that it was a 5.1 file, and that it needed to line the centre channel with the zero point on the video, and then it locked from there.

Alicia Eames: Wow.

Mike: Yeah.

Alicia Eames: Cool.

Mike: It's cool.

Alicia Eames: Yeah.
Mike: Yeah.

Alicia Eames: What VR projects have you been working on recently?

Mike: Most recently, Heath has just finished a QPS project, so you can talk about that maybe.

Heath: Yeah. It was for the Queensland Police Service, and it was by an awesome agency called Gilimbaa, I think who’s just based at South Bank. They do some really great work. Basically they do hope to talk about subjects especially to do with our Indigenous community. They sort of make animations to make that talking a little bit easier, and to sort of raise the questions that need to be raised and all that, but in a safe sort of space. This was an animation. Just basically it was about the three-star ... Well, there’s, how many stars were there? There was lots of different-

Mike: Three main stars, right?

Heath: There were three main stars, and then there was lots of little stars that sort of ... like guidance, and ancestors and all those sort of things. So while it wasn’t fully directional, as in like there were lots of sources, because it was basically this big sort of cage that builds up around you that started from the bottom, but there were stars and stuff that were directional, that are spatial. But a lot of the sound was building sounds that came from all around you, and it was very atmospheric. I used ... I composed all the synthy pads for the music, which were just sort of ethereal sort of stuff. But then with the actual voiceover we had it all head-locked, so no matter where you looked it’d all sort of make sense.

But what I made spatial was the things that you’re sort of meant to look at. We had, this star was meant to represent this thing and guide in this way, and then that explained that. But then over here another star would appear. That’s when I got creative with the voiceover, and took it out of the head-locked state and said, "Okay, I want them to look over there now," that’s when I make the voiceover come from where the star was, and have like a little pinpoint sort of ding when it came up.

Mike: Yeah.

Heath: Other than that, it was about three minutes I think.

Mike: It was, yeah, three minutes.

Heath: Yeah. Three minutes.

Micky T: And it was on ... they were on Oculus Go’s, weren’t they?

Heath: Yeah, Oculus Go.

Micky T: At the Ekka?

Heath: That’s right.

Micky T: Was there those app-

Heath: Oh, that’s right. Then we’re working with developers that, that’s what all that crazy wild stuff was at the end.

Mike: This was some of the stuff that I was mentioning to you about the delivery, that we delivered in that Opus format?

Heath: Yeah.
Mike: That was this job.

Heath: That was mind-bending. Yeah, so that was my first experience, actually, with delivering the-

Micky T: We all remember our first time.

Mike: But it was great, because this job came along and we were looking at it and we kind of quartered it up, and it looked to be a relatively straightforward project.

Heath: Yeah, because it had already been done as a 2D, like sort of just a stereo mix.

Mike: They created a 2D version of it already, hadn’t they.

Heath: Yeah.

Micky T: To go up on the website or something, wasn’t it?

Mike: Mm-hmm (affirmative).

Heath: So the sound palette was already there, half the song was already there. Like, I just had to build a bit onto that.

Micky T: It was almost like we thought it was just going to be an upmix.

Heath: That’s right. Yeah.

Micky T: Like taking something from stereo to surround, but stereo to spatial. Yeah.

Mike: It was a really good first project for you to tackle, but it was supposed to be pretty straightforward and easy.

Heath: Yeah.

Mike: At the end, there was just this ...

Heath: It was a curve-

Mike: ... massive curve ball.

Heath: There was a curve ball. It was a surprise. But at the same time, yeah, we encountered a couple of problems because we were encountering ... everything had upgraded between ... Mike had-

Mike: Yeah, the software had upgraded.

Heath: Between when Mike had finished his last job, and by the time that I started this job. So there was this weird sort of plugin mismatch. We had to figure that out, which we-

Mike: Spent a while figuring that out, didn’t ... didn’t you? Micky T tends to arrive about an hour earlier than everyone else in the building.

Heath: Yeah.

Mike: So oftentimes Heath and I would go home at the end of the night going, "Oh, Micky T’ll have a look at that in the morning."
Heath: Yeah, "I really need Micky T to have a look at this."

Mike: Then by the time we'd come in, he'd gone, "Well I've half figured it out." We'd go, "Excellent."

Heath: Yeah. Yeah. So, yeah. Yeah, it was definitely-

Mike: That's teamwork though, right?

Micky T: Yeah.

Heath: Yeah. That's right. You have to utilise your assets.

Mike: That's exactly it.

Alicia Eames: That's Micky.

Heath: Yeah. Yeah.

Mike: But prior to that, the QPS job is probably the latest job we did. Then prior to that was-

Micky T: Sorry, I'm just still on the QPS.

Mike: Yeah?

Micky T: The good thing about all of that going really, really sideways is that forced us to go through and document everything.

Heath: Yeah.

Micky T: So we've got, which I don't think a lot of people out there would have, just a really firm kind of in-house documentation about file formats and delivery formats, and the plugins and how they work together, and what they're capable of, and how to run different versions depending on what you need. That was a really good benefit of that one, was that we kind of solidified all that, so that even if it's six months before the next project, we've got a reference point.

Heath: And we're prepared for it.

Mike: Yeah.

Alicia Eames: How long will it last before it changes?

