



Winston Churchill Memorial Trust of Australia

Fellowship Report | Ben Tolliday (B.Mus) | 2016 Fellow

Professional development
in film score recording and mixing



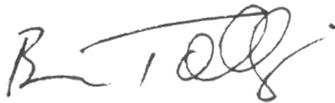
Scoring session for
Thor: Ragnarok
Abbey Road Studio 1
London, August 2017

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Signed

A handwritten signature in black ink, appearing to read 'B. Tolliday', with a stylized flourish at the end.

BEN TOLLIDAY
September 9, 2018

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And finally, to my parents Mac and Viv for supporting my idealistic dream to pursue music as a career – I would not have had this experience, were it not for your love and support.



Alan Meyerson
recording orchestra for
Thor: Ragnarok at
Abbey Road Studio 1

KEYWORDS

Film Score



Composer Mark Mothersbaugh's sketch on his Thor: Ragnarok score.

Film Score Production



Scoring session for Jumanji: Welcome to the Jungle at the Barbra Streisand Scoring Stage, Los Angeles. L-R: Adam Michalak (stage recordist), Kevin Globerman (ProTools engineer), Alan Meyerson (score engineer), Henry Jackman (composer), David Metzner (music editor).

Orchestra Recording



Double Bases for Thor: Ragnarok at Abbey Road.

Choir Recording



John Ashton Thomas conducts London Voices for Thor: Ragnarok at Abbey Road.

Film Score Mix Engineer



Alan Meyerson setting levels at Abbey Road.

Surround Sound Mixing



Alan Meyerson mixing the score for Thor: Ragnarok at Remote Control Productions, Los Angeles.

INTRODUCTION

During the course of my life in music, I've worn many hats:

- » Cellist
- » Recording Engineer & Mixer
- » Record Producer
- » Radio Broadcast Engineer
- » Film Score Mix Engineer

This diverse trajectory transpired partially due to my curiosity and thirst for knowledge. But it's also a result of shifts that have occurred in the music industry since I completed my undergraduate degree - B.Mus (Cello) - in 2000.

Technological advances, the mp3 download revolution, and the resulting change in resource allocation for audio recording mediums have meant that one must be agile to remain relevant, engaged and employed.

Most creative industries have faced similar challenges stemming from the impact of technological change, but the music recording industry has experienced a seismic shift like few other industries during this time.

The advent of home digital recording has empowered musicians, while the resulting contraction of recording budgets has meant recording professionals must adapt their skillset and career focus to get a gig.

Throughout my career, I've been very fortunate to have excellent mentors, from string teachers David Maddick, Stephen Chin & Mei-Lee Stocker, to maestro John Curro of the Queensland Youth Symphony, plus producers Guy Sigsworth, Jonathan Burnside, and Justin Tresidder.

The one pursuit for which I've never had a mentor, is in film score recording and mixing - a career direction that came about in 2010 when I moved to Los Angeles.

Since 2010 I've been hired to record and mix film and television scores for US and Australian composers and production companies.

For the most part, I applied skills acquired from working on records or from cello performance experience. As a recording engineer, I have often drawn on my classical background to inform my work. Whenever I hear an orchestra perform, the natural acoustic balance between instruments and phrasing between different musical parts is my litmus test for how they convey the composer's intent and emotional reach. In a way, an orchestral concert often ends up providing a welcome reset to my approach and workflow in the studio.

Despite this breadth of experiences and knowledge, I lacked confidence as a film score engineer. In particular, I felt ignorant in orchestra and choir recording workflows and surround sound mixing techniques. When I mixed my first feature film score, I spent hours making every music cue sound great by ear, without paying enough attention to the images on the

screen. During the first playback review with composer Steven Argila, he said "It sounds great, but it doesn't quite work with the picture." Since then, I've been far more cognizant of film music's supportive role to the picture - a distinctly different approach to working on records. That score turned out well, despite my inexperience, but I was eager to learn more from a leading film score engineer.



The iconic conductor's podium clock at the Barbra Streisand Scoring Stage Sony Studios, Los Angeles.

EXECUTIVE SUMMARY

Ben Tolliday
Sound Engineer
Los Angeles, USA
tolliday@mac.com

PROJECT AIM
Professional development in
film score recording and mixing.

PROJECT DESCRIPTION

To broaden my experience and skills as a film score mix engineer with Alan Meyerson as my mentor. Alan invited me to observe recording sessions for two major studio film scores:

- » Thor: Ragnarok (composed by Mark Mothersbaugh) at Abbey Road Studios, London.
 - » Jumanji: Welcome to the Jungle (composed by Henry Jackman) at Sony Studios, Los Angeles
- Following these recording sessions, I edited orchestra and choir recordings alongside Forest Christenson (assistant film score engineer), and shadowed Alan during his mixing sessions at Remote Control Productions, Los Angeles.

In addition, I observed two days of score production with engineer Michael Farrow for a forthcoming Coen brothers film, The Ballad of Buster Scruggs (composed by Carter Burwell) at Sear Sound and The Body Studio, New York.

My goal is to bring these skills back to Australia, disseminate my findings among tertiary institutions and industry associations through seminars and speaking engagements. I plan to write articles for industry publications, and apply these skills to Australian films. Ultimately, I hope to grow our film score industry to better compete on an international level.

Knowledge travels slowly in creative industries. To help speed up the process, I propose:

- » Federal, state and local government funding investments in similar mentorship grant programs with industry professionals. It takes time to forge these types of mentor-mentoree relationships, but the benefits are immediate and could be far-reaching for Australian sound engineers (whose global reputation is growing ever stronger thanks to our strong work ethic and positive attitude).
- » Greater financial support for industry forums (like Bigsound) to disseminate information and expertise from industry-leading recording professionals.
- » Tax incentives to attract foreign film score production to Australia.
- » Investment by government and private entities to establish specialised music score production facilities.

ALAN MEYERSON BIO

Alan Meyerson is a leading film score mix engineer of the modern era. With hundreds of credits on a myriad of projects, Meyerson has an unparalleled wealth of experience in engineering and mixing in general, and film score mixing in particular. He has worked with leading film score composers like James Newton Howard and Danny Elfman, plus he has a long-standing working relationship with Hans Zimmer that continues to this day.

Meyerson's film score credits include: The Dark Knight trilogy, Inception, Interstellar, Wonder Woman, and Dunkirk. For the small screen, he mixed the score for the award-winning Netflix drama, 'The Crown' (season one), and Amazon's 'The Man in the High Castle'. Meyerson also has many big music mixing credits dating mostly from the 1980s, including Bryan Ferry, New Order, and Etta James. During that time Meyerson worked with some of the great New York remixers, like Arthur Baker and Shep Pettibone, and his background in rock and club mixing means that he has a unique reputation in Hollywood as the go-to engineer for a tougher, more aggressive film score sound.

Meyerson frequently records at the finest studios and scoring stages around the world,

including Abbey Road Studios and AIR Studios in London. In Los Angeles he regularly works at the Barbra Streisand Scoring Stage at Sony, the Newman Scoring Stage at 20th Century Fox, and Eastwood Scoring Stage at Warner Brothers.

His own mix room is located at Hans Zimmer's Remote Control Productions facility in Santa Monica, Los Angeles.



Alan Meyerson (above) and Mike Shapiro (left) getting drum sounds for Jumanji: Welcome to the Jungle, at Apogee Studios, Los Angeles.

ALAN MEYERSON INTERVIEW

I sat down for a video interview with Alan, where I asked a series of questions (below). I've created hyperlinks to each of Alan's individual answers, for ease of reference. Click on a question to load the corresponding video answer:

[Was there a moment when you first realised you could pursue sound engineering as a career?](#)

[Who were the most influential engineer mentors during your formative years?](#)

[Are you continually learning something new?](#)

[Is creating the perspective of being inside the ensemble one of your primary objectives in surround mixing?](#)

[Should a film score mix engineer be more conservative with dynamic processing to preserve dynamic contrast?](#)

[Is there greater scope for dynamic contrast on a film score than on a record?](#)

[If a technical problem arises mid session, how do you stay calm & quickly resolve it?](#)

[Does instinct ever elude you, and if so how do you overcome it?](#)

[Have you had a home studio, and if so how does it compare to being based at a facility like Remote Control Productions?](#)

[What will the film score production process look like in the future?](#)

PROGRAMME

30 June - 8 July 2017



Recording for Jumanji: Welcome to the Jungle at Barbra Streisand Scoring Stage, Los Angeles.

26 - 31 July 2017



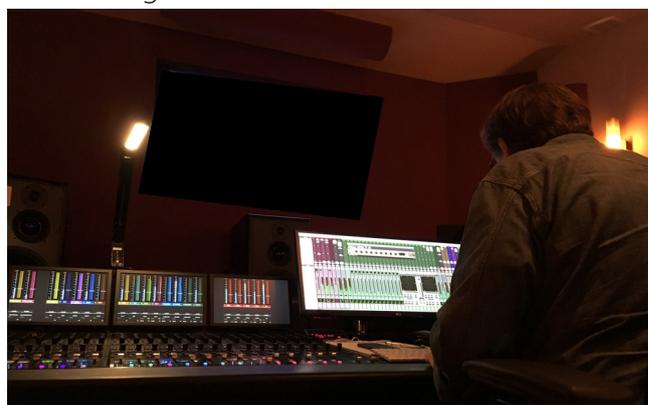
Recording for Thor: Ragnarok at Abbey Road Studios London.

9 July 2017



Additional percussion overdubs for Jumanji: Welcome to the Jungle at Apogee Studios, Los Angeles.

3 - 12 August 2017



Score mixing for Thor: Ragnarok at Remote Control Productions, Los Angeles.

10 - 20 July 2017



Score mixing for Jumanji: Welcome to the Jungle at Remote Control Productions, Los Angeles.

20 - 21 May 2018



Overdubs and mixing for The Ballad of Buster Scruggs at Sear Sound and The Body studios, New York.

