Title

Voicing the Sonic: a case study of the RMIT Sonic Arts Collection and the Speaker Orchestra

Authors

Lawrence Harvey[i], Jon Buckingham[ii], Lisa Rae Bartolomei[i], Gillian Lever[i] and Josh Peters[i]

SIAL Sound Studios, School of Design[i] and Royal Melbourne Institute of Technology University Art Collection[ii], Royal Melbourne Institute of Technology University

Contact

Lawrence.harvey@rmit.edu.au

Title

Voicing the Sonic: a case study of the RMIT Sonic Arts Collection and the Speaker Orchestra

Abstract

Universities are uniquely resourced to produce cultural events audiences wouldn't otherwise experience. This paper describes one such project – the establishment and development of the RMIT Sonic Arts Collection (SAC) and a series of public engagement events on a speaker orchestra.

Most Australian universities maintain cultural collections, which offer specialised forms of engagement to support teaching, learning and research, and offer a means for piloting cross-disciplinary projects. The integration of cultural collections into pedagogical models can disseminate specific and interdisciplinary knowledge, encourage peer discourse, and support training of practical skills for students.

This paper reports on the development, components and projects undertaken with the SAC and SIAL Sound Studios since 2012. We describe specific engagement activities with undergraduates, post-graduates and industry partners through exhibitions, national and international performances. The SAC is made present in the life of the university through events on the speaker orchestra, as teaching materials, opportunities for HDRs to work on pieces and for unique listening experiences in three dedicated spatial sound spaces around the University. Together these form an ecology of teaching, research and engagement represented and discussed at the end of the paper.

Biographies

Lawrence Harvey

Lawrence Harvey is a composer, sound designer and director of SIAL Sound Studios, based in the School of Design, RMIT University. He has led ARC Grants with local arts organisations and published widely on creative and cultural aspects of spatial sound.

Lisa Rae Bartolomei

Lisa Rae Bartolomei is an artist, composer & sound designer and is currently enrolled as a Masters Research Candidate at SIAL Sound Studios In RMIT University's School of Design . Employing a hybrid of multichannel electroacoustic, soundscape & musical composition for Installation & performance, her practice and research explore the liminal spaces between the Imagination and the environment, the known and the mythical realms.

Jon Buckingham

Jon Buckingham is curator and manager of the RMIT University Art Collection. He has curated a number of exhibitions, and his practice explores object-based learning initiatives, and the role played by collections in contemporary institutions and curatorial models.

Gillian Lever

Gillian Lever is a sound artist and composer working across multichannel sound performance, diffusion and sound installation. She is currently undertaking a Master of Design at RMIT's School of Design, and her practice-led research explores the intertwined nature of the relationship between spatial sound, the space it inhabits, and the embodied listener.

Josh Peters

Josh Peters is a composer, sound designer and recent Honours graduate of Fine Arts at RMIT University. Through audio manipulation and spatial sound performance, his practice examines the underlying mechanisms of listening.

Lawrence Harvey[i], Jon Buckingham[ii], Lisa Rae Bartolomei[i], Gillian Lever[i], Josh Peters[i]

SIAL Sound Studios, School of Design[i] and Royal Melbourne Institute of Technology University Art Collection[ii], Royal Melbourne Institute of Technology University

Voicing the Sonic: a case study of the RMIT Sonic Arts Collection and the Speaker Orchestra

Keywords: Sound, Sound Art, Art Collections, Speaker Orchestra

Context

Although most Australian tertiary institutions maintain some cultural or art collections, few recent studies have investigated their scope, despite a pedigree traceable to the advent of the public museum and considerably further (Boylan, 1999). While the stated purpose of these collections varies from institution to institution, they nominally support engagement through branding, teaching, or research initiatives. As early as the 1960s, Andre Malraux's *Museum Without Walls* argued that the role of the modern museum was to facilitate audience engagement, using their holdings to create an open-ended dialogue, full of uncertainty and innovation (Malraux, 1967). University collections are evolving to meet audience expectations for displays that are socially engaged, increasingly interactive and interdisciplinary, and embrace responsiveness, novelty and invention. Bartlett (2012) has noted the potential application of university cultural collections in facilitating interdisciplinary engagement.