Micky T: A very good point.

Heath: Exactly. Yeah.

Mike: Yeah, it does. It keeps changing. But I certainly find from a technical point of view that, if I leave things for ... say if there's 12 months before ... it's more about the iterations of something. If there are so many changes by the time you come back to something, it's almost you feel like going, "Oh, I've missed it. I don't have a week solid to sit down and figure this all out again." That's the beautiful thing of working in a team, is that we can share that load. It's not one of us who has got it all stacked up in their brain. And Micky T's amazing at documentation. So through all of our R&D and working through projects and stuff like that, yeah, we've been able to document it.
Micky T: Even if stuff does change and it's six months before, at least we've got a-

Mike: We can catch up.

Micky T: ... reference point from the last project, rather than remembering how to use version two. But now we're on version four, so you've got to remember two and then work your way up to four.

Heath: That's right.

Mike: Yeah.

Heath: And make all the mistakes that we made to get to three.

Micky T: Yeah.

Mike: Yeah. Yeah. I mean, certainly in the first six months of me mucking around, I was continually going back to websites, reading things that I've read before, and they take a few times sometimes to sink in or to actually grasp the concept of something. That's our sort of way of being able to fast-track that as well, which is great.

Alicia Eames: Cool.

Mike: But yeah, did you want to step back through some of the other projects, or were you happy to continue moving on?

Alicia Eames: Probably we can continue moving on.

Mike: Yeah.

Alicia Eames: Unless there's interesting things to note. But how many projects, if you were going to take a stab, how many VR projects would you have worked with?

Mike: We have delivered now ... we've done heaps of testing and bits and pieces of little projects that weren't official things, but we have done the full post delivery on QPS.

Micky T: QRide.

Mike: QRide.

Micky T: Speed.

Mike: Speed. And yeah, and there were some early ones which were-

Heath: Was that TMR?

Mike: ... proof-of-concept.

Micky T: Speed was TMR.

Mike: Speed. Yeah, TMR Speed. So four big ones, and then probably another three or four little deliveries. They were final products, but they were more proof-of-concept things for clients.

Heath: TMR itself was quite big as well. It had lots of different parts, so it's worth noting probably that it was quite a huge project. It was like, probably, how many videos?
Mike:  Well, there was one.

Heath:  One VR part, and then there was lots of other little parts around ...

Mike:  Yeah. Yeah. It was a suite of TVCs and cinema that came off the back of that stuff, yeah.

Alicia Eames:  Yeah, cool.

Mike:  Yeah.

Alicia Eames:  Four big ones, and then another three or four little deliveries. The thing Heath, that you did with the perspective on that VR, I haven't really heard of anybody doing that before, as in moving it around. It's either head-locked or spatialized, and you've kind of done both. I haven't heard of someone doing that.

Mike:  It was the perfect opportunity, wasn't it, to do that.

Heath:  Yeah.

Mike:  Because it was-

Micky T:  And you know what? It blew us away, because we had tried things like that in previous versions, and had really struggled with just purely as a level point of view, the level difference between hearing something head-locked and then all of a sudden it's spatial, and then it kind of ... it's a little bit jarring? Then Heath showed us when he'd done that. We're like, "How'd you do that? How's it-".

Heath:  There's some weird bits in it too, like there was one bit where at the end, the final line was "Look to the stars." And I kept ... most of it, I kept it head-locked, but then I'd also gone, "Look to the stars!" [Heath waved his arms in the air to simulate the spatialisation of the audio] And I put in this mad spin and they're like, "What was that?"

Mike:  Yeah. He's like, "Alright, the first bit worked but the last bit [crosstalk 00:16:20]."

Heath:  Yeah. Yeah.

Mike:  But yeah, because you're flipping between outputting ... basically out of two separate soundtracks you're outputting a spatial stem and a head-locked stem, yeah. Particularly dialogue, because the human ear keys into that more than any other element of the soundtrack. Yeah, we've done plenty of stuff where we have done things where we've flipped between spatial narration or voiceover to head-locked and back. But yeah, the transition usually can be a bit rough, whereas that project it worked perfectly. Yeah, because the narration in the QPS project was almost like, a little bit like, the voice of God, in that it was just this really soothing, male tone telling you about this story and how all these things connect. Then the voice just shifts up to here, but it wasn't jarring in any way, was it? So it allowed you to kind of move smoothly up to kind of look up where his voice was now coming from, and then the animation developed further from there. Then it went back to head-locked.

Micky T:  Whereas we struggled ... I remember when we were doing 'Inside Manus' we struggled just with level management and found that we had to break it up by scenes. It was head-locked, and then there was a little bit of spatial dialogue, but then we couldn't make the transition back to head-locked until the scene changed and you felt like it warranted a difference in perspective.

Mike:  Yeah, that's right. You almost needed-
Micky T: And the story gave it that.

Mike: Yeah. You almost needed some ... in order to create a smooth transition, you needed some distraction of something else.

Micky T: Yeah. Yeah.

Mike: Like, "Oh, here we go. Look at the birds and the music." And now we'll transition the voice back to head-locked again.

Heath: That's what we did as well, because we had the stars appearing where the voice was appearing from as well. I had a vision-

Mike: Visual cue?