JUMANJI: WELCOME TO THE JUNGLE

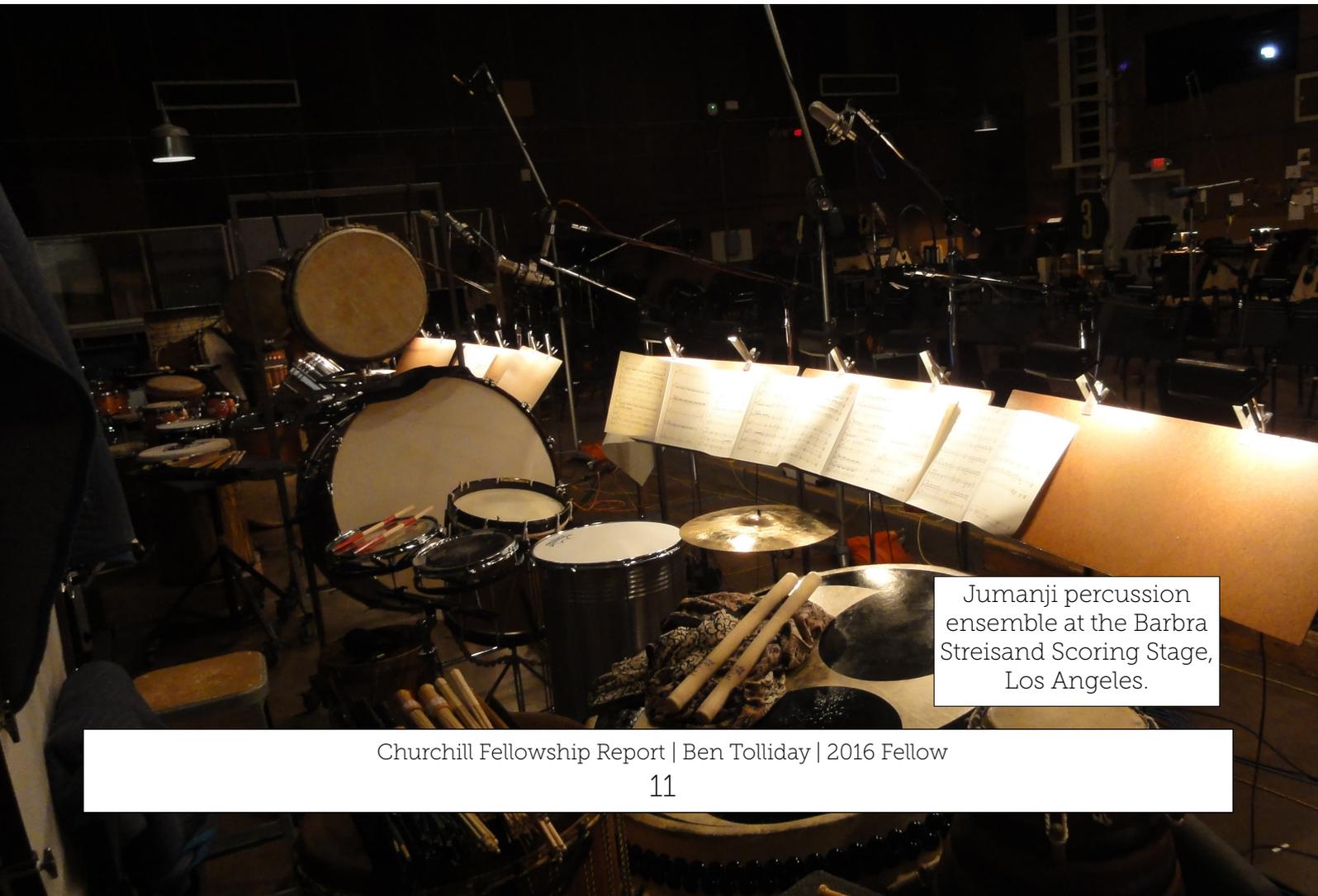
The score for the film *Jumanji: Welcome to the Jungle* was written by British composer Henry Jackman. It is a quite traditional orchestral and choral Hollywood film score, featuring a full symphony orchestra, choir, piano, celeste, harp and extensive percussion overdubs. Unlike many other modern film scores, there is very little use of sample library recordings or synthesisers.

To allow for maximum flexibility and scope for larger-than-life mixing results, Meyerson and Jackman decided to record the strings, brass and woodwinds together, and overdub keyboards, harp, choir and the percussion separately. This approach is quite common in modern film score productions for a number of reasons:

1. The final 'locked' picture edit may not be settled until very late in the production process, sometimes well after the score is recorded and mixed. When this is the case, the music editor is often required to re-work sections of the score by editing the final mixed music stems. Increasingly, many contemporary directors expect to have the ability to mute, remove or re-work individual elements

(for example, a tambourine part). This may seem straightforward, but it is not. For each separate part, the score mix engineer must account for the extra time to record, edit, mix, and print stems (the process of mixing parts separately in preparation for final file delivery).

2. A project can gain aesthetic advantages from recording potentially loud musical elements (percussion, brass) or very soft elements (celeste, harp) separately. Most scoring stages - especially the Barbra Streisand Scoring Stage - have an acoustic footprint that defines their sonic character. This character manifests as the aural space around the ensemble, usually referred to as the "room sound". Orchestras and choirs need some room sound to help glue the otherwise disparate sound of multiple individuals together into a cohesive sum of parts. To that end, certain instruments (especially strings, brass and woodwinds) massively benefit from room reverb. A great-sounding big room not only glues the instruments together, it adds dimensional depth.

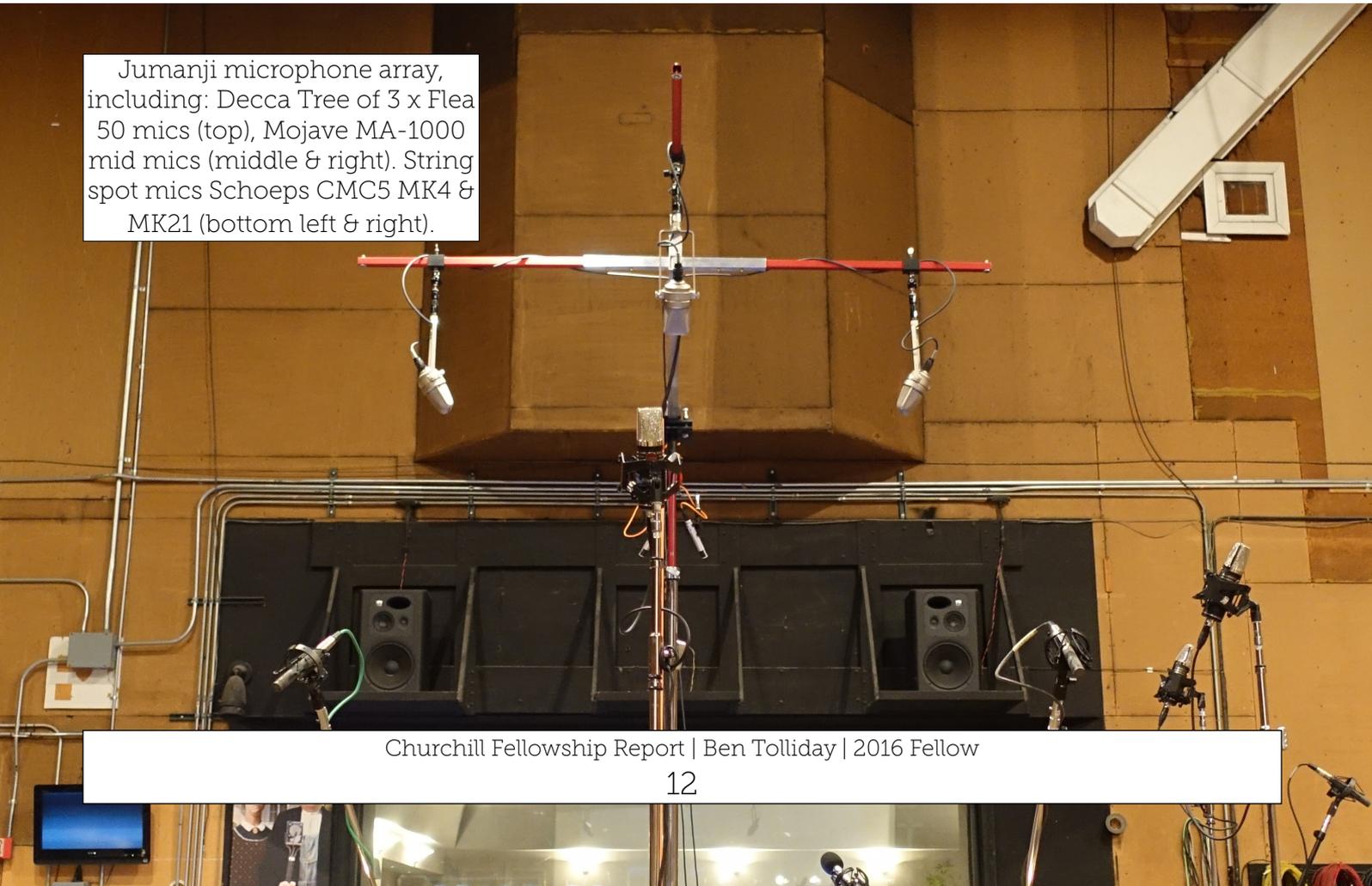


Jumanji percussion ensemble at the Barbra Streisand Scoring Stage, Los Angeles.

MICROPHONES & PREAMPS

The Decca Tree mic array is the core of most film score and classical orchestra recordings. The array is usually comprised of three M50 tube omnidirectional microphones - left, centre and right - set in a triangle approx 6 feet wide, 4.5 feet deep, hung 10-12 feet from the floor, above the conductor. The original vintage Neumann M50 microphones are rare and highly sought-after. Few studios have a matched set in perfect working order. As a result, many studios and engineers opt for modern reissues, such as the Flea Microphones 50 or Neumann M150.

Alan owns a matched set of the Flea 50 microphones as part of his extensive arsenal of microphones, preamps, and studio monitors - that he takes to all local sessions in Los Angeles. For Jumanji, his main microphone array comprised the Flea 50 Decca Tree, four Mojave MA-1000 large diaphragm condenser 'midfield' mics spaced evenly in front of the string section, and a pair of Sennheiser MKH800 omni mics (also known as 'outriggers') to capture the wide ends of the ensemble. He has a pair of MKH800s as side mics, another pair of MKH800s behind the conductor as the surround mics, plus two more pairs of MKH800s at the front and rear of the ensemble as the height microphones. These height mics were wide-spaced (approx 35 feet apart), mounted at a height of approximately 20 feet. The front pair was mounted behind the conductor, the rear pair at the opposite end of the room - behind the percussion section. Above the woodwinds (or choir), he placed three Royer 122-V ribbon mics as mid spots. The combination of these mics captured the essence of the ensemble in the room, with additional detail captured by spot mics on most instruments. Whether Alan was recording full orchestra, percussion, choir, or keyboard overdubs, he always recorded the main microphone array - in addition to the spot mics. This meant that each overdubbed part had sonic consistency in the room, which helps glue the sounds together in the mix. Depending on the size of ensemble during each recording pass, the number of mics captured could be anything from 22 for a Harp overdub, right up to 69 mics per orchestral pass of strings, winds, and brass. A full day of set-up is set aside for mounting, patching and checking microphones. Nevertheless, a setup of this magnitude - with 69 mics, 81 players, and 81 sets of headphones - renders the probability of a technical issue high. On the first morning of full orchestra, Alan had very limited time to double-check all the mic inputs to the console, and to fine-tune his recording levels into ProTools.



Jumanji microphone array, including: Decca Tree of 3 x Flea 50 mics (top), Mojave MA-1000 mid mics (middle & right). String spot mics Schoeps CMC5 MK4 & MK21 (bottom left & right).

Watching Alan speedily skip through every channel on the console and preview each mic input was awe-inspiring. On this occasion, a fault had developed on one of the outrigger tube mics so he made a quick mic change before the 10am downbeat. For any session, time is money - but this is especially true on an orchestral recording session with musicians, production staff and a scoring stage on the clock. Alan's more than 30 years of experience was apparent during this first day of recording - in particular how fast he set input levels and an overall balance. It's an advantage that all of the mics and outboard preamps belong to Alan, and that he intimately knows their characteristics and parameters. I was impressed with how accurately he pre-set his preamp levels. Before the session downbeat, he had made educated guesses for mic preamp levels. He listened to each mic in solo during the players' warm ups, honing in levels. For most engineers, until the orchestra plays altogether, it's difficult to know where the levels will sit. This degree of detailed knowledge can only come from years of experience on the job.

On Jumanji, Alan used his Grace, Pueblo, Manley, Forssell and AEA preamps. He prefers preamps set in the live room near the mics for a pure signal path, avoiding long cable runs between mic and preamp. His Grace m802 preamps can be digitally remote controlled via a long D-Sub cable, which allows the best of both worlds - short mic cable from mic to preamp, and remote controllable from up to 1000 feet away. Alan's approach to film score recording is simple - choose the appropriate mic for each purpose, and capture sounds as clearly as possible through uncoloured preamps.