Description

A concept design for the SAC was developed during a 2008-09 research project funded by RMIT's Design Research Institute (DRI) to investigate Melbourne's five CBD soundscape systems (Harvey, 2013).

The university, following a report recommendation, established its own system. A feasibility study and other development activities took place between 2010-12, leading to *Sound Bites City* – the collection launch and inaugural exhibition in 2013 (Davis et al, 2013). Between 2014-19, ten events have included or been dedicated to presenting works from the collection. To date, there are no other comparable collections dedicated to acquiring, commissioning, presenting and scholarship of sound art in Australia. Other institutions such as the Australian Music Centre and the National Film and Sound Archive perform some, but not all four functions.

The collection comprises 31 individual works commissioned or acquired from Australian and international artists. These are either spatial sound works stored digitally, or paper-based scores for performance with accompanying recordings and performance documentation. The emphasis on digital spatial sound works is driven by three factors;

1. Storage: With current resources, storing, handling, and remounting physical objects or instruments is difficult.
2. Access: Digital media is easily accessible for teaching and curatorial or academic research.
3. Exhibition options: Loudspeaker arrangements for spatial sound works in performances and exhibition settings allow listening experiences for audiences unavailable at home, on phones, or in the classroom.

Title	Composer/Artist	Country
We'll All Go Together	Suzanne Philips	UK
Kirribilli Wharf	Bill Fontana	US
Namib	Chris Watson	UK
Constructions Metalliques	Christian Zanesi	France
Si je les Ecoutais	Christine Groult	France
Sounds of Weather	Christophe Charles	France
Spaces of Mind	Daniel Teruggi	France/Argentina
5000 Calls	David Chesworth and Sonia Leber	Australia
Madeira Soundscape	Doug Quin	US
Points Critiques	Horacio Vaggione	France
White Noise Spatialisation	Nick Murray	Australia
Wayfinder	Nick Murray and Carl Anderson	Australia
Atmosis	Philip Brophy	Australia
A Sonic Truce	Stephan Schutze	Australia
Schnurrendes Katzchen im Bunker	Katrin Isabel Ernst	Germany
Passing By…More Quickly	Stephen Adam	Australia
Coffee Sugar	Stephen Adam	Australia
Echo Chamber	Sarah Edwards	Australia
A Day of Hours: Sonic Archaeology From Here	Susan Frykberg	NZ/Australia
Lens (from worldline)	Richard Barret	UK
the wreck of former boundaries	Aaron Cassidy	US/UK
subsidence-karst	Timothy McCormack	US
Lichen	Mathew Sergeant	UK
Catalogue des Errances Bibliques	Michael Kieran-Harvey	Australia
Cooee Song	Paul Carter	Australia
Loops	Ros Bandt	Australia
Raptor	Ros Bandt	Australia
What you might have heard	Nigel Frayne	Australia
Poranui	Reuben Derrick	NZ
Spring Bloom in the Marginal Ice Zone	Jana Winderen	Norway
Ocean Deep	Barry Truax	Canada

Figure 1: list of works in the collection, created between the 1980's-2019.

Curatorial agendas and themes

The RMIT Art Collection Policy seeks artworks that are congruent with the university's teaching practices (both current and historical), and preferences pieces that display innovation in media or technique. Additionally, the collection curators and selection committee decided that sound works would be treated no differently than any other piece of art: each needed to meet benchmarks of aesthetic and/or historical merit meeting the following considerations:

1. Format and sonic qualities would lend themselves to display purposes, both on campus and at external venues;
2. present opportunities for student engagement, including use in teaching;
3. achieve equal gender representation in the collection;
4. include local, national, and international artists as budgets and opportunities permitted;
5. reflect multiple career stages, from emerging, mid-career, and established artists.

The initial acquisitions for the collection mirrored RMIT's inner city location, including pieces that used urban sounds as materials, works from electroacoustic sub-genres such as environmental soundscape compositions, and radiophonic works dealing with experiences of place. There has subsequently been significant exploration of sound as a sculptural medium, with works investigating form, space, and time. Additionally, the collection has also become a way to 'voice' sound-based research from the university and work with industry partners on experimental contemporary music performances.