Heath: ...visual cue done, like stars that I had to put little sound effects on as well. That might have helped the transition as well. It was just like this little sound effects cluster that just sort of went up, like that. That's what helped it as well.

Mike: Yeah.

Alicia Eames: Yeah, cool. You guys did the sound design on 'Inside Manus'?

Mike: Yeah.

Micky T: That one was a little bit different, because there was the room-scale version which was all done in Unity. So we were actually doing the spatial ambisonic mix, but then we were delivering assets and handing over to the developers.

Mike: To integrate it all in there.

Micky T: Yeah.

Mike: With them.

Micky T: So that was-

Mike: There were a few long nights there.

Alicia Eames: I'm doing something sort of similar. We're designing ... I'm doing my main design in Reaper, but then delivering short sound effect assets to attach to objects in Unity.

Micky T: Yeah. That's exactly, exactly ... But we had no experience doing that.

Mike: No.

Alicia Eames: Me neither.

Mike: It's fun.

Alicia Eames: Yeah.

Mike: I think it depends a lot on the developers at the other end, you know the guys who are integrating the sound, how much experience they have with sound. We had, we're working with a great team.
Micky T: Yeah.

Mike: But just the whole ... the new tools that we're using-

Micky T: It was like mixing by email-

Mike: Yeah.

Micky T: ... in that they were running the engine. We had no idea how any of that worked, and we were just sitting behind them and saying, "Put that on there. Oh no, turn it up. No, turn it down. Alright, play back the top. No, turn it down more."

Mike: And the way that the animation and scenes were built inside Unity, there was no ability to fast-forward or align and things like that, so we were playing through scenes. We were tweaking through a sound effect at the end of a two-minute scene, and then ... 

Micky T: Playback from the top.

Mike: ...going in playback for two minutes. And you'd go, "Oh, I'll watch it in a second." You'd be chatting about the next scene and then you'd go, "Doh! I missed it!" So our review process as well, it was just pretty tough. But we got there, and it was an awesome result. And in terms of 'Manus', when did we complete that?

Micky T: This time last year.

Mike: 12 months ago?

Micky T: Yeah.

Mike: I haven't seen anything like it since, but it certainly had some impact on the scene of people seeing the animation, and then coupled with the soundtrack people just going, "Man this is next level. I haven't seen anything like this." And it was a really beautiful story and purpose behind it, so that helped as well.

Alicia Eames: I haven't actually seen it yet.

Mike: Great.

Alicia Eames: But it was at the film festival recently, wasn't it?

Mike: Yeah.

Alicia Eames: I didn't actually get to see it, but everybody who came out of that was like, "You have to see it. You have to see that."

Mike: Awesome.

Alicia Eames: They were like crying, or had been crying.

Mike: We'll see if we can fire it up and show you then. I went out to our rig yesterday, and it was all kind of locked up and I didn't want to stuff it up, but the guys'll probably be there this morning. We'll see if we can duck out afterwards.

Alicia Eames: Thanks.

Mike: And play it. Yeah. I haven't seen it in ages.
Micky T: No, neither have I.

Alicia Eames: How do you guys find the review process?

Mike: Reviewing your mixes?

Alicia Eames: Reviewing your mixes, and just the whole process of working with virtual reality as opposed to working with traditional 2D?

Micky T: Time-consuming.

Mike: Yeah. Yeah.

Micky T: It's gotten a lot better.

Mike: It has.

Micky T: Even in the last year. But we're so used to doing something, hitting play, review, "Cool." The tools are great for that, to a certain degree, but eventually you need to balance it out, MUX it, put it on a headset, watch it back. It's just time-consuming. What would usually take a few minutes to play through and go, "Yeah. No, that's sounding good," takes an hour and a half to get through all of that, and then watch it a couple of times. That's presuming you haven't messed anything up with the encoding.

Mike: Mm-hmm (affirmative). But yeah, the tools are making it easier and easier and easier, to the point now, and we still haven't done this, but to the point now where you can, using the spatial workstation you can plug a Rift in, and have live previewing. We have got ... I think our Rift is down in Sydney, but we need to get on that, get that going. So there is the ability to do live previewing, but yeah, it's far more accessible for us at the moment to be able to smash it out onto the Go. We've got a couple of Gos, and even a Gear VR, it's so old now that it's always around for us to grab and use. Then we've got the Vive out the back, sort of permanently set up more or less. That's there to check things out on, as well.

Mike: In different playback engines, things sound a bit different as well. On the Go we were finding with this last project particularly, the playback can change between playback runs. So I guess where the software is doing its decoding-

Heath: Well, playback runs and formats of video, as well.

Mike: Yeah, that's right. If you're giving it a h.264 or a h.265-

Heath: Or an MKV.

Mike: Or an MKV. Yeah, your audio playback can alter and change slightly, even just with sync and things like that. So it's, in terms of that review process, that also sort of throws curve balls as you're going. It's not just a matter of being able to rely on hitting the play button and knowing that everything's in sync, all your orientation's correct, because it's not every time. Yeah, sometimes you'll spend a half hour just troubleshooting something, just to get review playback.