When tracking orchestra, his left, centre, and right studio monitors are a set of Bowers & Wilkins 800D speakers, which he'll typically pair with the studio's own surround monitors and subwoofer.

RECORDING PROCESS

For film scores and most modern music recording, a click track is the guide pulse for the players and conductor. The tempo is mapped in great detail to match the picture, and can fluctuate greatly within each musical cue, as the picture demands.

Quick side note here. In brass sections, there's a tendency to articulate notes a fraction late or towards the back of the beat. This can add weight, drama or a deeper groove and rhythmic swing. For strings, the rhythmic playing style typically sits more on top the beat. This perception is often enhanced by the sheer physics of distance. Strings are at the front of the ensemble, whilst brass sit further back. At times there is some compensation of the distance by certain players. A percussionist might typically strike a triangle slightly ahead of the conductor's downbeat in order for the sound to speak in time with the ensemble. Generally, tight timing and precise intonation is key. However, on a few occasions Henry Jackman wanted certain percussion instruments - bass drum, timpani or gran casa - to land a very small fraction late of the downbeat. The end result was surprisingly effective. On a technical level, one might expect such an approach to sound sloppy or out of time. But in the right context, the effect gave an impressive and forceful drama to the downbeat. Having worked on many styles of music over the years, this was an important take-away for me. The expressive potential of subtle timing tweaks like this, whether executed in performance, or through editing, can have great effect on how the music translates, which in turn can enhance the narrative. During the editing process, many careful and judicious timing decisions were made, especially related to the percussion overdubs, which employed this technique.

The click track is needed to keep everyone together, but this 'rub' of instruments landing on a beat at slightly different times also helps define the orchestral ensemble sound. It brings the score to life, and adds humanity that cannot be recreated by orchestral samples.

Recording overdubs allows great flexibility for the composer to creatively layer multiple recording takes/passes of different instruments to create unique textures. There are specific rules about over-dubbing parts on union recording sessions, which I observed in the Jumanji sessions. Put

simply, it is not permitted for a musician to overdub multiple parts on a single music cue within one three-hour session. The workaround is to record the first part during the first session, then return and have the player record the next part in the second session, and so forth. This rule was created by the musician's union to prevent exploitation of individual players, and aims to keep more musicians employed for ensemble recording on film and television score sessions. On the flipside, it creates more work for the production team in carefully scheduling the sessions to avoid additional overdub overtime expenses.

Henry and his team spent three and a half months composing the score for Jumanji, and the decision to overdub all percussion was very much an aesthetic one. This score is rich with a fusion of influences ranging from composers like Copland and Scriabin, to a mix of African and Asian percussion styles. Some composers like to conduct the ensemble, for direct interface with the players, while others prefer the perspective from the control room, beside the production team. Henry's preference is the latter, as he's constantly liaising with Alan, the music editor, score copyist, and his assistants, as well as controlling the pace of the session. Henry's energy was quite remarkable to witness. He'd often listen to a take while jogging around the control room and having conversations with his production staff at the same time. He had his own idiomatic phrases too. "More biscuits" implied the need for a bigger, more energetic style of playing. "Fire" was his directive for the ProTools engineer to hit record. "Give it a wallup" was a common request to the percussion section to strike their instruments with greater force. His diction was concise - a clear message and brevity are both essential in this environment. He was very detail-oriented with phrasing, at times asking the orchestra to record numerous takes of a passage in order to achieve his desired outcome. Throughout the sessions, I closely observed how Alan interacted with Henry and the musicians, and noticed he used a lot of discretion as to when he gave musical feedback, and what that feedback was. Always supremely respectful of the musicians, Alan and Henry's symbiotic working relationship is well-honed. The way the music served the film narrative always guided the decision-making process.

During a break on a percussion recording day, I got to meet Greg Goodall - an experienced percussionist on the Los Angeles film score scene. I told Greg about the nature of my fellowship - learning how Alan makes everything sound great - when he politely corrected me. "The players make it sound great, and the engineer captures it," he said. A salient point, although I might add that the engineer not only captures but has the ability to greatly enhance the recordings.

The ProTools engineer for these recording sessions was Kevin Globerman, who has worked with Alan for over 20 years. Kevin's roles included:

- * building and maintaining record templates, including labeling of record tracks, in this case, 69 tracks per orchestra take.
- * digital routing to/from the recording console.
- * operating the two separate ProTools rigs - prelay (composer's pre-recorded elements, click track & video) and record (destination for orchestra, choir, percussion, harp and keyboard recordings).
- * note-taking during recording sessions.

The ProTools recording sessions had very high track counts, given the nature of recording multiple separate takes of orchestra, choir, percussion, piano, harp and celeste. Over the years, Kevin has designed a brilliant system to very quickly automate otherwise time-consuming tasks, by using macros. He programmed these macros with the software 'Keyboard Maestro'. Kevin has carefully created bespoke macros for key tasks such as track labeling, and notating key information from each take. I had used macros earlier in my career, mainly to automate simpler ProTools editing tasks, but Kevin's macros are on another level altogether. His note-taking macros were the most impressive to me. Incorporating the ProTools commands for 'record' and 'stop', his macro would copy a range of data - date, time, cue name, take number, recording start bar number, recording end bar number and instrument description - then paste it into a google spreadsheet doc which is shared with the music team. The only manual data entry required is performance feedback from the composer or engineer. These spreadsheets were invaluable during editing and mix review sessions with the composer.

Below is a screenshot excerpt from Kevin's take notes document:

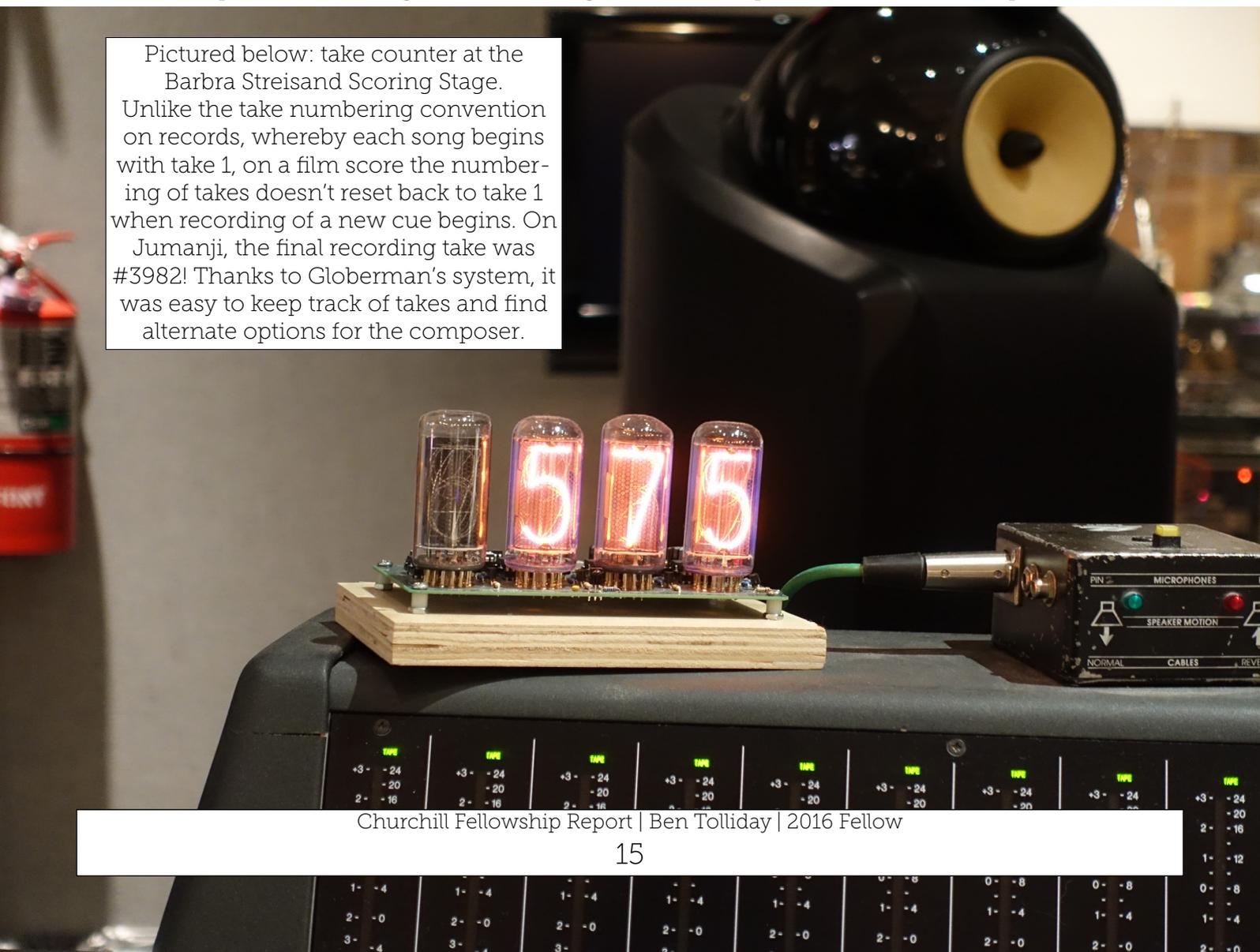
Cue	Take #	FROM	TO	Time	Date	Instruments	Master	Edit/Tracking Notes - KG	Edit/Tracking Notes - Ben & Mezz
MysSUITEv1.2	573	35 1 000	63 3 490	8:09 PM	7/3/17	Piano			
MysSUITEv1.2	574	35 1 000	65 2 023	8:11 PM	7/3/17	Piano			
MysSUITEv1.2	575	75 1 000	84 2 456	8:12 PM	7/3/17	Piano			
4m24v1.2	576	1 1 000	16 2 626	10:02 AM	7/5/17	Orch			
4m24v1.2	577	1 1 000	16 2 696	10:04 AM	7/5/17	Orch			
4m24v1.2	578	1 1 000	16 4 097	10:06 AM	7/5/17	Orch			
4m24v1.2	579	1 1 000	16 3 685	10:07 AM	7/5/17	Orch	x	very close	this is the take
4m24v1.2	580	1 1 000	16 4 685	10:08 AM	7/5/17	Orch		not as good	
3m15Bv3.0	581	7 1 000	31 3 329	10:10 AM	7/5/17	Orch			
3m15Bv3.0	582	7 1 000	33 1 098	10:16 AM	7/5/17	Orch			
3m15Bv3.0	583	7 1 000	32 1 167	10:18 AM	7/5/17	Orch		Tacet Flute & Clari - Good	pretty close, good front
3m15Bv3.0	584	7 1 000	18 1 615	10:19 AM	7/5/17	Orch			
3m15Bv3.0	585	7 1 000	31 2 928	10:21 AM	7/5/17	Orch		bssn was particularly good	good bassoon, horns a bit pitchy at

MIX PREPARATION

Throughout the recording process, files were delivered to the assistant score mix engineer, Forest Christenson, who began editing and prepping Pro Tools sessions in readiness for mixing.

Due to the nature of recording orchestra, choir and multi-layered percussion separately, the editing and mix session preparation process required a huge amount of work. Despite this challenge, Alan and Forest have developed a great synchronicity in their workflow so Alan could begin mixing within a few days of the recording sessions, with Forest simultaneously editing and prepping the remaining music cues. It was a race to remain a few cues ahead of Alan, so during this part of the process I offered to help out with editing, in turn learning the idiomatic preferences of the composer.