Voicing research and engagement through five case examples

Engagement example 1: Poranui: working on a collection piece
Reuben Derrick's *Poranui* is a stereo recording of the hostile shoreline of Poranui Beach in New Zealand. Derrick has written, "Attention has been given to record from perspectives that visitors to this astonishing environment are unlikely to otherwise experience" (Derrick, 2011). In 2017 it was presented at the *Oceans* concert and mixed live to the Speaker Orchestra. In 2018 Masters candidate Lisa Rae Bartolomei

was commissioned to rework *Poranui* into an 8-channel version for future exhibitions at RMIT Gallery. In April 2019 it was presented to Soundscape Studies students and members of RMIT's academic community at a workshop hosted by SIAL Sound Studios.

By spatialising the flattened plane of stereo into 360 degrees, the listener is moved into the centre of the ocean, an unlikely sonic vista for land-dwelling humans, who would experience buffeting winds, spraying water, and the current dragging them out to sea from their small perch on a rock from this listening position. This builds on Derrick's original intent to present unique auditory perspectives in *Poranui*.

The spatialisation uses a spectromorphological approach (Smalley, 1997). Stereo files were filtered into different frequency bands and spatialised. Low frequencies were sent to the front speakers, emulating the low rumble of incoming waves. The back speakers used higher frequencies, reproducing the high fizz sound of waves breaking. Unique trajectories were charted for each wave through the sound field, a process taking many hours of experimentation in SIAL Sound Studios on a multi-channel system. Two outcomes arose from this activity on a collection work:

1. A new, 'hyper'-immersive version of the work for exhibition. Spectral layering of the material gave spatial depth to the composition, creating a deep experience of sonic immersion in space for audiences.
2. Development of a research direction for the Masters candidate. It was an invaluable opportunity to extend the technical repertoire of the researcher. The spatialisation techniques can be utilised in future research and compositions.

Engagement example 2: Starlings Sound Collective and the collection as a learning tool

Starlings Spatial Sound Collective formed from a small group of SIAL elective alumni with logistical and educational support from the team at SIAL. In early 2018 Starlings utilised the SAC to deconstruct and analyse spatial sound works such as Chris Watson's *Namib* in SIAL Sound Studios. Information about the works' origins, artistic intent, and realisation were sought from published literature and used to spatialise the individual stems over the 16-channel speaker array in SIAL Sound Studios *n-space*. Starlings used this opportunity to experiment with different spatialisation techniques.

Watson's *Namib* was spatialised in relatively unaltered form on the 16-channel speaker array for a listening session. The original recording used an 8-channel ambisonic speaker arrangement. Starlings experimented with expanding the composition out to the full 16-channel array in *n-space* and made minor equalisation adjustments to the composition. Four speakers mounted in the ceiling were equalised to only emit high-frequency bands, and full range tower speakers had high frequencies cut out. Even these small changes led to a distinct alteration in perception of the work. Hearing sounds from desert-dwelling animals from locations higher than ear level gave the piece a sense of hyper-reality and an expanded sense of space. This experience was enhanced by the large distance between two speakers at the back of the room, spreading a single animal over a much greater distance than seemed naturalistic. Noticing how spatialisation decisions affect listening perception encouraged Starlings, as emerging spatial sound artists, to further hone and develop their compositional and spatialisation techniques.

In late 2019 the Collective presented a public listening session of works from the SAC as part of their *Murmurations Spatial Sound Week,* held in RMIT's newly constructed Black Box space. Selected works were presented over an 8-channel system and reflected a varied spectrum of approaches to multichannel sound composition. Daniel Terrugi's *Spaces of Mind* (2004) reflected a typical electroacoustic approach to sound transformation, exploring the movement of fixed sound sources between physical space, virtual space and the inner imaginary. Bill Fontana's iconic soundscape work *Kirribilli Wharf* immersed the listener in the natural ambience of the sonic environment without electroacoustic manipulation, contrasting both Terrugi's and Christine Groult's *Si je les écoutais'* phenomenological and surreal sonic excursions.