Heath: Yeah. What was the problem that we had, when I export my QPS, I think it was when we were using the Gear VR, because I couldn't get hold of the Go. I'd load it onto the phone. I was looking around, and I'm like, "Something just doesn't sound right," like it was clicking as you were moving your head in orientation-

Mike: Yeah, there were artefacts in the panning and stuff.
Heath: Yeah. So I was like, "Oh my God. My mix is broken again. What's going on?" So I just went and had a quick look on the forum, and other people were having the same sort of problems with, I think it was h.264, when they were dropping frames. Because they were dropping frames, it would lose the point for where the audio was attached to, and so the audio wouldn't play in that particular part, but then as soon as you moved your head it'd come back again when it had caught back up with the frames. That's when we would be like, "Okay. We'll go for the MKV because it's a lot more stable."

Mike: Yeah.

Heath: It just so happened that that's what they wanted delivered as well with the Opus, so we were just like-

Alicia Eames: Thank goodness.

Mike: Yeah.

Heath: Yeah.

Alicia Eames: Yeah. Wow. It's actually really interesting. Any time I've spoken to somebody, they say all the same stuff. It's just like, the process is time-consuming and [crosstalk 00:26:18]-

Micky T: If anyone says it's easy, they're a liar.

Heath: They're either a liar or an asshole.

Mike: Yeah, yeah. That's right.

Alicia Eames: Let me just write that down.

Mike: Yeah.

Heath: Yeah. We can [crosstalk 00:26:30]-

Mike: That's a good quote. That's your quote that's going to pop out.

Heath: Yeah, we can play that, right? Yeah.

Mike: "If they say mixing for VR's easy, they're a liar or an asshole."

Alicia Eames: - Cutting Edge.

Mike: Yeah.

Heath: Yeah.

Alicia Eames: Perfect. No, that's awesome. Thank you.

Mike: That's funny.

Alicia Eames: The projects you've done, have any of them been narrative-based? Or are they doco based?

Micky T: QRide was narrative.
Mike: QRide was narrative-based. That was an underwater adventure. Speed was absolutely narrative-based. Q-

Heath: It was a bit of both, wasn’t it? It was narrative and it was historical.

Mike: What’s ‘Manus’, you mean?

Heath: No, QPS.

Mike: Oh, QPS. Yeah. Yeah, yeah, yeah.

Heath: Yeah. That was a bit of both.

Mike: But in terms of more of a traditional narrative, yeah, Speed. Speed VR, TMR, so it was Transport Main Roads. When I keep saying "TMR Speed", it sounds like it’s a Keanu Reeves sequel. It’s not. It almost should have been called "Speeding". It was all about the dangers of speeding. I can show you that one as well. But yeah, they all have had a narrative element to them, even ‘Manus’.

Micky T: Yeah, 'Manus' was-

Mike: It had a strong narrative to it.

Micky T: Yeah, because it was ...

Mike: It was almost a memoir-style.

Micky T: Yeah, it was recorded interviews, but almost presented narratively.

Mike: Yeah.

Micky T: In the way that it was animated, and it leads you through ... they're talking about their past.

Mike: What's Lucas's surname? Lucas, do you remember?

Micky T: No. But I can-

Mike: No.

Micky T: [crosstalk 00:28:37].

Mike: Do you ... weren't we talking last time about the writer who wrote 'Inside Manus', Alicia, do you know? He's not with Hoodlum anymore. Lucas ...

Micky T: Taylor.

Mike: Taylor. Do you know that name at all?

Alicia Eames: No.

Mike: Okay. Lucas Taylor was the writer. He took all of these interviews and stories along with, I think there was an initial producer involved in those stories, I believe. But yeah, he took all of the transcripts and created a narrative from that.

So yeah, that definitely had narrative elements to it as well.
Alicia Eames: So for cinema, traditional cinema, sound design is quite creative. It's not necessarily realistic to the scene. But for VR, where do you find your sound design falls on that spectrum?

Mike: I think of it the same way. I think of it the same way in terms of, it's just dependent on the project, so where the TMR Speed project was almost like a short film, it had a whole lot of realistic stuff going on for the majority of the story. You know, a door opening and closing just needed to sound like a door opening and closing, and needed to fit the perspective of the room or the kitchen it was in, or whatever it might have been, or any footsteps I laid in needed to just feel like they were there and feel realistic. Whereas for 'Inside Manus' we had a whole lot more creativity.

Micky T: Yeah, ghosts and-

Mike: Yeah that's right, we had ghosts. But then there were certain ... some of the atmospheres, for example. We almost broke between, there were little scenes that felt much more realistic, and we had the real ... friarbirds, were they?

Micky T: Oh, yeah.

Mike: The Manus friar?

Micky T: The Manus Island friarbird. Chalkers.

Mike: Chalkers, that's right. So we had realistic atmospheres happening and that sort of thing, so when you were standing in the detention centre, in the yard, it felt like you were there. But then we'd go off on, as the detainees were retelling stories, you'd go off on this creative sort of adventure journey with them. We'd have music coming in and-

Micky T: It got very hyper-realistic.

Mike: Yeah. It got very hyper-realistic at times, and then it'd come back to reality again. That had a real mix of things. Then QPS was completely creative, wasn't it?

Micky T: Yeah.

Mike: There was almost nothing realistic-

Heath: Yeah. It was a soundscape, really.

Mike: ... about that. So kind of to me, the approach doesn't necessarily change between 2D to VR. It's just the major difference is that you're not looking through a 16" x 9" window anymore. You're not designing sound with ... with a set focus, I guess.