Pictured below: take counter at the Barbra Streisand Scoring Stage. Unlike the take numbering convention on records, whereby each song begins with take 1, on a film score the numbering of takes doesn't reset back to take 1 when recording of a new cue begins. On Jumanji, the final recording take was #3982! Thanks to Globerman's system, it was easy to keep track of takes and find alternate options for the composer.



Before Alan begins mixing, extensive preparation goes into each cue. Most of the score for Jumanji had over 300 audio tracks, and the largest cue had over 700 audio tracks due to the layering of multiple orchestra, choir, percussion, keyboard and harp parts. Routing is a time-consuming and complex part of the job, and is essential to ensure speed and efficiency during the mix. In order to best prepare and organise the sessions, it's important to know the required deliverables for the dub stage - a combination of different surround and stereo files - plus, in this instance, a separate set of deliverables to be used for the soundtrack stereo mix.

Below is the list of stems and channel specs for the dub stage:

Orchestra A (7.1)	Low Percussion (7.1)
*Orchestra A Height 1 (Stereo)	Mid Percussion (7.0)
*Orchestra A Height 2 (Stereo)	High Percussion (7.0)
Orchestra B (7.1)	Production Percussion (Quad)
*Orchestra B Height 1 (Stereo)	Extra Percussion (7.1)
*Orchestra B Height 2 (Stereo)	Jumanji Percussion (7.1)
Choir (7.1)	Harp (Quad)
*Choir Height 1 (Stereo)	Piano/Celeste (Quad)
*Choir Height 2 (Stereo)	Tuned Percussion (Quad)
Orchestral Percussion (7.1)	Guitar (Quad)
Metal (Quad)	Synth (5.1)
Ethnic (Quad)	Extra (7.1)
Click (Mono)	

Here's the list of stems and channel specs requested by the composer for the soundtrack mix:

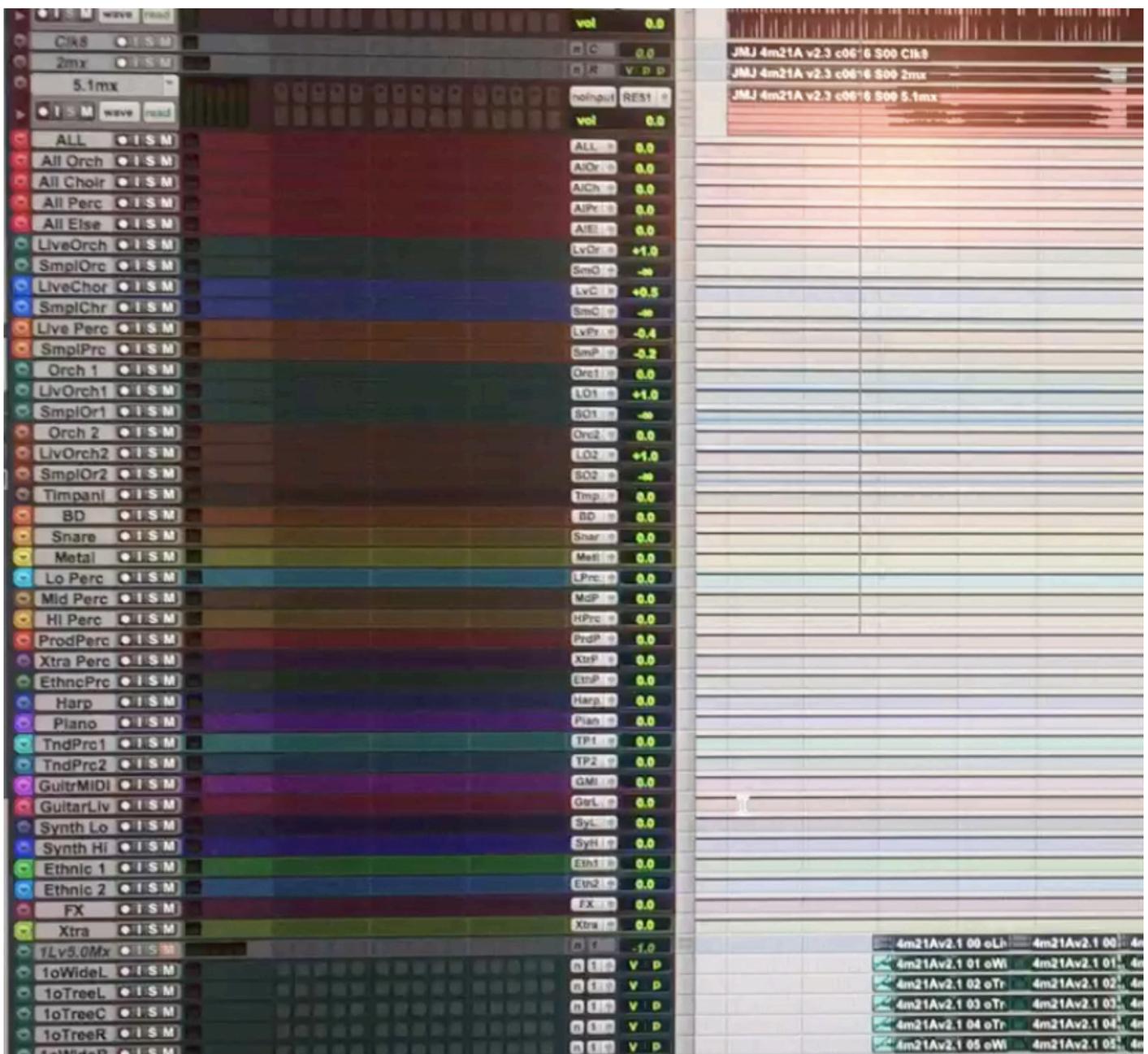
Orchestra A (7.1)	High Percussion (7.0)
*Orchestra A Height 1 (Stereo)	Production Percussion (Quad)
*Orchestra A Height 2 (Stereo)	Extra Percussion (7.1)
Orchestra B (7.1)	Jumanji Percussion (7.1)
*Orchestra B Height 1 (Stereo)	Harp (Quad)
*Orchestra B Height 2 (Stereo)	Piano (Quad)
Choir (7.1)	Tuned Perc 2 (Quad)
*Choir Height 1 (Stereo)	Guitar MIDI (Quad)
*Choir Height 2 (Stereo)	Guitar Live (Quad)
Timpani (7.0)	Synth Low (5.1)
Bass Drum (7.1)	Ethnic 1 (Quad)
Snare (7.0)	Ethnic 2 (Quad)
Metal (Quad)	FX (7.1)
Low Percussion (7.1)	Extra (7.1)
Mid Percussion (7.0)	

*Seeing as Jumanji was to be presented in Dolby Atmos - a surround sound technology introduced in 2012 - Alan delivered several 'height stems', in addition to 7.1, 5.1, quad and stereo stems. This gave the re-recording/dubbing mixer options to assign the height stems to audio objects in the Atmos array. Put simply, these height stems would be assigned to the ceiling speakers, adding vertical dimension to the music mix.

The number of stems required for delivery was higher than I had encountered before, but not abnormal for a major studio film of this scale. I wasn't aware that a composer might request more separate stems for the soundtrack mix. It requires more time for the mix engineer and assistant, as each cue requires more routing to accommodate this request. It also means there are many more files to manage, label, export, transfer and back-up.

Without a full-time assistant, and a mixing rig as powerful as Alan's (more on that below), these deliverables would have been impossible to complete by the deadline. Having only worked on small to mid-sized films, documentaries and TV show scores myself, this was a significant observation. On the biggest film score I've mixed - for a musical movie score called 'Basmati Blues' - I worked up to 19 hours/day towards the end of mixing, in order to get everything done on time. The scale of that film score was quite large, but not as huge as the scale of this Jumanji score. During mix preparation, Forest and I had a few 18 hour days - a reminder that epic long days are a reality even on a major film score with a large production team.

Below I've linked to a video scrolling through the most dense ProTools mix session from Jumanji, titled '[The Bikers](#)'. This cue had over 700 tracks of audio, mainly due to the number of layered orchestral and percussion parts. Forest's impeccable session organisation skills are on display here. This is a private link, so click on the image below and enter the password 'churchill' to open the video:



MIXING

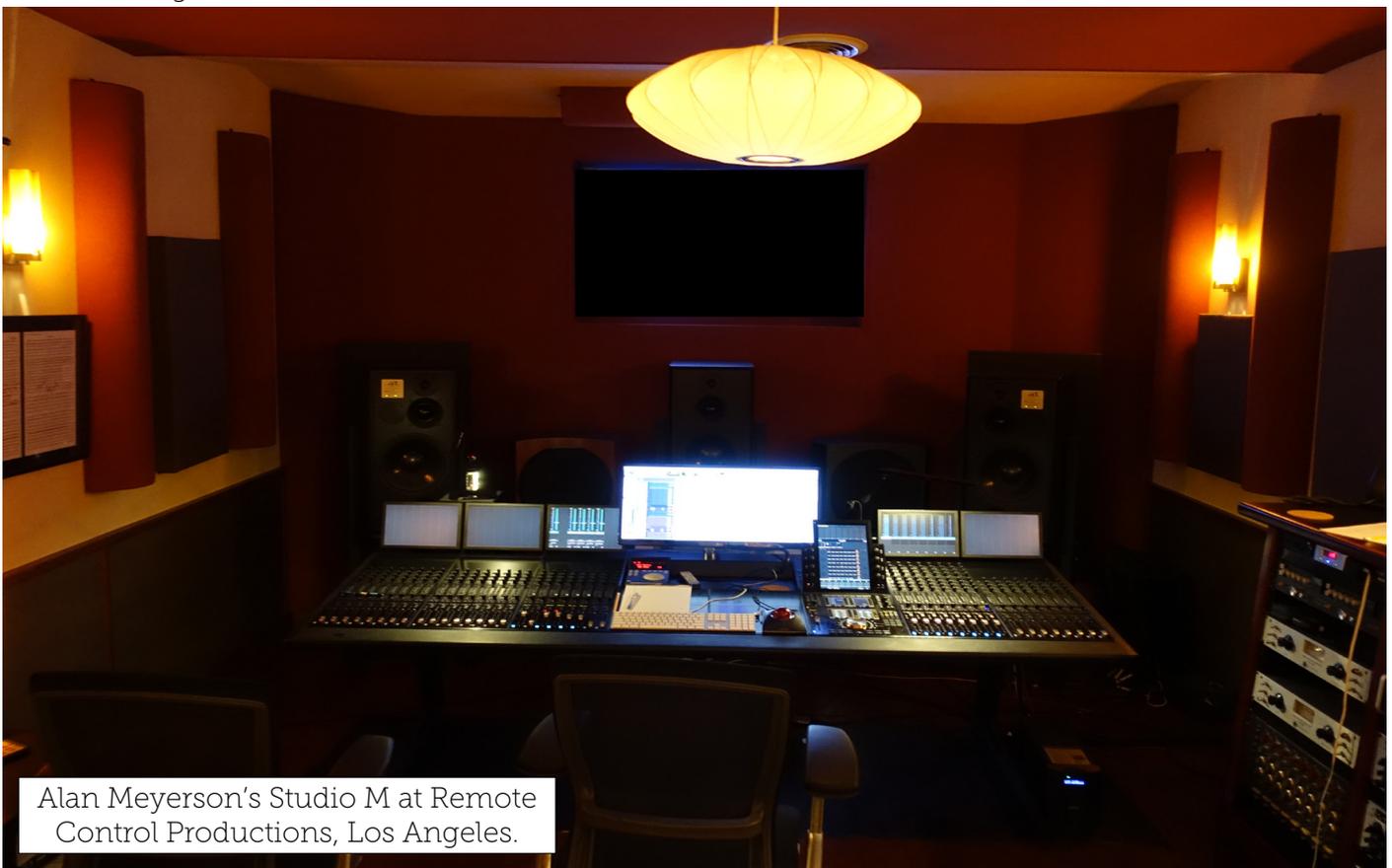
Alan's mix room is Studio M at Remote Control Productions, Los Angeles. His 7.1 channel surround monitoring set-up is listed below:

- 3 x ATC SCM100ASL Pro speakers (left, centre & right channels), with left & right running via 2 x Bowers & Wilkins active subwoofers with inbuilt crossovers
- 2 x ATC HTS11 speakers (side channels)
- 2 x ATC SCM20PSL Pro speakers (rear channels)
- Kreisel DXD-12012 Duo

The mix rig comprises two synced ProTools HDX systems connected via a Digital Audio Denmark MADi interface, all clocking off an Antelope OCX-V, with the capacity to capture up to 128 channels in one pass. Alan's control surface is the Avid S6 - a modular and versatile tool, widely used in film and television sound.