Engagement example 3: Sound Bites City: inaugural exhibition of the collection
Sound Bites City was curated by Suzanne Davies, Jon Buckingham and Lawrence Harvey as a joint initiative of the RMIT Art Collection, RMT Gallery and SIAL Sound Studios.

While establishing the collection through 2012-13, we developed proposals for a multi-loudspeaker soundscape system on the city campus. The inaugural exhibition became an opportunity to prototype a structure for that system. The final design by Nick Williams in collaboration with Sascha Bohnenberger and John Cherrey (Williams, N. et al, 2014) was based on grid-shells, prominent in the 1970s,

especially through the work of Frei Otto. The resulting design was based on a large torus – a structure of interwoven red cedar wrapped in a spiralling fabric canopy forming a circular tunnel around a raised platform with seating and astro-turf. This afforded solutions to project sound above, around and below listening locations, while encouraging the audience to sit, stroll or lay down to listen (See Figure 2). A cohort of 20 students from the Master of Design Innovation Technology at RMIT University were presented with collection works and asked to consider Williams' design in this context. Over a semester, engineering and material options were investigated and students submitted alternate designs focussing on innovative use of materials and acoustic enhancements. This culminated in a 10-day intensive construction period. Students worked alongside contracted builders to assemble Williams' design and apply new skills[i].

Figure 2: The Torus exhibition environment for *Sound Bites City* exhibition in the RMIT Gallery, 2013.

Engagement example 4: Oceans Concert

In 2017 the RMIT Gallery and SIAL Sound Studios collaborated on a sonic component to a visual exhibition. *Oceans Imaginaries* was an exhibition at RMIT Gallery (5 May - 1 July 2017) that "…focuses on some of the contradictions and conflicted feelings raised by how the ocean is imagined in an age of environmental risk" (RMIT Gallery website, 2017), and part of CLIMARTE 2017. The program included works about, inspired by, or directly using sound from oceans (See Figure 3 for concert programs). Three works from *Oceans* were subsequentially acquired into the SAC.

Tuesday 2 May, 6-8pm
Buoy (2011) David Berezan (Canada/UK)
La vie en bleu (2013-2014) Anna Raimondo (Italy)
And then the sea came back (2016) Anja Kanngieser / Polly Stanton (Australia)
Island (2000) Barry Truax (Canada)
Prospero's Voyage (2004) Barry Truax (Canada)
Spring Bloom in the Marginal Ice Zone (2017) Jana Winderen (Norway)
Wednesday 3 May, 6-8pm
Tides: Sea Flight (1984) Denis Smalley (NZ/UK)
frostbYte: cHaTter (2012) Daniel Blinkhorn (Australia)
Billy sees inside the sea (2016) Jane Ullman (Australia)
HydroSonics (2016) Leah Barclay (Australia)
Poranui (2011-12) Reuben Derrick (NZ)
Ocean Deep – World Premiere: (2017) Barry Truax (Canada)

Figure 3: concert programs from Oceans concerts 2-3 May, 2017.

Date	Event	Location
4 Sept-19 Oct, 2013	*Sound Bites City*, inaugural collection	RMIT Gallery
End 2013	Opening of the Bundoora Soundscape System	Bundoora Campus, RMIT
30 April, 2015	*World Line*, Elision Ensemble and SIAL Sound Studios	Storey Hall, RMIT
21 Sep, 2016	*The Surface Project*, Elision and SIAL Sound Studios	Storey Hall, RMIT
Various performances through 2016-17	Elision Ensemble include performances of commission works in international concerts	Harvard University; Leeds; Singapore; Meat Market in North Melbourne
2-3 May, 2017	*Oceans* and SIAL Sound Studios	Storey Hall, RMIT
20 Sep, 2017	New Academic Street opening – *Kirribilli Wharf* temporary sound installation on site	City Campus, RMIT
7-10 Oct, 2018	Murmurations – Starlings	Black Box, RMIT
13 Apr-09 Jun, 2018	Chaos & Order – 120 years of collecting at RMIT – selection of works.	RMIT Gallery
25 May, 2019	*The Encyclopedia of Biblical Errancy* Michael Kieran Harvey at Australian National Academy of Music	South Melbourne Town Hall