Micky T: That's a good point, is that what you then can do is, because the view, what they're supposed to be looking at, isn't necessarily defined, is then you can use sound in a creative way to draw their attention to things, more so than anything else.

Mike: Yeah.

Micky T: They're looking in this direction and they need to look that, you've kind of got to do that with either a big, ugly arrow or sound.

Heath: Yeah.

Mike: That's it. So where in traditional cinema, in a film, even though we've got Atmos and 7.1 and 5.1 formats and that sort of thing, they're all pretty standard now, even now, there's
no expectation for the audience member to turn around in a cinema and look behind them or look above them, because there's just a big fat silver screen in front of them, a window that they're looking through. Whereas obviously with VR, we have that opportunity to get the viewer to turn around and look at things, or-

Micky T: And I mean the reverse I suppose is true, as well. Sometimes if the main part of the story is here, and you've already got them looking here and things start to move like that, maybe you don't track them all the way up because you don't necessarily want them to take their eyes off this bit yet. This is just kind of extraneous, what's happening over here. So you do get more creative with your localization and where you're placing things. But I think like Mike said, we approach it in a very similar way.

Mike: It's the same storytelling mentality from a sound perspective. How do you best tell the story? Except now the story's all around you. This is sort of onto a slightly different tangent, but we also use at the start of each scene, of say with 'Manus' or ... QPS is a little different. It didn't have separate scenes. But TMR was very much scene-based. It was two parallel stories, so you kept chopping back and forth between them. Each scene, we'd spend the first 10 seconds, 20 seconds just orientating the viewer. It's probably the most important at the beginning of the project, but to orientate the viewer to give them an indication that they do need to move around and look around. And so, in using visual cues, tied ... yeah, using visual cues and tying audio cues onto those visual cues to get the viewer to move around. And know that they need to move around, in order to get the information for the story. Some things like QPS, the viewer could just sit there and spin almost the whole time, and there's beautiful stuff around them the entire time. Whereas with 'Manus', at times, the camera angle was such that we really wanted the viewer to focus on a 130-degree perspective. We wanted them to look around from left to right, but not necessarily turn around for that scene. So yeah, we'd set the camera in a certain perspective, and then we'd ensure that we weren't firing heaps of sounds behind them or above them. We'd keep it all off into the distance, almost. And especially for the room scale version where there was some actual left-right/up-down movement as well, they could almost look through the scene, look off into the distance, and hear what was happening.

So yeah. They're the major differences between mixing for 2D versus VR.

Alicia Eames: Yeah, cool. A lot of VR research in the past is focused on really realistic sound, looking for really high-fidelity extreme realism, to try and give a greater sense of immersion. There's a couple of people that are like, "Okay, we need to start treating sound more creatively in virtual reality for audience engagement and emotional response," which is what my project is looking at. I'm just kind of exploring how that works, and so talking to you guys is really awesome because you come from film and are working in this space. Is there anything you have to say to that, about-

Micky T: I have never, ever used a B-format recording in anything I've worked on. Any kind of realistic capture of something in an ambisonic sense, everything's been built from mono or stereo sources, which is exactly the same as how I'd approach a 5.1 programme or cinema mix. You have more control over individual elements, so quite often it's a bit of a pain to grab a 5.1 recording of Atmos, when you can build it in a much more satisfying way, to build the environment that you want out of multiple mono or stereo sources. I suppose I've never approached it in any other way than the kind of cinematic principles we already work on.

Mike: Yeah, that's the other thing. Even though we want to create that, suspend that disbelief and immerse the viewer into this completely other world, they're still engaging with it, initially at least, engaging with it in the same way that they do cinema, or watching something on their iPad, Netflix and that sort of thing. We're so used to the way that microphones sound, and close-proximity mics, so whenever anybody hears a recording of
an ambient mic, like say this mic even in the room, as soon as they hear the ambience in the room, oftentimes it's like, "Oh, that doesn't sound very good. That's not very clear."

So we've got a Sennheiser Ambeo rig. That's what you use, isn't it? Yeah. We've done plenty of recording with that, but we do find, just like throwing up a boom mic on a set versus having everyone ... You might have a boom mic catching everything, a distance mic, but then you've got lavs on everyone. We're going to go for those lav mics when we can use them, nine times out of 10. For us at least in the projects we've worked on it's proven to be the same kind of approach.

I don't know whether some of that research that you're talking about in terms of it being realistic is coming from tech developer dudes who are looking for being able to simulate real reverbs and things like that in spaces, whether it's coming from that. So if we place a, you know, in a Unity engine if you place a sound on a whatever it might be, a radio. I was going to say "a juke box", how old am I? A radio-

Heath: That's older.

Mike: "A little bit older" is the answer.

Micky T: He's almost 40.

Mike: Shut up.

Heath: That's Micky T's quote: "Almost 40."

Mike: Well you're almost 20 then. A radio on a... a counter. You know, if there's a radio playing in the corner of the room, and you're able to move around the space, then they're developing tools that are working all of that interaction stuff and the reverb times, and the- ... diff sbsh... what is-

Micky T: Diffusion?

Mike: Diffusion, but the bounce off 3D objects in the room and that sort of thing as well, so that you can move around walls and that sort of thing, and you get all of those reflections and ... diffraction? What's the word?