Outboard hardware includes six Bricasti M7 reverbs, three Manley Massive Passive equalisers, an EAR 825Q equaliser, and a Manley Vari-Mu compressor. The latter two stereo units are mainly used for stereo fold-down mixes and/or for mastering stereo soundtrack releases. The Massive Passive equalisers are sometimes inserted over a 5.1 group (for example, an orchestra stem). The Bricasti M7 reverbs are typically used on the most important stems (usually orchestra), and are often panned to different channels in the surround image, gluing the sum of all parts together.

Aside from the outboard hardware listed above, most of the mixing action happens in ProTools. Alan owns just about every ProTools plug-in available, far too many to list here, and he uses a wide range of these plug-ins in his workflow. He began by listening through the orchestra mics, quickly balancing the main array mics, then removing unnecessary individual mics and filtering low end rumble. Noise floor is always a consideration, given the number of recorded channels. I was fascinated watching Alan begin to shape the mix, quickly adding plug-ins and twisting virtual knobs in a stream-of-consciousness fashion. He liked throwing a bunch of ideas at the wall to see what might stick, moving fast to create momentum.



I didn't notice a formulaic approach- he would quickly experiment with different processing approaches for the sake of variety, or to find a new sound. At times, Alan would use the Fab Filter equaliser plug-in as a high or low cut, or to notch out problematic frequencies. He would also use the Massenburg MDW equaliser plug-in to perform the exact same tasks, but used this plug-in merely for the sake of tonal variation. I found Alan taking a similar approach when he used transient-shaping plug-ins. Sometimes he would use the Sonnox Envolution, other times Sonnox TransMod. Both are powerful tools, but the Envolution has more flexible functionality, it can hone in on a frequency range to make transients punchier or softer. Alan would reach for the simpler TransMod in the interests of diverse processing. According to him, the improved accessibility of modern mixing tools, like software plug-ins, has been a great equalising force in the world of mixing. These days, most musicians, engineers and composers own a similar set of tools, placing a higher value on creativity and finding innovative ways to execute musical or sonic ideas.

After some time working on balance and experimenting with plug-ins, Alan always compared his work-in-progress with the composer's reference mix. It's a common mistake for an engineer to embark on a tangential direction, in turn losing sight of the artist/composer's intent. He would check his work at a lowered volume, un-muting the dialogue (Dx) & special effects (SFX) audio for context. Alan constantly cross-checks the 'ref' in his workflow, minimising the likelihood of an undesired end result for the composer. In Alan's words, "Don't underestimate the power of a good ref mix".

Alan's use of reverbs was another area of interest for me - his film and television score mixes have great depth and dimension. Generally he would use auxiliary sends to reverbs, blending the effects returns on auxiliary tracks. This approach creates space and dimension around the source material, and is a common way to achieve both clarity and space with separate control over each element. Sometimes, when he wanted to dimensionally push a sound back in the mix, he would insert the reverb plug-in over the master auxiliary of an instrument or group of instruments and adjust the wet-dry balance of that effect to taste. One example on Jumanji was a snare drum overdub. He inserted a D-spatial reverb plug-in over the snare aux master, creating a spread around the surround image and pushing it deeper into the sound field. This technique added an audible glow to the snare drum's tonality, but also created space for other instruments in the mix.

To my ears, a great mix immerses the listener, creating the impression that one needs to reach deep inside the sound field to hear the most distant elements. It takes a lot to achieve this overall experience, but Alan's judicious use of this particular technique certainly perked up my ears.

Alan's use of saturation processing was another interesting revelation, as he employed a range of plug-ins to add grit or analogue flavour, and shape tonality in a dense mix. He would often add a saturation plug-in (for example, Plugin Alliance Black Box or SlyFi Kaya) in conjunction with an equaliser or multi-band compressor plug-in to control the resulting resonant frequencies created by the saturation. He used a lot of saturation on the percussion, as drums benefit greatly from this treatment. On the other end of the spectrum, Alan also used saturation for a harp passage. Although harp is typically mixed with a more natural approach, it was interesting to hear Alan's unusual mix treatment. At times, he would also insert a saturation plug-in after a reverb plug-in - darkening the tone and removing some sheen from the reverb.

For some of the more exposed cues, if there was some audible low frequency rumble on the recordings, Alan employed a quick, great technique to resolve it. In these instances, some engineers might use noise reduction (such as Izotope RX) or insert a high-pass equaliser for the full duration of the cue. Instead, Alan automated a high-pass equaliser for the quiet moments (usually the start or end of a cue), then left the full frequency range untouched for the rest of the cue.

Another workflow of note was Alan's use of Voltage Controlled Amplifiers, or VCAs, to control groups of faders. The structure of VCAs in each ProTools session was described by Forest as a tree, starting at the top with an 'ALL' VCA fader (controlling the overall output level of all musical elements). The next set of VCAs branched out to sub-groups: All Orch, All Choir, All Perc and All Else. Below these were

another set of sub-groups: Live Orch, Sample Orch, Live Choir, Sample Choir etc. At the bottom of the list were the VCAs controlling effects returns: All Reverb Returns, then sub-groups of the individual reverbs and other effects. These VCAs were organised in such a way that Alan could select any VCA group, and easily access all of its spill tracks (individual tracks within that VCA group) through the Avid S6 control surface. This workflow approach was key, given the large number of tracks in most cues, and the fact that Alan's Avid S6 comprises 48 faders. Alan made volume automation moves using VCAs, adding great musicality and a final polish to the mixes.

Once Alan had made his way through mixing each cue, and was ready to present his work to the composer, Henry Jackman, the team scheduled a playback review. Alan has worked with Henry for many years, so there is great trust and symbiosis in their working relationship. The first thing I noticed during the review, was that Henry likes to get his hands on the console to do subtle yet very musical volume rides. Knowing this in advance, Forest created separate VCAs for Henry's volume rides. That meant Alan's automation wouldn't be over-written during the review, and that both composer and engineer's volume rides should work together. This type of fine-tuning could easily go awry in the wrong hands, but Henry and Alan are both masters of their craft, with incredibly well-honed instincts for what feels natural and musical instead of something that sounds artificial and forced. There's a fine line between these two ends of the spectrum, and both are quick to call each other out if a volume ride draws unwanted attention. Other than volume rides, many of Henry's comments were for subtractive, rather than additive changes. For example, reducing a guitar level to serve the orchestra melody, or removing some 700Hz from the violins to create space for other parts. Alan later shared with me that his goal in preparing for reviews with Henry is to make each cue highly presentable, but to leave room for Henry's in-depth automation and tweaks. Alan has learnt not to aim for perfection before the first playback review with a composer. There were times earlier in his career when changes were later made by the composer and Alan felt too emotionally invested in his mix balance. I'm familiar with this feeling.

There's an anecdote from one of the Jumanji review sessions worth sharing here. On the cue, "[The Bazaar](#)", a cue that I had edited, there was a melody exchange between an ethnic flute, played by Pedro Eustache, and an erhu, played by George Doering. At one point, the melody was doubled by both instruments and Henry wasn't quite happy with the balance. He and Alan tried to figure out which part should have the lead voicing. Without being asked for my opinion, I decided to chime in, "I think the erhu has the lead voicing there." First, it was a subjective question. Second, I was incorrect - Henry preferred the flute as the lead instrument. More importantly, it wasn't my place to interject as an observer during this process. I immediately knew it was the wrong thing to do, and was told so when Henry left the room. I apologised to Alan, and made sure to bite my tongue when I was tempted to interject at inopportune moments for the remainder of the fellowship! One of the first things I learned as an assistant many years ago is that extra voices can create confusion when making decisions.

After each review session with Henry, it was Forest's job to print stems for the approved cues, a process requiring great attention to detail. When recording stems in real-time from playback to a print rig, a small amount of latency is introduced to all the stems on the print rig. This is addressed as follows: import click track from the playback session to the print rig, calculate latency in samples by comparing to the recorded click track stem, nudge all printed stems earlier by calculated latency. Next up, Forest trimmed all stem regions to begin at the first click, consolidated audio on all stems, renamed them with the agreed file labeling protocol, labelled unused stems as EMPTY, then spot-checked stems for errors before exporting and uploading files to the music editor. This process again highlighted to me the importance of a great assistant who can carefully execute this volume of work.

Time spent with Alan on Jumanji encompassed about two thirds of the total score production time, as the last two reels were scored in September, after my allotted time had ended. It was a great privilege to gain first-hand insight into this part of the score production process.

THOR: RAGNAROK

The score for Marvel's third 'Thor' was written by American composer Mark Mothersbaugh, whose film score credits include: Moonrise Kingdom, The Royal Tenenbaums, and The Life Aquatic. Prior to his scoring career, Mark was co-founder, singer and keyboard player of the new wave band 'Devo' - whose 1980 song "Whip It" was a worldwide hit. Thor would be the first superhero film score in Mark's career. He was chosen by director Taika Waititi for his renowned avant-pop sound, fused with orchestral/choral compositions. Themes from the first two Thor films, composed by Patrick Doyle and Brian Tyler were reworked by Mark and his team, as well Tyler's theme from Avengers: Age of Ultron and Joe Harnell's theme from The Incredible Hulk.

In Thor: Ragnarok, the protagonists set about on intergalactic travels between fictional planets Asgard and Sakaar. A broad concept for the score was to feature orchestra and choir more prominently for the Asgard scenes, and more electronic synthesiser elements for the Sakaar scenes.

Mark chose to record the orchestra and choir at one of the world's finest studios - Abbey Road Studio, London. The scoring sessions were split into two parts, due to scheduling challenges. I attended part one, which involved five days of recording: four days for orchestral cues, an evening of duduk overdubs, and one day for choir and solo soprano. The orchestra featured 89 players, recorded live in a single pass on all but one of the cues. The exception was the main theme "[Thor: Ragnarok](#)", which was split into four separate ensemble passes:

- Strings and Woodwinds
- Trumpets, Trombones and Tuba
- French Horns
- Percussion

Alan suggested this approach on the main title for added flexibility to tweak the arrangement with Mark's synthesiser parts, and to allow more options for mix processing to add punch and dimension.

The production team in the control room comprised: Alan (score engineer), Mark (composer), Gordon Davidson (ProTools engineer), Dan Pinder (music editor), Wataru Hokoyama (additional music composer), Steve Durkee (score supervisor) and Matt Jones (assistant scoring engineer).



