



Audio Engineering Society

Convention Express

Paper 199

Presented at the 156th Convention
2024 June 15-17, Madrid, Spain

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Indigenizing Sound Recording: Integrating Ambisonics with Indigenous Sonic & Spatial Practice

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ABSTRACT

The purpose of this paper is to address the colonial ancestry of sound recording and its role within ethnographic research. Grounded in colonial logics, it is revealed that traditional sound preservation tactics participate in the despatialization of Indigenous acoustic culture. By unpacking how sound recording enforces normative, Western listening practices, and contrasting this with Indigenous epistemologies, the indigenization of audio technologies is explored, transforming them into cultural tools to reclaim acoustic and spatial agency over cultural heritage. This is investigated through conducting a series of ambisonic recordings that capture storyteller and poet, Dakota Feirer, a Bundjalung-Gumbayngirr man from the Southeast Coast of New South Wales, Australia. These recordings, taking place at New York University, aim at emphasizing the spatial nuances of Indigenous sonic and spatial practice, and highlight the inseparability of space, body and sound.

1 Coloniality & Sonic Extraction

Thomas Edison, in his 1878 paper “The Phonograph and its Future”, cements into history the extractive capabilities of his device. He declares that the phonograph allows for the “indefinite multiplication and preservation of such sounds without regard to the existence or non-existence of the original source” [1] in addition to the “captivation of sounds, with or without the knowledge or consent of the source of their origin” [1]. With Edison’s technology and theoretical imprint, anthropologist, Jesse Walter Fewkes, collected and claimed not only authorship over the recordings of Passamaquoddy oral tradition, but also transferred legal ownership of the recordings to Harvard University [2], after an expedition that was undertaken in testing of Edison’s phonograph. In a written reflection of his work, Fewkes considers sound recording as “a most valuable auxiliary in linguistic [research], and that it should be used in the study of the fast disappearing languages of races, and

in making record of those which are rapidly becoming extinct” [3]. Fewkes’ participation in recording Indigenous oral culture addresses two issues that have remained within this practice: 1) the extraction and ownership, of Indigenous knowledge, and 2) the fetishization [4] of Indigenous phonetic, linguistic and musical aesthetics throughout ethnographic fields. Therefore, settler ears value that which is spoken or musically expressed, as the Western academy believes it is acceptable to compare, assess and appropriate Indigenous sonic culture with existing Western models (e.g. language, tonal systems etc). This is especially true in the work of Frances Densmore, who recorded Native American songs, and assimilated native tonal complexities into Western notation [5].

While it must be acknowledged that many of these recordings have aided Indigenous language restoration, it is crucial to highlight that the same colonial project endorsing this research is also

complicit in the elimination of Indigenous peoples and their languages [6]. Predetermining the aspects of Indigenous heritage to ‘preserve’ is an eliminatory practice which removes cultural elements that are inextricably connected to one another.

2 Sound, Space & Despatialization

Realizing these logics that inform ethnographic sound recording illuminates how the recorded artifact becomes an object of despatialization. Despatialization produces a sonic object that is removed from its spatial context. Sharing conceptual boundaries with colonial acousmètres [5], defined as the bodiless Indigenous voices in colonial sound recordings, despatialization propagates settler rationalities around the Indigenous body – one that is absent or movable from the inhabitable land. This concept is also akin with the notion of *dematerialization*, the ethnographic practice of removing a cultural artifact “from its original context and abstinence from any desire to reconstitute to it its materiality” [4]. In summary, despatialization removes the multi-dimensional and inter-relational potency of Indigenous sonic and spatial practice, perpetuating the abstraction and appropriation of linguistic and musical aesthetics [5]. Consequently, this creates an object of salvage research, severed from the omnipresent sonic, spatial and bodily relations that are implanted within cultural practice. What remains, as Robinson reveals, is an object of knowledge that is “fragmentary and partial” [8].

Sonic and spatial practice is key in the survival of history, law and tradition, transmitted through song and story throughout many First Nations cultures peoples around the globe [8] [9] [10] [11]. Sonic practice encompasses sound-centred traditions produced by Indigenous bodies and acoustic ecologies - inclusive of spoken word, song and dance, instrumental performance, and the bio-acoustic patterns that inform Indigenous ontologies. Spatial practice acknowledges the entanglement of acoustic culture with land, bodies and space. This is articulated through spatial subjectivity, which observes how “space exerts agency, affect, and character beyond the realm of striking aesthetic impact. In certain cases, it may mean experiencing it as a partner, interlocutor, or kin” [8].

These complex sonic and spatial epistemologies require specific technologies to capture and reproduce the essence of Indigenous practice. Interestingly, spatial audio technology has been explored by several scholars for this application.