Alicia Eames: I know what you mean.

Mike: You know what I mean? So I don't know whether there's some of that research is coming from that, as opposed to a creative mixing/design point of view?

Alicia Eames: Yeah.

Heath: When you were doing TMR, you were getting that car ambience by actually using that ambisonic mic in the middle, weren't you?

Mike: Yep. Yeah, yeah, yeah. So no, that's worth... yeah. That's a good point.

Heath: Yeah. That's what made me think of that straightaway, actually. You actually... there's a couple of times that I could actually remember that you were using that ambisonic rig, and that was for the ping pong table?

Mike: Yeah, yeah. Did all that.

Heath: Out the back, and then playing with the rotation of it. Then, it was pretty tricky to get the car ambience right, but you got it in the end, didn't you? This is just from memory.
Mike: Yeah. No, that's right.

Heath: Yeah.

Mike: For that project, where realism was a big part of it, 90% of it was all sort of very realistic-sounding things, there was a scene where there was a mother and daughter in a car, and they were having a conversation back and forth. So I had the Ambeo mic on set while we were filming and recording, and it was hidden and ... I can't remember exactly where it was in that scene, but it was super-close to the-

Heath: You put it in the headrest, didn't you?

Mike: ...camera. Yeah, but we had to hang it off windows and stuff at one point as well. It was sort of tied up to the camera rig. But to get all of the Foley sounds of doors closing and the handbrake being let off, and that sort of thing, and even the keys jingling, I post-recorded all of that with the Ambeo mic in one of the work vans here, and so recorded all of that and then laid that into the scene. And it was just beautiful. It felt like an ambient mic in the space. Yeah. That's using old-school techniques of just recording this whole sound, basically, you know? There was no real trickery involved there. I wasn't trying to lay in Foley sound effects that had been recorded on a Hollywood set anywhere, I was just going and recording the real sounds with that Ambeo rig.

Alicia Eames: Cool. Do you guys work with location recordists who are recording sound for you for all these projects, apart from yourselves?

Mike: No. Ourselves, so far. Yeah.

Alicia Eames: Cool. It's beyond the scope of my project, anyway. I was just curious.

Mike: No, but that's definitely something that we've considered a number of times. There have been a few times where we've been out on set, supervising and recording, and when I was telling you I worked with Salty for a few days, he was out there rigging up all the lavs and stuff like that, and I was just running around with the Ambeo. But yeah, that's definitely something that... I mean even us talking, I said to the guys, I said, "It could be something that down the track we can get Alicia out recording stuff for us on set, knowing that we've got someone who knows what they're doing from a location point of view but coming from the other perspective would be very helpful."

I was out on set doing a record on something that we didn't post. We were just out there recording and shooting. Ben was on camera. I was out there having to rig up lavs and stuff like that as well, and I'm bloody making little sticky triangles, trying to make sure I could stick it on these things. And I'm going, "This is so ... I'm so out of my depth trying to make sure these mics stay on." And you know, "Was there a rustle? I don't know. Where's the rustle from?" All of that sort of stuff. So yeah, someone coming at it from the other perspective would be very helpful.

Alicia Eames: And you can't even be around. When I've done VR projects, you leave your bag and hope for the best, and come back and playback the recording.

Mike: Yeah.

Alicia Eames: Yeah. "No, it's good. We're okay."

Mike: That's right. That's right. That's where having that collaboration would be good, or that's why up until now us being out on set I've sort of felt is kind of imperative, because I need to be able to say to Ben or whoever's on the visual side of the team, be able to say, "Can I run a cable from here to there?" And they'll say, "Yeah. We'll be running this from here to
there, and we're painting that out." So great, I can run my rig into that room over there, and be out of view, and know that they're going to paint that stuff out later. Or, as you say, yeah. I've got to keep my rig nice and tidy, you know the bag underneath the tripod or the monopod or whatever it is, and hope for the best. And run away, or chuck an IFB on and try and be monitoring. Yeah.

Alicia Eames: Yeah. Kind of stepping away from that side of things. Clients, talking about clients and just the industry in general. How does the budget compare to 2D? The cost of designing sound for VR, how does it compare to designing for 2D? Do clients have the budget for it?

Micky T: It can be hard to approach the subject, because not only does the time taken to actually design and mix and all of that, but the R&D time as well, and having to explain at the very start that we can do this, but it might take a day to figure out how to deliver it depending on... Quite often, you don't know where it's actually going to end up when you first start working. We certainly didn't with QPS.

Mike: Yes. The QPS job might have had... was it originally two or three days' worth of... was it about that?

Heath: Yeah. It was.

Mike: Is that what we budgeted?

Heath: Officially, yes.

Mike: Yeah. So there were then two or three days-

Heath: But then it was also encouraged to, any downtime, just to get that stuff prepared. Yeah.

Micky T: I think it's almost... I guess still with, maybe not so much with budgets but just with clients, it's still the same issue we face. Sometimes with people who are less experienced with... you know, we still have corporate videos come through and they don't understand the process. We need to explain things, and that's just for-

Heath: That's even just a stereo mix, yeah.

Micky T: ... a web video. But then, the opposite to that is true as well, because with 'Inside Manus' was very understanding.