Composer Mark Mothersbaugh greets the orchestra from the conductor's podium on day 1, sharing his inspiration for Thor's viking superhero score.

MICROPHONES & PREAMPS

Abbey Road Studios has one of the world's finest working collections of vintage and modern microphones, maintained by their full-time microphone technician, Lester Smith. On the set-up day for Thor, I had the privilege of meeting Lester, a jovial and eccentric character. He also gave me a personal tour of the mic lockers. The number of iconic vintage microphones was staggering: 19 x Coles 4038, 18 x Neumann U67, 15 x Neumann M50, 13 x Neumann U47, and 8 x AKG C12 (to name a few highlights). The complete collection is listed [here](#), and would be of interest to any recording enthusiast.

Lester shared an amusing anecdote during the tour. In 1970, not long after he started at Abbey Road, the studio added Neumann's recently-released solid state condenser microphones (pictured right) to the mic locker. This included the U87, KM86, KM84 and U47 FET models. Almost 50 years later, Lester still fondly describes these as the 'new Neumanns.' The rest of the recording world would certainly call them vintage!



Lester Smith and a drawer of 'new' Neumann KM86 and U47 FET mics.



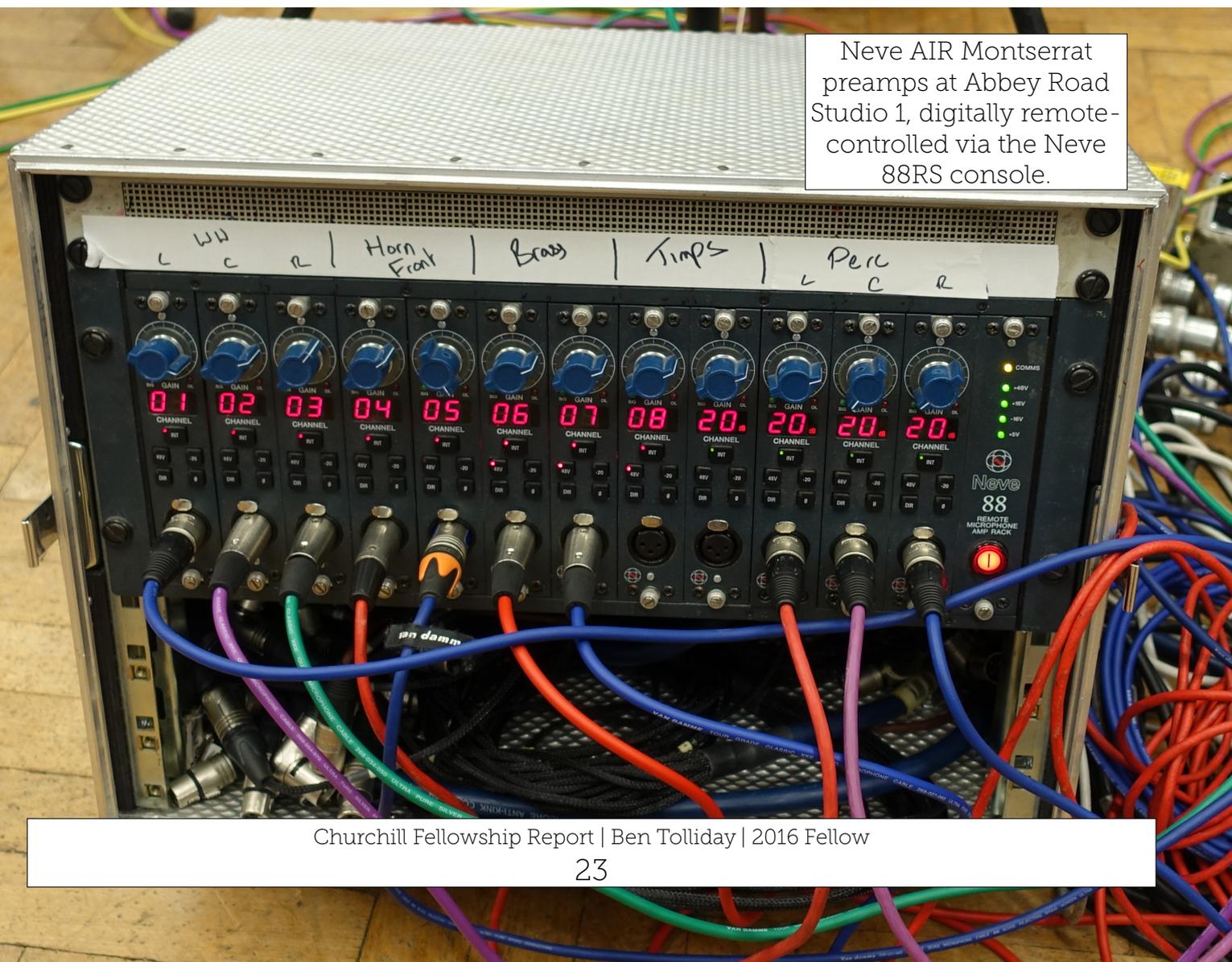
Vintage Neumann U67 microphone (centre) and Neumann M50 Decca Tree (background).

Alan's main microphone array for Thor included: a Decca Tree of three Neumann M50s, four Neumann U67 'midfield' mics spaced evenly in front of the string section, two wide-spaced Neumann M50 outriggers, two Brüel & Kjær 4006 side mics, two Sennheiser MKH800s surround mics (hypercardioid setting), two more pairs of Brüel & Kjær 4006 height mics, and three Royer R121 mics as woodwinds/choir overheads. For closer detail, he used a range of spot mics, including: AKG C12 (brass sections), Neumann U47 (double basses), Sennheiser MKH800 Twin (double basses), Neumann U67 (celli), Coles 4038s (trumpets and trombones), Neumann M49 (timpani), Schoeps CMC6 MK4 & MK21 (violins, percussion section and violas), Neumann KM84 (woodwinds), Neumann U87 (piano) and Brüel & Kjær 4011 (percussion spots).

For preamps, Alan used the Neve AIR Montserrat preamps on the main array and overall/sectional mics, remote-controlled via the Neve 88RS console. For all other spot mics, he used the inbuilt preamps on the Neve console.

The orchestra for Thor comprised 80 players, captured with a total of 71 microphones per pass. With that many mics, cables, headphones, and players together in one room, there are a great deal of moving parts. The Abbey Road Studios staff were so professional and impressive, with their seemingly effortless demeanour keeping the sessions moving forward efficiently. Only one technical issue arose over the five days - whereby one of the players accidentally moved their chair onto a mic cable, shorting out the signal. The cable was switched out during the next break, with minimal impact to the session. Given the number of vintage mics on this session, I was impressed with the level of maintenance by Lester and the Abbey Road technicians. The studio's legacy is in excellent hands.

In addition to the technical equipment mentioned above, the other 'x-factor' is the magnificent acoustic quality of Abbey Road Studio 1, with its 40 ft ceiling height and 92 ft x 52 ft floor plan. Size, especially height, matters a great deal!



RECORDING PROCESS

On the Thor sessions, full orchestra was recorded live in one pass with harp set up in a separate isolation booth. Given this approach, balance/arrangement decisions were committed during re-recording. This allowed for limited options to make substantial balance changes or to generate separate instrument group stems within the orchestra during mixing. The control room's position in studio 1 is unusual, as it sits at the long end of the live room. With 80 players in the orchestra, Alan requested a 'landscape' configuration to more comfortably accommodate the width of the ensemble. As a result, our view of the orchestra was from behind the double basses (see pic below). In most other scoring studios, the control room is set behind the conductor, with a full view of the ensemble.

During tracking, Wataru Hokoyama - additional composer and score co-producer - communicated performance feedback. At the first break, conductor/orchestrator John Ashton Thomas entered the control room to hear playbacks from the first session. John was impressed with the tonality and balance, but had one small request moving forward, though. He asked that the control room comments be more succinct and consistent. Specifically, John asked for all feedback to begin with the bar number, then instrument, followed by the notes/comments. A simple request, but one that noticeably expedited the momentum and efficiency for the following sessions.

The level of musicianship from the orchestra was fantastic, with many of the players either current or past members of London Symphony Orchestra or London Philharmonic. Lead by concertmaster Thomas Bowes, the orchestra powered through over 11 minutes of music during the first three-hour session, and almost 14 minutes of music during the second session on day 1. Very fast progress! For the main title, Alan requested that we return to re-record it later on (time-permitting).

On Day 2, I met associate principal viola player Pete Lale, whose brother David is principal cello for Queensland Symphony Orchestra. David was a cello tutor during my time in Queensland Youth Symphony, and both Lale brothers have had long and impressive careers in classical music. Pete has been a regular on London film score sessions for approximately 20 years. We spoke about performance feedback, and he mentioned how much the players appreciate some positive reinforcement from the control room first, before the (hopefully) constructive criticism. He said the vibe in the live room can really sink fast when all of the feedback is negative. This was a great reminder that even the most incredible top-level musicians are human. Respect, decency and positivity always goes a long way towards getting the best out of people, and Pete was very complimentary about the positive energy coming from the control room on these sessions.



Control room view of the Thor orchestra, Abbey Road Studio 1.

LONDON VOICES

The choir was made up of 32 singers (12 gents and 20 ladies) from London Voices - a world-class ensemble, originally founded by their revered choirmaster Terry Edwards in 1973. The UK has a rich choral tradition, and London Voices is its premiere choir for film score sessions. Rather than being a fixed ensemble, the group is drawn from a pool of singers, so the make-up of each ensemble can be tailored to the needs of any given project.

For Thor, the choir was booked for 2 x three-hour sessions, with an additional two-hour session to record solo soprano, Grace Davidson. For the choir sessions, the tenors and basses stood together in the middle of the back row, flanked by altos either side, with sopranos in the front row. The main microphone array captured most of the choir sound, with the addition of three Royer R121 mics (left, centre and right) set above the gents. This gave Alan flexibility to later boost volume and presence of the tenors and basses in the mix, as they were outnumbered by the sopranos and altos.

For the solo soprano, Alan used a vintage AKG C12 mic (set approximately 2-3 feet from the singer), with a Neve AIR Montserrat preamp, plus he captured the room sound with the main mic array. It was the only occasion during my entire fellowship that Alan used compression during recording - gently controlling the C12 soloist mic with a Teletronix LA2A compressor. The solo soprano features prominently in the "[Ragnarok Suite](#)", around 0:40 and again at 2:13. Her purity of timbre and delivery closely resembled that of a boy soprano, sung with no vibrato, in turn creating a haunting effect.

Throughout these vocal sessions, Terry gave detailed and constructive feedback from the control room, with John Ashton Thomas conducting. Terry frequently adjusted the voicings and/or make-up of the ensemble if the balance wasn't even. Like the soprano soloist, the ensemble sang with little or no vibrato and had incredible intonation - as is evident on the cue "[Where To](#)". Like most other modern film scores, the choir's key function is to sing pads - typically "Ooh, Aah, Oh, or Ha" shapes - to thicken the orchestral textures without distracting the audience from the narrative. Aside from voice balance tweaks, most of Terry's feedback regarded dynamics. The ladies, especially the sopranos, often overpowered the gentlemen in this session. At times, when it was difficult for the men to match the volume of the ladies, Alan suggested a separate recording pass of men then a separate pass of ladies.

With Alan's blessing, I had the opportunity to sit in the live room during some of the choir tracking. This was a highlight of my fellowship experience. It was very special to be an audience of one, listening to London Voices acoustically in this magnificent and historic space.