Figure 4: Public exhibitions and performances of works in the RMIT Sonic Arts Collections since 2013

Engagement example 5: The database: an online directory for the collection
In early 2019, author and recent graduate Josh Peters was employed as a research assistant to develop an online database for the collection that would systematically organise all the projects, events, pieces, lectures, and papers that have emerged from both the SAC and SIAL Sound Studios. The database can immediately identify every detail about a given piece from the collection, such as duration, place of origin, speaker configuration, along with all the events where the piece has been performed or presented. Analysing the database in a time-linear view demonstrates how the collection has evolved, expanded, and collaborated with different creative bodies

since its inception in 2013. The system is designed for open access to the public. It accurately connects all its information in an intuitive and interactive spreadsheet. Individuals can investigate details of any piece, concert, or exhibition of interest. The database demonstrates the breadth of material that a sound-based art collection can produce. It provides an accessible place to explore both the SAC and SIAL Sound Studios' history, practice, and repertoire.

Sonic Arts as a teaching resource

Object Based Learning (OBL) models for university collections were first investigated nearly a decade ago, and are currently practiced internationally and locally; prominent examples include University College London and the University of Melbourne (Chatterjee, 2010; Jamieson, 2016). OBL divorces collection objects – in this context, either the digital files or scores that comprise sound-based works, or the aural experience of the works themselves – from exhibition/performance environments and integrates them directly into interdisciplinary teaching and learning activities. Students actively examine, interact with, and discuss objects in peer-to-peer situations, and construct hypotheses around meaning and use pertinent to their own frame of reference (Hannan et al, 2013).

Recent studies at the University of Melbourne have shown student disengagement increasing, and a corresponding decline in attendance at both traditional and online lectures over the last 5 years, except where elements of OBL have been introduced into the course[ii]. RMIT has begun using the SAC to engage students both at a classroom level (using shared listening experiences to instigate discussion), and at a research level (examining the format and structure of works).

As an example, the experience of listening to multi-channel files and discerning the correct way to organize the channel assignments both presented challenges and created opportunities to hone the Starlings' listening and technical proficiency. Spatial sound works are altered when they interact with the architecture of the listening environment for performance; learning how to optimise sound for space is only possible through experimentation and physical interaction with sonic materiality. From the perspective of emerging artists working with spatial sound, the ability to deconstruct works such as those held in the SAC and reconstruct them spatially in a considered and analytical manner is invaluable. The Starlings gained knowledge about how spatial sound works are composed, and developed technical and

compositional skills in reconstructing SAC works for listening sessions and public presentation.

The Speaker Orchestra: public presentations of the collection

Speaker orchestra concerts, or sound diffusions, are an international practice based in universities and cultural centres. The original and best-known system - the Acousmonium at the INA-GRM in Paris - dates back to the mid-1970s (see Figure 5). Other systems include those housed and managed at Harvard University (Hydra), BEAST, and MOTUS (Deruty, 2012).

Figure 5: INA/GRM Acousmonium installed at the Institute of Sonology, The Hague 2013.

The classic diffusion technique uses stereo sound files distributed or split over a large number – usually more than 20 – loudspeakers and a sound diffusion expert who orchestrates or performs the distribution in performance. The speakers are mapped/placed in a venue according to the unique spatial conditions of that space, the pieces, audience size, and seating locations. Once installed and with the right software and expertise, pieces in diverse formats can be distributed across the same system, e.g. 8- to16-channel pieces. Speaker orchestra concerts provide experiences for audiences impossible to have in the home, a classroom, on-line, or on a phone. It is communal, spatial, and, to use a cliché – deeply immersive. Events in this genre are often named *cinema for the ears*.[iii] The practice is not without critics (Burt 1999), and present issues around concert management and rehearsal time (Tuschku, 2012).

Since the establishment of SIAL Sound Studios during 2002-04, academics, technical staff, research students, industry, and guests have continued to develop and perform spatial sound concerts on the speaker orchestra. The Studios have produced around 30 concerts in 18 events on the system in Australian and overseas, in addition to undertaking two ARC Linkage projects using the system.[iv]

Over the years a series of in-house techniques have been developed which are now taught through electives that are providing pathways for new students/practitioners to work on the speaker orchestra (see above discussions on the Starlings Sound Collective and the collection as a learning tool). Technical and musical preparations are essential, as each work is adapted to the unique conditions posed by the given performance space, including seating arrangements and acoustic conditions (See Figures 6 and 7).