Mike: In terms of the time it was going to take and all of that sort of thing, and the review process and that. Yeah. Yeah. You know, basically going through and making 10 to 15 tweaks to a mix, and then reviewing and revising and outputting again, it's easily half a day's worth of work.

Heath: That's right.

Micky T: Of course that affects budget.

Heath: And of course it's new technology, so if we're not sure how long it's going to take, they've got no idea. You know what I mean?

Mike: But generally the budgets at the moment are probably a quarter of what they should be. If you translated a 2D budget to a VR budget, it should almost be four times the cost because you're creating four times the amount of vision and visual effects, or even sound to a degree. Then, because of the new technology, the review process is slower and the revision process is slower and all of that sort of thing. So at the moment, they're a quarter
of what they should be, so that makes them pretty tiny. I think everyone is in that state at
the moment, where we’re basically all trying to over-deliver on smaller budgets.

Micky T: I suppose that’s the way it is with any new kind of-

Mike: Yeah.

Micky T: ...thing is, you’ve got people working on it who are passionate about it and trying to over-
deliver, and then that sets the standard for where it eventually ends up.

Mike: That’s right.

Heath: You just have to look at the projects on the Facebook 360 site, you know? Like on the
Facebook site. There’s pretty amazing stuff on there. They’re just hobbyists. So if they’re
setting the standard, so...

Mike: Yeah. We usually blow out our budgets, particularly on the four big projects we’ve done
so far. They’ve all blown out one way or another. ‘Manus’ was better. ‘Manus’ was
probably the best one in terms of not blowing out, because TMR went from a five days to
25 days or something like that. Originally we’d budgeted five days, and went to 25. Heath,
though yours was probably quadrupled. Two or three days turned into nine, 10 solid days’
worth of-

Heath: Well, we had a lot of problems with the mismatch of the plugins as well.

Mike: Yeah.

Heath: That was another couple of days.

Mike: All of that, yeah. So often times it’s not the content, it’s the tech that gets in the way. But
yeah.

Heath: But actually, because it was my first VR job, after mixing for 5.1 and stuff, it just sort of
makes sense. It’s definitely not the content or anything like that, because it does make
sense. It is. It’s the tech. Yeah. It’s constantly changing and forcing programs to do what
they didn’t use to do.

Mike: But yeah, it’s all in communication to the client. We’re getting better and better at that,
and obviously we have... luckily, we have producers who look after the money side of
things, and Ben for example who looks after the communications and the sell to clients,
and showing them projects that we’ve worked on.

Micky T: That’s the other thing, is having four kind of big projects that we have over-delivered on
and there to be able to show people, and proof of concept-

Mike: That’s right. Yeah. Our budget for something might have been $50 grand. We can show a
project that looks like it’s worth $200,000 or $300,000, and we can then put a price tag
on it that looks... you know, it’s a bit more realistic. And then we’ll halve it, in order to
actually sell it. But yeah, that’s pretty typical, I think, of how things’ll continue, until it’s
more understood and gets even easier from a technical point of view. Yeah.

Alicia Eames: Is it worth it?

Mike: Yes.

Alicia Eames: For the client?
Mike: That's actually a good question, because I think of all the projects that we've worked on so far, yes, but I've seen heaps of stuff out there that's just not worth it, in terms of, there’s no need to have done it in VR. There’s no need to have created that project in VR. That’s I think integral to virtual reality's progress and integration into the mainstream market. We have to be creating experiences for people that exceed their expectations. If you show them, and I talk about this a lot, showing someone VR for the first time and putting them on a rollercoaster seems like the dumbest idea to me in the world because if you make someone sick within 30 seconds of going into VR then... Sure, it’s really gimmicky and it’s kind of cool the first time you check it out, but then you feel sick and you go, "No, I feel sick. I'm not going to... " And everyone else who's seen it: "Yeah, I put the headset on and felt sick, too."

Then you think, "How are we ever going to have people with headsets on for half an hour, let alone five minutes, and be able to present the real life-changing experiences, if we’re giving them things like roller-coaster rides to go on?" And yeah, even just simple narrative stories, there are plenty of ambitious directors and storytellers out there who their first stories just ... they're not worth telling in virtual reality. I think that's really key to it.

Alicia Eames: That was really interesting. I was actually asking is if the spatial sound in VR is worth it. Is it worth the investment for clients to worry about the soundtrack?

Micky T: 100%.

Heath: Yeah.

Micky T: Yeah. Sure.

Mike: Yeah. If realism is what they're going for, or taking the viewer, looking to really take them on a journey outside ... oh, this is so cliché ... outside reality ...

Heath: You mean "virtual reality".

Mike: Yes! But to really get the full sense of immersion, the audio is as important as the visual. Yeah. I don't feel like that's just me being-

Heath: It doesn't feel real if it's not.

Mike: Yeah, that's right. I think with-

Heath: Creatively speaking, you've got so much... if everything's head-locked, it just doesn't feel real, I think.

Mike: But I think it's that thing for the viewer. A lot of people who even walk into a cinema don't recognise that the sound is coming from behind them, and the surround speakers and stuff like that are firing sound effects and music and that sort of thing, and that melts into their subconscious.

Heath: Unless it's new. Unless it's new, because I remember when I first heard ... you know, like when Dad brought home his first 5.1 setup, we were all listening to it and you're like, "Oh, there's a helicopter!" You know?