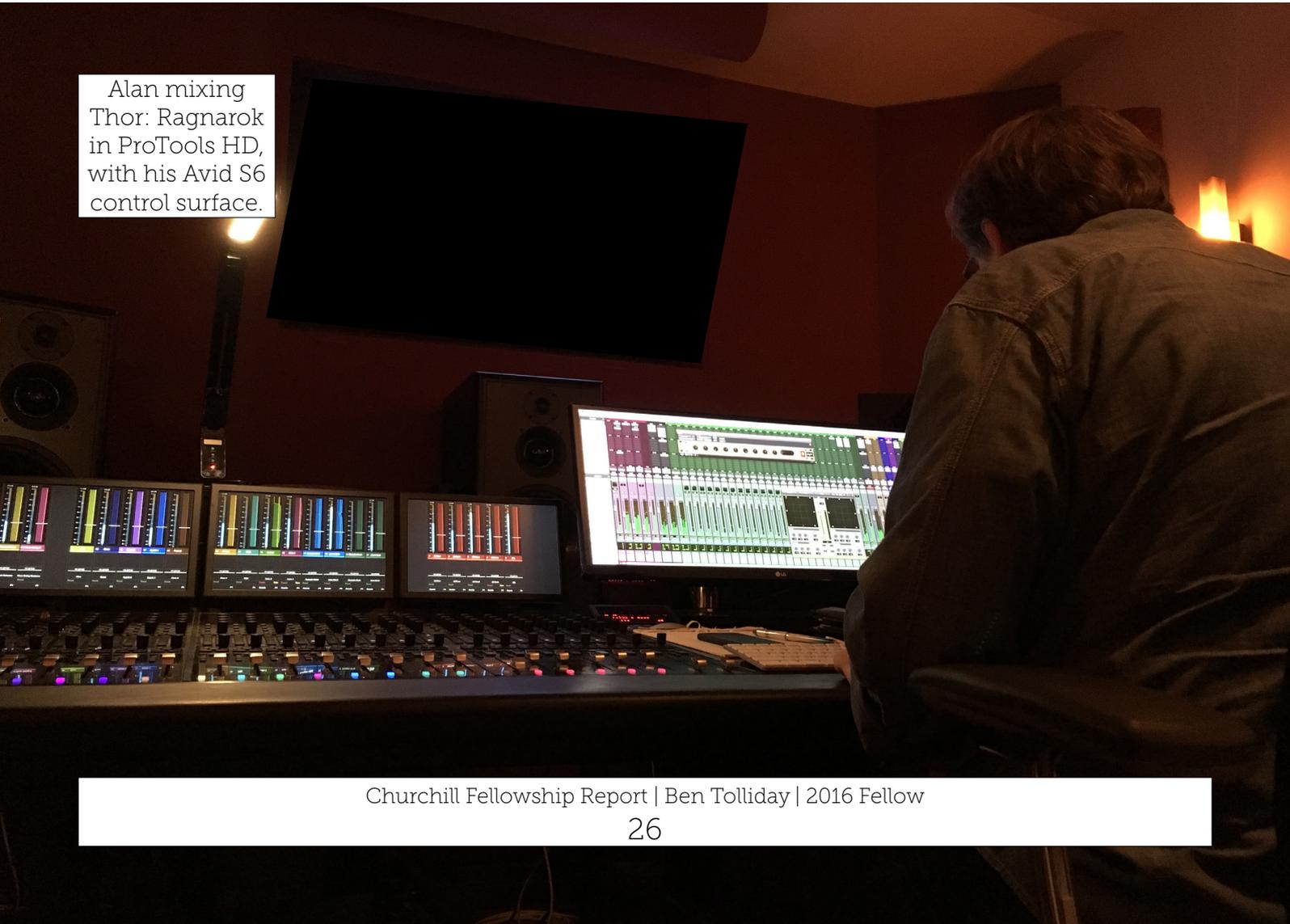


MIXING

The list of music stem deliverables for Thor was quite compact, due to the orchestra mostly recording live without overdubs. Below is the list of stems and specs for the dub stage:

- Orchestra (7.1)
- Orchestra Height 1 (Stereo)
- Orchestra Height 2 (Stereo)
- Choir (7.1)
- Choir Height 1 (Stereo)
- Choir Height 2 (Stereo)
- Solo 1 (5.0)
- Solo 2 (5.0)
- Piano/Bells/Harp (Quad)
- Percussion 1 (7.1)
- Percussion 2 (7.1)
- Synth 1 (7.1)
- Synth 2 (7.1)
- Bass (5.1)
- Xtra (7.1)
- Click (Mono)

On this occasion, no separate stems were requested by the composer for the soundtrack release. As such, Alan routed a fold-down stereo mix through his analogue mastering chain - Manley Vari-Mu and EAR 825Q - to simultaneously record stereo mixes for the soundtrack release, whilst printing stems for the dub. On the left, centre, right and side channels of the orchestra stem, his analogue Manley Massive Passive equalisers were used as inserts for extra warmth and sheen.



Alan mixing
Thor: Ragnarok
in ProTools HD,
with his Avid S6
control surface.

Alan employed his trademark aggressive mixing style on Thor, pushing the orchestral elements hard with saturation, compression and EQ. This approach brilliantly fused Mark Mothersbaugh's kooky avant-pop sound with the rich orchestral and choral textures recorded at Abbey Road Studios. A great example of this synthesis - and one of Thor's biggest cues - was "[Arena Fight](#)". For added drama and impact, Alan made a concerted effort to spread the mix deeper into the surround field to match the epic scale/width of the camera angles in this arena scene. This spread is most noticeable watching the film in a cinema or home theatre with surround sound, but is also very apparent on the soundtrack stereo mix at 0:27, 2:08 and 2:57. Alan is judicious pushing this extreme widening technique - do it too often, and it becomes a distraction to the audience and lessens the impact. From my perspective, it's a similar concept to dynamic range - too much loud volume/high intensity can become fatiguing for the listener.

On the more electronic music cues - something like a scene from Sakaar - Alan used modern approaches to classic 1980s pop mixing tricks, adding magic to the synth and drum machine parts. If a synth part or drums needed more weight, he might try duplicating the track, pitching it down an octave and blending the track with the original. Alternatively, he might add subharmonic synthesis via the Waves R-Bass or Refuse Lowender plug-ins.

Other mix techniques included widening mono sources by inserting a mono-stereo Soundtoys Tremolator on the track, using a subtle time-synced stereo tremolo to spread the image. On his mix for "[What Heroes Do](#)", Alan created an aux send from the electronic snare to a 16th note delay, automating it on/off for different snare hits to add rhythmic momentum.

When Mark came in to review mixes, he was very happy with the results, and made just a few minor changes. This was Alan and Mark's 's first time working together, so it seemed like neither of them quite knew what to expect. With a smooth review completed, Alan could confidently proceed onto the remaining cues with a well-calibrated mix aesthetic.

The mixing for this phase of the Thor score production was ultimately completed a few days ahead of schedule, with pickup dates for the final phase scheduled for September 2017.



Conductor John Ashton Thomas (left), Alan Meyerson (centre) and myself after the Thor sessions.

MICHAEL FARROW

My time with Alan Meyerson was a rich learning experience, and it motivated me to contact another film score mix engineer whose work I greatly admire - Michael Farrow. His credits include: Three Billboards Outside Ebbing Missouri, Carol, and most of the Coen brothers' films. In addition, he worked on Academy Award-winning scores for Alladin and Beauty and the Beast. Michael has worked for 30 years with composer Carter Burwell, whose scores often feature chamber orchestras and spacious acoustic instrumentation. This was an interesting stylistic counterpoint to the rest of my fellowship.

Curiously, both Michael Farrow and Alan Meyerson started out as trumpet players. For Michael, playing trumpet in symphony orchestras has been central to his approach to recording. While attending Indiana University as a music major, he developed the skills of score reading and transposition. At age 19, he became Associate Principal Trumpet with the Dallas Symphony. In the late 1960s, Michael was appointed Principal Trumpet with the Indianapolis Symphony where he also appeared as a featured soloist during his seven-year tenure. In the early 1970s, he transitioned to sound engineering, and cut his teeth recording jingles - first in Indiana, then later in New York. He moved to Los Angeles in 1993, and has worked on film and television scores internationally ever since.

Initially I sat down with Michael for an interview about his background and career. I've created hyperlinks to each of his individual answers, so click on a question below to load the corresponding video answer:

[Tell me about your transition from trumpet player to sound engineer and what sparked your interest in recording?](#)

[Did you have a mentor during your formative years?](#)

[Can tertiary recording courses institutionalise mentoring, or should it develop organically during one's career?](#)

[Are you aiming for photo-realism, or a more impressionist image in your recordings?](#)

[How did you develop your sonic identity as a mixer, especially in your collaborations with Carter Burwell](#)

[Are you constantly learning something new on each project?](#)

[Is there greater scope for dynamic range in film score mixes?](#)

[Does instinct ever elude you, and if so how do you overcome it?](#)

[What will the film score production process look like in the future?](#)

[Typically a picture edit isn't locked until the dub - does this present additional challenges to you, or the music editor?](#)

[Sonically, is there anything you miss from the old days of recording using analogue tape?](#)

[Is high-resolution 96k audio on the horizon for film scores?](#)

THE BALLAD OF BUSTER SCRUGGS

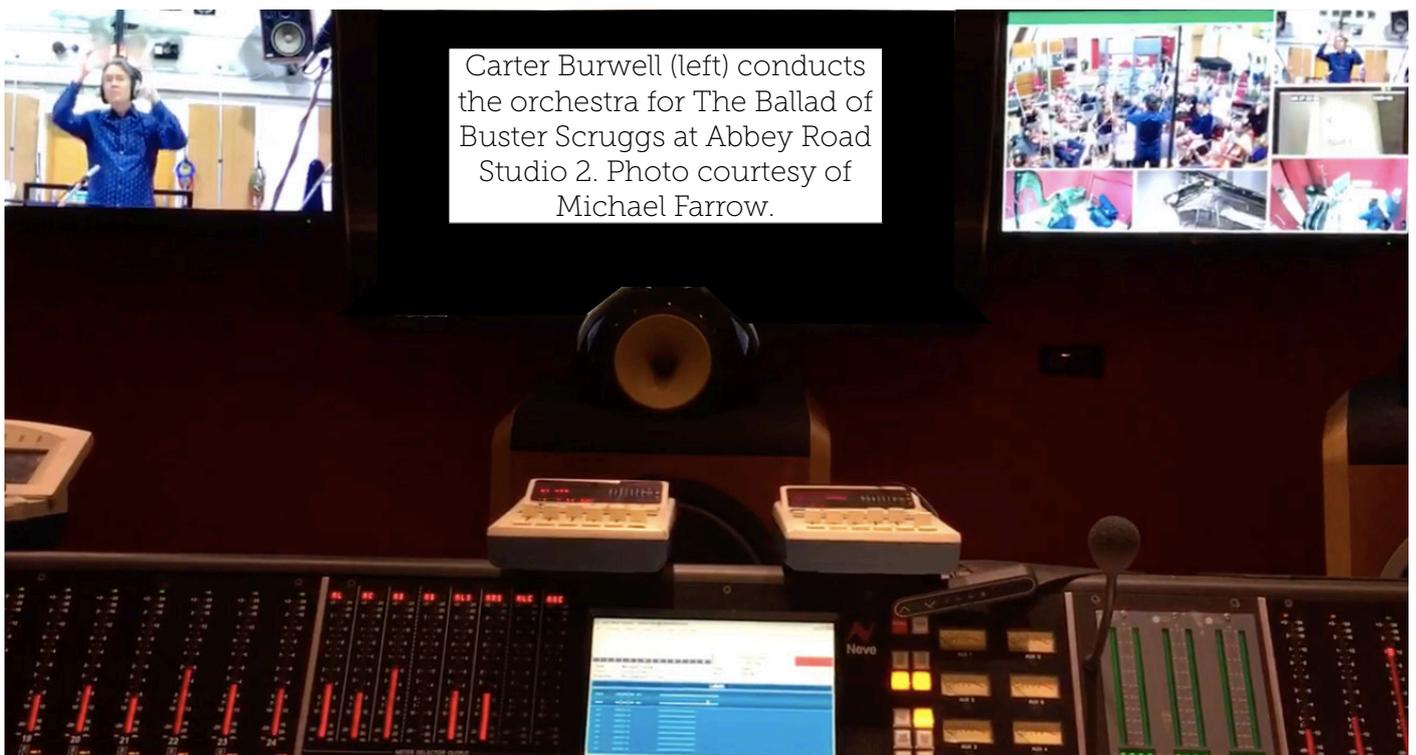
Following our interview, Michael invited me to attend recording and mix sessions in London and New York for the Coen brothers' western anthology, 'The Ballad of Buster Scruggs'. This would be Michael's 13th collaboration with Carter Burwell on a Coen brothers film. I was thrilled at the prospect of attending these sessions, but unfortunately was only able to attend the final day of overdubs and the first day of mixing in New York. Regardless, Michael was kind enough to document and share his workflow for the London sessions.