Sheehan (2018), in Aotearoa, adopts binaural and ambisonic techniques to capture the “importance of Māori women within Māori society and within the world” [12]. Woodland et. al. (2019) select binaural and multichannel techniques, bringing the acoustic signature of land to incarcerated Aboriginal women in Brisbane, Australia [13]. Their work, especially, emphasizes the emotional and cultural value of listening to land among Aboriginal people. And lastly, Sierra et. al. (2023) utilize ambisonics and 360-degree video to encompass the multiple dimensions of traditional music from the Arabian Gulf [14]. This frequent integration of spatial audio and heritage practice outlines how cultural actors resist the restrictive logics curated by Western research, through utilizing contemporary tools that they deem as properly illustrative.

3 Ambisonics

Ambisonics, a subset of sound field synthesis, is a sound recording technique that allows for the capture and reproduction of sound waves from a single point in space [15]. Where binaural, stereo and surround sound rely on psychoacoustics to recreate spatial perception, the sound field approach reproduces the physical properties of sound waves from “its point of origin, to its point of observation” [15]. In summary, ambisonics attempts to capture and reproduce the acoustic sphere from a single point, rather than relying on the perceptual manipulation to impose the illusion of space. This allows for nuanced spatial detailing that cannot be captured using traditional mono and stereo microphone sources. Moreover, higher-order ambisonics allows for higher spatial resolution and accuracy, by increasing the number of microphone capsules, and thus, the amount of directional patterns (spherical harmonics) to represent the sound field [15] [16].

4 Ambisonic Recording

Three ambisonic microphones were used to record Indigenous Australian poet and storyteller, Dakota Feirer. These microphones included:

- A 1st-order Sennheiser Ambeo
- A 3rd-order Zylia ZM-1
- A 4th-order EigenMike EM32

The recording sessions took place in three spaces over two days at New York University (NYU) to capture various depictions of Dakota’s spatial practice. These spaces were:

- Studio A in the Music Technology department.

- The Ensemble Rehearsal and Performance Room at the John A. Paulson Centre.
- The treated control room accompanying the ensemble room.

Both the EM32 and ZM-1 microphones were connected to an Apple MacBook Pro laptop, running Reaper for the EM32 and Zylia Studios for the ZM-1 recording. The Ambeo ran separately through a Zoom H6 field recorder.

During day one, only the EM32 was used in Studio A's treated recording room to accentuate Dakota's voice and body in space. He was instructed to prepare no script, and instead consider this a moment to share cultural identity and knowledge. The EigenMike was positioned approximately 1-meter off the ground, at 1.5-meters from Dakota's sitting position.

For day 2, Dakota was asked to bring his own poetry, and position himself as he pleases in the spaces. In the control room, the EM32 and ZM-1 microphones were used independently, each accompanied by an inverted Ambeo positioned directly above, capturing the same sound field in 1st-order. In the ensemble room, only the Ambeo and ZM-1 were used independently. Within this space, Dakota recited his poetry while allowing himself to move around the spacious, reverberant room.

5 Performance Reflection

After the Day 2 session, Dakota reflected on his performances in the ensemble room, recalling that he grounded himself by "finding the sky and speaking to the horizon" [17]. He noted how his voice lengthened as he found the sky, and how "speaking to the corners of the room" allowed him to observe the "different depths and angles" of his voice [17]. Navigating the built environment, one embodying rooted colonial histories, Dakota cements his sovereign voice and body in the Western performance space – defying the normative focus that spaces like this exert [8], and instead, treating it as kin.

6 Encoding & Editing

After collecting the recordings, each format was rendered to their corresponding channel count in Reaper; the 4 separate channels of the Ambeo were consolidated as one 4-channel file, and likewise for the 19-channel ZM-1 and 32-channel EM32 recordings. This allowed for a simple workflow when it came time to encode each file. Using the IEM ambisonic plug-in suite, the ZM-1 and Ambeo files

could be encoded effectively, whereas the EigenMike recordings were independently uploaded to EigenStudios, converting the 32-channel A-format file into a 19-channel B-format file.

7 Poetry Recordings

The day 2 ambisonic recordings containing Dakota's poetry were edited, organized and labelled in various formats for Dakota to use wherever applicable. Each recording consists of an A-format, B-format, and omnidirectional render, as well as four stereo beamform renderings, pointing at the four walls of the ensemble space. This enables Dakota to govern how his recorded practice is used, what format it is used in, and to reconstruct his acoustic performing body across any immersive system, including AR/VR and multichannel.

8 White Noise Design

The Day 1 EM32 recordings were used in *White Noise*, as they demonstrate the transmission of knowledge through conversation. Due to software compatibility issues, there was no ability to adjust the EM32's gain during the recording process, and as a result, the files contained large amount of noise. Where a light lowpass filter was used to minimize this prior to A-format conversion, a larger amount of filtering was implemented before and after the decoding stage in MAX MSP – within which the project was designed.

In addition to higher-order ambisonics, *White Noise* incorporated procedural modelling, amplitude panning and generative techniques to design an artificial soundscape moulded out of white noise. The soundscape attempted to impersonate that of the southeast coast of New South Wales, Australia, one that has significant cultural ties to both of the project's collaborators. This was fundamentally influence by the concept of 'white noise' as colonial dialogue, one that often needs to be 'filtered out' from Indigenous issues.