Mike: Sure. Yeah, yeah, yeah.

Heath: Then that becomes normal, after that. I feel like it's-

Mike: Yeah. But people are used to wearing headphones, so you put them under VR goggles and you put headphones on them, and the headphones are not an unusual, new feeling
for them. But then their experience is such that, like with 'Manus' for example, from an emotional point of view they’re really moved by it. They don't necessarily recognise that the sound was coming from all around them, or anything like that. But because they've been just taken on this journey that feels real, feels like everyday life, and in everyday life the sound comes from all around us.

**Micky T:** I'd certainly say from a narrative perspective it's essential. There's not a whole lot of other ways to direct people's attention, if the action does need to move to a perspective behind you. If it was all head-locked and someone says, "Hey, look at me," then you go... You've got someone who, maybe they're there and they spin 310 degrees before they reach the point.

**Mike:** Yeah, that's right. A visual cue behind you has no impact without an audio cue attached to it. Yeah.

**Alicia Eames:** That's brilliant. I don't have anything else for you guys.

**Mike:** Oh cool.

**Alicia Eames:** Is there anything else that you feel that you should add, need to add?

**Mike:** There was something that is worthwhile bringing up, that was on your list. At one point you were talking about, at what point do we get involved in the pre-production process and stuff like that.

**Alicia Eames:** Yes. When do you like to be involved? When is it important?

**Mike:** Yeah. That's a big thing that, talking about differences between 2D and VR, not even necessarily that but, but yeah. We started using the term "spatial sound supervisor", which is just a wanky thing, but we have the effect supervisors here that are regularly out on sets supervising and advising on set of, “Yes, if we put the green screen there and lights there, that will work.” You know, advising on all of what's possible from a visual point of view once we get things in post. Not only us being out on set is something which is new for us, which is really cool and fun, and pretty essential, but being involved right from the pre-production process, even from early script stages ... 'Manus' was an example of where we were involved directly with the writer right from the beginning, wasn't it?

**Micky T:** Before-

**Mike:** The first draft script.

**Micky T:** Before anything was animated. Yeah, it began with you sitting with Lucas and turning those interviews into the story.

**Mike:** Yeah. So basically all the way through, we're just looking for opportunities where the sound can help direct the viewers' attention, or help progress the narrative through, or help tell... And 'Manus' was an animated project as opposed to a filmed project, so we were able to take sections of the story that Lucas wanted to tell, and represent it with audio. It meant we didn’t need any of that dialogue or narration in there, because six seconds of the mother singing, a singing vocal from the mother in the story, could help tell that story without having to vocalise it.

TMR Speed was another one as well. I'd insisted that I was part of all the pre-prod meetings with the advertising agency and the director. That was terrific as well because oftentimes, as you would know on set, and this is one of those violin moments, but the sound is always the last thing to be considered. You know, you have to pick your
opportunity to yell, "Sound speed," otherwise they just start rolling, you know? Sound just kind of gets forgotten.

Being part of that pre-prod process was great, because I was able to interject at certain times and say, "Well, we could do this here, or we could have... if we want to know that it's morning but we're going to be shooting in the afternoon, sure we're going to be shooting lights through the window that will represent morning light and that sort of thing. But I can fill atmos coming from here. We can have an alarm clock go off that will help the viewers' attention. So great, let's write an alarm clock into the scene. Where's the kitchen in the scene? Oh, the kitchen's just down the hallway, great. I can have sounds of the kettle boiling and that sort of thing, and the husband's in bed sleeping while the wife's out. She's already up." So we can use all of that. Opposed to that being an afterthought, that could be worked into the story right from the beginning. It's worked beautifully, particularly on those two projects.

Alicia Eames: Thank you. That's awesome.

Micky T: Yeah. Great.

Alicia Eames: Yeah.

Mike: Nothing else to cover?

Alicia Eames: No. But I'm really glad you brought that up.

Mike: Great. Ideally, I'm not a location sound recordist. I know exactly where the Ambeo rig needs to go, and I know exactly how I want everything set up and how I want everything to sound, but being a sound sup and having a location recordist is the perfect scenario. You know, you have a proper sort of sound team on set doing all that stuff, and then everything can get captured. Because it's still the last thing that gets thought of. The rigging of a VR camera for each shot can take half an hour to get right, camera position and technical rig and things working and wireless transmitters and all that sort of thing. And you need to be able to get in there and rig up the Ambeo mic, and also have all of the lavs and any other mics sorted as well. It's bloody... it's bloody stressful, having so many channels.

Alicia Eames: I found with mine as well, we recorded on the Insta360pro, and we were in a really quiet room. Like really quiet. And the fans on it were just too loud, so I didn't bother with on... like, I only got reference sound. I didn't get-

Mike: Yep.

Alicia Eames: I just then had to re-record. The other shot was outside but it was on a drone, and the drone was the size of like-

Mike: Yes.

Alicia Eames: so it was-

Mike: Yeah. That's it. It's probably for Speed where I had the Ambeo mic in most scenes, half the time I used it as reference. It was still great for reference, but yeah, there was just too much other noise stuff going on.

Alicia Eames: Thank you so much. You guys have been amazing.

Mike: Cool.