Various chamber ensembles and solo instruments were scheduled to record at Abbey Road Studio 2 over five days as follows:

- 38-piece ensemble (strings, woodwinds, french horn, piano, harp acoustic guitar, and timpani)
- 34-piece ensemble (strings, woodwinds, piano, harp, acoustic guitar, and timpani)
- 10-piece brass ensemble (french horns, trumpets, tenor trombones, bass trombone and tuba)
- 12-piece choir (sopranos, altos and tenors)
- Solo piano
- Timpani and percussion

Michael recorded the orchestra with a main microphone array comprising: a Decca Tree of three Neumann M50s, stereo pair of Brüel & Kjær 4011 TLX cardioid mics, stereo pair of Schoeps CMC5 MK2 omnidirectional mics as surrounds, and a pair of Neumann KM84 as brass ensemble overhead mics. For added detail, he used these spot mics: Neumann TLM170 (violins and timpani), Schoeps CMC6 MK4 (celli, double basses, harp, and acoustic guitar), Neumann KM86 (woodwinds), Brüel & Kjær 4011 TLX (piano), Coles 4050 (piano), Neumann KM184 (french horns), and Coles 4038 (trumpets, trombones and tuba).

The dobro overdubs were played by David Torn, Carter's preferred guitarist, at Sear Sound, New York. Torn's dobro sound comprised the acoustic instrument sound blended with the dobro's electric pick-up running through stereo effects and a pair of Fender Twin guitar amplifiers. Michael used a pair of Sennheiser MKH40 cardioid mics on the acoustic dobro, and a pair of Coles 4038 mics on the two guitar amps. He used the vintage Neve 1081 preamps on the console, without EQ or compression. In attendance were: Ethan Coen (director), Carter Burwell (composer), Michael Farrow (score engineer), Todd Kasow (music editor), Owen Mulholland (ProTools Engineer) and Dean Parker (composer's assistant).



MIXING

The following day, Michael began mixing at Carter's 'The Body studio' in Tribeca, New York. Michael mixed using ProTools HD software, a Euphonix System 5 digital console, and a 5.1 channel Genelec studio monitoring system. All of the processing is handled in ProTools, except a TC Electronic 6000 surround reverb unit - used for the orchestra and guitar. Carter's assistant, Dean Parker, helped set up mix templates and digital routing. It's a small, but very efficient and experienced team.

Starting with the orchestra, Michael used 17 microphones in the mix, with very little processing - other than subtle, broad Q low cut and high shelf boost EQ - and adding reverb. The phrase 'less is more' sprang to mind during the first playback of a raw, unmixed orchestra cue from the Abbey Road sessions. Although it was a smaller chamber orchestra of 32 players, the perceived size of the ensemble was significantly larger. I've noticed this paradox before. On recordings with dense instrumentation and a high track-count, it can be a challenge to make it sound big, yet more sparse recordings with a low track count can sound more effortlessly full and rich.

After a couple of hours working on the first few cue mixes, Michael invited Carter into the studio for a playback review. His first reaction was very positive, but unexpected. He said "I think this cue sounds great, but it's too full for this scene". From my perspective, this was quite a compliment to Michael! Creating size in a mix, without resorting to heavy reverb and effects processing, has been a challenge for me. Yet Michael had done it with judicious microphone selection and placement, great balance and a subtle touch of processing. So the revisions on this cue were simple: lower the orchestra by 3-4dB, import a synth part that doubled the guitar and harp melody, bring the guitar melody forward, and lower some other harmonic elements to create space for the melody.

These two days provided me with a fascinating insight to the workflow of a composer and film score engineer whose work I've admired for many years. Since these sessions, Michael has continued to offer his ongoing advice and support, for which I'm humbled and incredibly grateful.



Recording dobro for The Ballad of Buster Scruggs with David Torn (rear left), composer Carter Burwell (centre) and score engineer Michael Farrow (right) at Sear Sound, New York.

CONCLUSIONS

I feel incredibly fortunate to have experienced parts of the production workflow for three studio film scores during my Churchill fellowship. I've gained a substantial amount of knowledge, and I feel indebted to Alan Meyerson, Forest Christenson, and Michael Farrow for their patience and generosity. In the recording world, the mentor-mentoree relationship has been a tradition for decades. So much knowledge is passed down purely through word of mouth or osmosis. Because of this fellowship, I also reconnected with other mentors from earlier in my career - namely Justin Tresidder and Jonathan Burnside - to share updated knowledge and experience. This was an unexpected but wonderful addition to the experience. A mix engineer's existence can be a lonely pursuit, most of the time working in isolation from clients or production teams. This amazing experience inspired me to maintain more regular contact with my other mentors, but also to be more open with young engineers who reach out for advice.

None of my recording or mixing knowledge came from tertiary training in sound engineering, so the skills I have learnt over the years has either been through a mentor, or it was self-taught. To that end, I would highly recommend every young sound engineer to seek out a formalised mentoring program with an industry professional - either through a grant, fellowship or as part of their tertiary degree. These professional relationships are tremendously formative, and essential for the short, medium and long term development and growth of our industry.

This fellowship also illustrated how much I don't know and aspire to learn. It opened doors I never thought would be open to me, and pushed me to be more engaged and committed to developing knowledge, excellence and longevity in the work I and others in the industry do. I don't know that I'll ever be regarded in the same light as engineers like Alan Meyerson or Michael Farrow, but I feel confident that I can strive to constantly improve and become an ambassador for the open sharing of best practices as sound engineers.

DISSEMINATION

In addition to the publication of this report on the Churchill Trust's website, I'm hoping to speak at Queensland Conservatorium - Griffith University about my fellowship and career experiences. I'm also planning to propose workshops at: Australian Film, Television and Radio School, Australian Guild of Screen Composers, and APRA Screen Music Summit.

In 2017, shortly after working with Alan Meyerson, I pitched a film score panel discussion at QMusic's Bigsound conference, titled 'Artists moving from the stage to the score'. Unfortunately I was unable to appear on this panel due to a recording commitment, but a robust discussion took place between Samuel Bright (moderator), composers Ryan Walsh, Amanda Brown and Hans van Vliet, and music supervisor Gary Seeger.

I've been in touch with Mark Davie, editor of Australia's leading sound engineering publication 'Audio Technology', regarding a feature article about my fellowship experience.

In February 2017, I appeared on an ABC radio interview with Rhianna Patrick about my fellowship. Here's a link to the interview - [Bucketlist: Ben Tolliday, Audio Engineer and 2016 Churchill Fellow](#). The ABC offered a follow-up interview after my fellowship, to speak about my experiences.

Lastly, I plan to apply the knowledge gained from this experience on Australian film and television scores and music releases.

GLOSSARY

7.1, 5.1, 5.0, and quad - Surround sound formats, with the first number delineating full frequency range audio channels (left, centre, right, sides and surrounds) for dialogue, sound effects and music. The '1' number refers to the LFE (low frequency engine), a subwoofer used for low frequency sound effects and musical elements.

Channel/Track - Single stream of audio signal, either manifesting digitally as an audio file or analogue as a strip on the console.

Click track - Digital metronome used to map and dictate timing.

Compression - A process of volume reduction for loud sounds, and amplification for quiet sounds typically found in a digital software plug-in or analogue hardware unit.

Console - Recording tool used to route, adjust level or tone, and combine audio signals to connect microphones, recording mediums (eg hard disk or magnetic tape), studio monitors and headphones.

Control room - During a recording, this is where most of the production team - including engineer, composer, producer, music editor - work.

Cue - Individual music composition, within a film score.

Dolby Atmos - Surround sound technology featuring extensive options for horizontal and vertical panning in the sound-field, creating new possibilities for a more immersive experience.

Dub - Post-production process of mixing final picture with dialogue, sound effects and music score.

Equalisation - A process used to alter the frequency response of audio, typically found in a digital software plug-in or analogue hardware unit.

Hypercardioid microphone - Recording tool with a directional polar pattern that picks up most sound from the front, with minimal sound from the sides and fractionally more from directly behind.

Omnidirectional microphone - Recording tool used to capture sound equally from all sides of the microphone. Open sonic character, with a full frequency response and sensitivity to room ambience.

Overdub - Additional layered recording.

Plug-in processing - Encompasses a very wide range of effects, including (but not limited to): reverb, equalisation, compression and saturation.

Preamp - Recording tool used to boost and shape a microphone's audio signal.

Print stems - Process of creating mixed music files, typically split into instrument groups - for example orchestra stem or choir stem - as final deliverables.

ProTools - An industry-standard recording, editing and mixing software for film scores, dialogue, other music releases, and podcasts.

Record template - Data related to routing and labelling of audio inputs, outputs, and track labelling, saved as a ProTools session file.

Ribbon microphone - Recording tool that uses a thin, electrically conductive ribbon to produce voltage by electromagnetic induction. Sonic character is typically dark, smooth, thick and natural.

Saturation - A process used to alter the tonal quality of audio through harmonic distortion, originally created by analogue recording (magnetic tape, direct-to-disc recording or tube processing) now emulated by digital software plug-ins.

Session - Recording date, typically scheduled in blocks of three hours or less.

Solid state condenser microphone - Recording tool requiring power from an external source, either electrical or battery-operated, that captures audio signal with greater sensitivity and typically stronger output signal than a dynamic microphone.

Soundtrack - Composer's score, mixed in stereo, plus songs that were licensed for the film.

Spot microphones - Close-placed recording tools to capture a more direct signal.

Stereo fold-down - A process to convert a multi-channel surround mix to a stereo mix.

Surround microphones - Recording tools placed to capture diffuse room characteristics and typically panned to surround speakers in a multi-channel mix.

Take/pass - Individual or successive attempts to record a cue.

Tube condenser microphone - Recording tool that uses a valve amplifier rather than a transistor circuit. Sonic character is typically present and crisp, with added warmth from tube circuitry.

VCA (Voltage Controlled Amplifier) - Typically a single fader assigned to control the parameters of multiple channels within a group.