Figure 6: SIAL Sound Studios Speaker Orchestra installed in The Design Hub Multipurpose Room. This space located in Building 100 at RMIT University has since been refurbished as a design workshop.
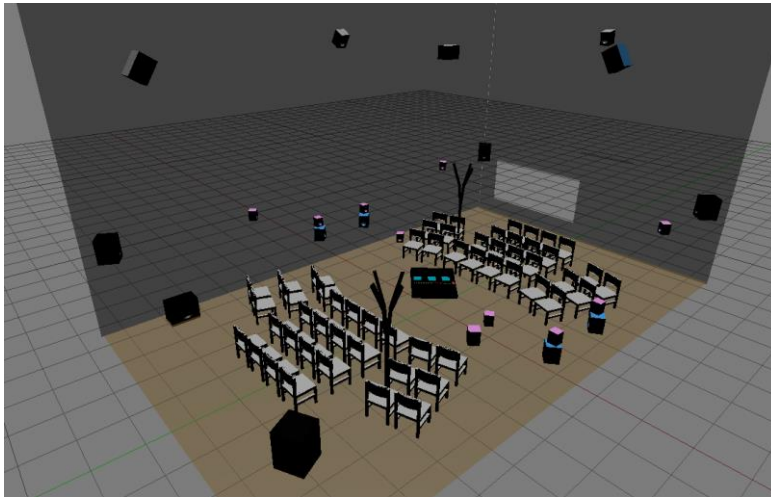
Figure 7: 3D model of the RMIT Speaker Orchestra mapping system in the Salon, for Melbourne Recital Centre concerts in 2009. Image by Jeffrey Hannam.

Future Work, Emerging Ideas

In the previous sections we have sought to describe a series of interconnected activities that have evolved from and around the collection. This growth has been as much organic as following a pre-determined plan, although we continually sought to align acquisitions and commissions with other curatorial themes of the RMIT Art Collection. Like all large institutions RMIT is a shifting mosaic of resourcing, opportunities, policy, management practices and restructures. However the key players have maintained a lively collegial discussion of ideas that have shaped the development of the SAC, while continually negotiating the shifting landscape of a university. This paper has identified what now stands out from this development phase, and to consider these key elements of a cultural endeavour dedicated to sound art and listening inside a university. With reference to the conference theme of engagement, we now briefly turn to outcomes – and offer some opinions or descriptions about this development to date.

An ecology of teaching, research and engagement

Development to date has established an ecology of teaching, research, and engagement. If engagement is to happen over an extended period and achieve sustained critical enquiry – then clear pathways are needed for academics and students to work with the collection. We see this engagement being both inward and

outward focused, and moving between the SAC and its primary vehicle of presentation – the speaker orchestra. This engagement spans practitioners from creative, curatorial, and technical engineering disciplines (See Figure 8).
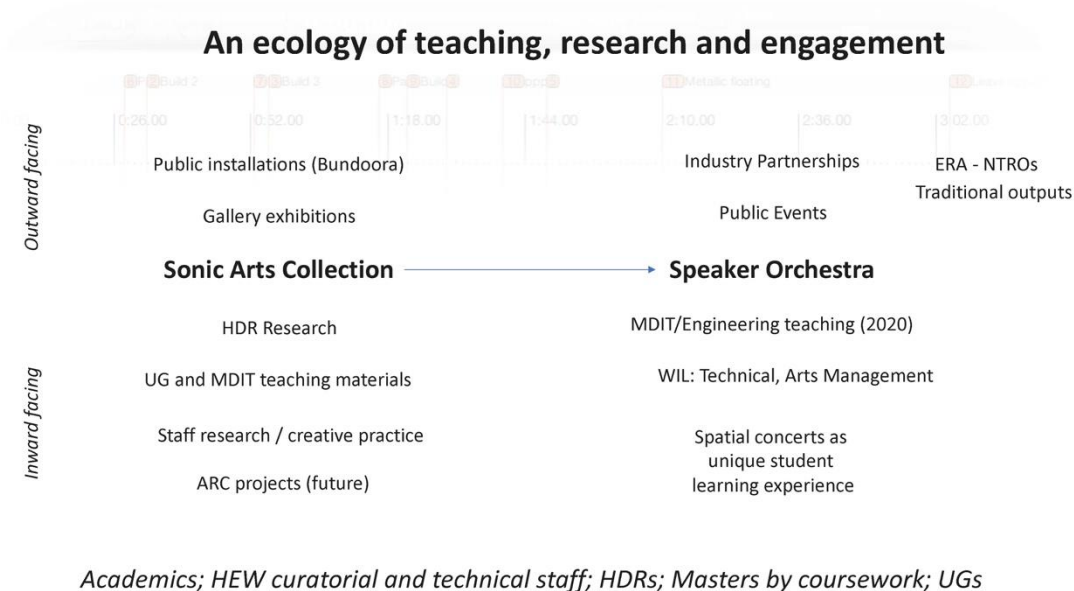