Upon creating the soundscape, a 45-minute EM32 rendering of Dakota was decoded across a 20-loudspeaker cube in New York University's Research Lab. The decoding process involved measuring each of the loudspeaker's azimuth, elevation and distance from the centre listening position in relation to the array and initializing multiple Spat5 objects in MAX MSP with this coordinate data. An *mc.groove~* object called the encoded file from a buffer in MAX MSP, to be loaded *spat5.hoa.decoder~* and decoded across

the loudspeakers. Upon realizing that the decoded spatial image was not ideally positioned, *spat5.hoa.panner~* was used to pan Dakota in front of the listening position.

White Noise resulted in being a 45-minute listening experience between a single listener and a knowledgeable Indigenous body.

9 Discussion

Capturing the Indigenous body with a higher-order ambisonic microphone demonstrates a process which coalesces sonic and spatial elements of Indigenous practice. The ability for ambisonics to measure acoustic directionality on the surface of a spherical microphone array [15] supports the logic of capturing and reproducing the spatialized body without discarding its sonic aesthetics.

Recording Dakota with the EM32 in Studio A, as opposed to a mono/stereo microphone array, captured the angular propagation paths of his voice and the paths emitting off his resonating body; the subtle, acoustic artifacts that he produced in space; his location in three-dimensional space; and the spatial agency that is exerted upon him. In essence, Dakota was recorded and reproduced, not as a despatialized, linguistic object, but as a materialized, resonant Indigenous knowledge-holder existing in, and reacting to, space.

Similarly, recording his performance in the ensemble room articulated Dakota's collaboration with space, as he searched for his voice in the reflection of the walls, and grounded himself in the sky's expanse. While Dakota's sonic practice amplifies cultural ties to his homeland, his spatial practice in this moment is equally as poetic – it describes the navigation of an Indigenous body, removed from (and speaking about) his Country, asserting his sovereignty inside an autonomous, colonized space.

Packaging these cultural recordings in numerous listening formats, and resisting colonial logics of ownership by acknowledging the knowledge holder as the original author and owner, situates governance into the hands of the recorded subject. The flexibility of ambisonics enables Dakota to present his sonic and spatial practice across immersive loudspeaker arrays and head-tracking systems, in addition to more accessible listening formats including mono, stereo and binaural. Through this, Dakota's personal archive surpasses the expectation of linguistic aesthetics, and instead, allows him to project his knowledge

Indigenous body conducting etymological and spatial practice.

10 Indigenizing Ambisonics

Observing the function of ambisonics in cultural practice allows one to envision a recording process which exceeds the limitations of capturing linguistic and musical aesthetics. Listening to the recorded Indigenous body participating in sonic and spatial practice allows one to comprehend how knowledge holders are informed by the dimensions of space. Therefore, it is inappropriate to restrict the preservation of Indigenous practice to the confines of sound - especially since the logics of sonic preservation has propagated across nearly 130-years. What if ethnography ceased seeking acoustic data, and instead, handed over this task to Indigenous communities? If ambisonic technologies became available to Indigenous communities, how would they engage in the spatial recording of culture? How would it be different to current despatialized recording practices?

11 Conclusion

Indigenizing sound recording eliminates the settler, ethnographic hunger [8] for salvaging and storing the sonic aesthetics of Indigenous culture. Since its emergence in the late 1800s, sound recording became entangled in colonial logics of preservation. It has broadcasted a fallacy, that Indigenous sonic and spatial culture is dying and its up to Western science to salvage what remains. While colonial preservation methods are frequently critiqued, there is limited discourse around how Indigenous sonic and spatial practice becomes despatialized by the Western researcher, and thereby, exists a fragmented and partial, incarcerated object in the settler sound archive.

One method of resistance is explored through reconceptualizing the ambisonic microphone as a cultural tool, to simultaneously capture sonic and spatial practice. It opposes ethnographic recording techniques by assessing the dimensional components of Indigenous culture and locating a technology that offers multi-dimensional capture. This confronts the colonial assumption that Indigenous sonic culture produces only sonic data, and thus, any recording device is acceptable for documentation. Engaging in multiple recording sessions with different order ambisonic microphones allowed for these cultural dimensions to be captured and reproduced; it encapsulated Dakota, as a resonant knowledgeable body,

participating in sonic and spatial practice *with* the spaces that he occupied. It is, therefore, unreasonable for these colonial notions of sonic extraction to continue to inform recording practices, especially as spatial audio technologies are becoming readily available in institutional settings (however, not entirely accessible to Indigenous communities). Institutions must realize that these colonial ideologies reverberate through both the ethnographic and tech spaces, making it difficult for Indigenous scholars and artists to decolonize the extractive research practices that persist within, and exhaust, Indigenous nations. Henceforth, the indigenization, rather than decolonization, of sound technologies is considered - putting the practical approach in the hands of Indigenous peoples to assert sovereignty over cultural knowledge, and the ways in which it is captured, preserved and reproduced.

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