Figure 8: engagement ecology created around the SAC and Speaker Orchestra.

Cultural producer, cultural presence, cultural positioning

Arising from the 'collection as an ecology' idea is the aim of building the team to position the University as a cultural producer. This emerging back-of-house production unit includes academics, students, artists, composers, curators, technicians, arts producers, and logistic support[v] in an endeavour to present more regular events and build audiences though direct experiences of spatial listening. Auditory culture and spatial sound experience are undergoing a resurgence driven by technological innovation in the digital age. The rapidly growing audience for podcasts and technologies accompanying visual experience such as Facebook 360, Dolby Atmos, and Ambisonics means practices of sound design, composition, and music continue to re-emerge across arts and cultural practices to wide audiences.

Many of the examples in this paper have been 'in-house'. However the role of culture producer is how we are now positioning the SAC for a wider external audience. In this we aim to partner with external arts organisations and practitioners to develop collaborative works incorporating spatial sound that engage with the general public through concerts, theatre shows, art installations, podcasting and online content development. The spatial sound expertise and resources we bring to such

collaborations, including the SAC, will provide audiences with new experiences of immersive sound and increase engagement with sound art.

Evaluation, Engagement, Impact and Future Work

At the time of establishment, there were few precedents or working models to form the aim of establishing a sound art collection in a university using a speaker orchestra for a range of regular public presentations, while also supporting teaching, learning and research.

Having moved from start-up to consolidation, we also now have the elements to undertake deeper forms of evaluation. The HDR co-authors of this paper are trialling evaluation techniques for spatial sound works through their own practice-led research which we do not think can be achieved through online click surveys, or simply monitoring social media posts. To that end, we are playing a long game – to position the collection and speaker orchestra concerts as *experiences audiences would not have elsewhere.* We are also seeking to improve visibility and presence of the SAC for arts audiences and to address the lack of gender and culture diversity in sound practices through ensuring wider representation of women artists in future acquisitions and commissions. A lack of direct engagement with Aboriginal and Torres Strait Islander culture within the SAC represents a notable direction for future development. Large-scale spatial events are perhaps a means to bridge predominately western visual centric cultural and the knowledge systems of the Indigenous owners of Australia. Remembering, for thousands of years, sustained an oral-aural cultural, with all the complexities of social-family organisation, food gathering, farming, medicine, history, astronomy, navigation, politics, environmental knowledge, and spiritual practices – through acoustic communication.

References

BARRETT, R 2019, 'Music of Possibility', Vision Edition. ISBN 978-0-9931761-4-2

BARTLETT, D 2012, 'Coaxing them out of the box: Removing disciplinary barriers to collection use'. In Jandl, S & Gold, M. (eds.), *A Handbook for Academic Museums: Exhibitions and Education.* Museums Etc. Boston. 190-218.

BOYLAN, P 1999, 'Universities and Museums: Past, Present and Future', *Museum Management and Curatorship.* 18: 43-56.

BUCKLEY, D 2015, 'From body schema to score: creating spatial grammars in contemporary electric guitar practice', Doctor of Philosophy (PhD), Architecture and Design, RMIT University. Retrieved from <http://researchbank.rmit.edu.au/view/rmit:161557> on 03/12/2019.

BURT, W 1999, "The Spectacle and Computer Music: A Critical Assessment" in *Proceedings of the ACMC99,* Victoria U. of Wellington, July 1999.

CHATTERJEE, H J 2010, 'Object-based learning in higher education: The pedagogical power of museums'. *University Museums and Collections Journal* 3: 179-181.

DAVIS, J (et al.) 2013, *Sound Bites City: the RMIT Sound Art Collection* [exhibition catalogue], RMIT Gallery, Melbourne.

DERRICK, R 2011, Composer entry at SOUNZ website, retrieved from <https://www.sounz.org.nz/works/21069> on 03/12/2019.

DERUTY, E 2012, 'Loudspeaker Orchestra: Non-Standard Multi-Loudspeaker Diffusion Systems'. In *Sound on Sound.* Retrieved from <https://www.soundonsound.com/techniques/loudspeaker-orchestras> on 03/12/2019.

HANNAN, L, CHATTERJEE, H, DUHS, R 2013, 'Object Based Learning: A powerful pedagogy for higher education'. *Museums and Higher Education Working Together: Challenges and Opportunities*. Anne Boddington; Jos Boys; Catherine Speight. Farnham (eds.): Ashgate Publishing.159–168.

HARVEY, L 2013, 'Improving models for urban soundscape systems'. *SoundEffects - An Interdisciplinary Journal of Sound and Sound Experience*, Vol. 3, No.3 (2013): Urban Sounds. Available online, http://www.soundeffects.dk/, ISSN: 1904-500X

JAMIESON, A 2016, 'Object-based Learning: a new mode in Arts West'. Retrieved from <https://arts.unimelb.edu.au/articulation/editions/2016-editions/december-2016/object-based-learning-a-new-mode-in-arts-west> on 1/12/2019.

MALRAUX, A 1967, *Museum Without Walls*. trans. Gilbert S. & Price, F. London: Secker & Warburg.

RMIT GALLERY WEBSITE 2016 Notice for 'The Surface Project' event. Retrieved from <https://www.rmit.edu.au/events/all-events/special-events/2016/september/the-surface-project> on 03/12/2019.

RMIT GALLERY WEBSITE 2017 Notice for 'Ocean-Imaginaries' exhibition. Retrieved from <https://www.rmit.edu.au/events/all-events/exhibitions/2017/may/ocean-imaginaries> on 03/12/2019.

SMALLEY, D 1997, 'Spectromorphology: Explaining sound-shapes'. *Organised Sound, 2*(2), 107-126. doi:10.1017/S1355771897009059.

TUTSCHKU, H 2012, 'On the interpretation of multi-channel electroacoustic works on loudspeaker-orchestras: some thoughts on the GRM-acousmonium and BEAST. Retrieved from <http://www.tutschku.com/on-the-interpretation-of-multi-channel-electroacoustic-works-on-loudspeaker-orchestras-some-thoughts-on-the-grm-acousmonium-and-beast/> on 03/12/2019.

WILLIAMS, N. et. al. 2014, 'A system for collaborative design on timber gridshells'. In *Rethinking Comprehensive Design: Speculative Counterculture, Proceedings of the 19th International Conference on Computer-Aided Architectural Design Research in Asia* (CAADRIA 2014) / Kyoto 14-16 May 2014, pp. 441–450.

Endnotes

[i] For a time-lapse video of the Torus installation in Sound Bites City, see <https://www.youtube.com/watch?v=Oxv2GojC2MI> (Accessed 3/12/2019)

[ii] Relayed during presentation by Dr Andrew Jamieson, *Object laboratories: The Classics and Archaeology Collection and object-based learning*, at CAUMAC symposium 21/02/2019.

[iii] For an example, see the film 'My Cinema for the ears' about electroacoustic composers Francis Dhomont and Paul Lansky.

[iv] For a lecture on the topic, see 'Concerts as Research'. Available at <https://vimeo.com/161703410> Accessed 3/12/2019.