



The Listenⁿ Project: Acoustic Ecology as a Tool for Remediating Environmental Awareness

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Abstract

The Listenⁿ project¹ is an interdisciplinary media arts project, investigating the pristine acoustic ecologies of Southwest deserts of America. Establishing the largest database of ambisonic and stereo field recordings of the Southwestern landscapes of the United States, the Listenⁿ project is designed to not only archive sound, but to explore how virtual environmental engagement through media arts and sound can cultivate environmental awareness and community agency. It delivers community partnerships and capacity building with enthusiastic communities in four American Southwest desert communities: Joshua Tree, Sequoia & Kings Canyon and Organ Pipe Cactus National Parks and the Mojave Desert Trust. Aiming to empower and encourage communities to make creative contributions to and have agency in the development of the Listenⁿ project, this paper outlines the fieldwork undertaken in 2014 and 2015 and discusses the substantial online listening database, virtual reality and web based tools deployed and currently in development. It will also provide information on the project's innovative application of ambisonic audio recording and playback to create 360-degree immersive experiences online and through the Oculus Rift VR headset (EcoRift).

Keywords

acoustic ecology, field recording, ambisonics, immersion, virtual reality, modes of listening.

Introduction

The Listenⁿ project is an interdisciplinary media arts project, investigating the invaluable sonic ecologies of Southwest deserts of the United States. At its core, accessibility is actively designed into the digital platforms, community workshops and media artworks to support their creative use by as many different people as possible. The outcomes support engagement with rich natural environments for the broader public whilst also advocating for the proper recognition, respect and the active involvement of indigenous communities, elderly individuals and people with disabilities who would not traditionally have visitation access to these environments. The Listenⁿ project aims to empower individuals of different abilities to collaborate and engage communities that do not traditionally have access to audiovisual technology. The project's collaborative media art-

works and forthcoming touring exhibition will provide immersive environmental experiences for audiences all over the world.

Contested Spaces

The Listenⁿ project focuses on the acoustic ecologies of pristine natural environments in the American Southwest. The term, "pristine natural environments" is of course problematic. It romanticizes and commodifies the land and our engagement with it. All landscapes are contested spaces, they are constructions of enculturation, be that perceptions of the energy and spirits within the land, and reflected by the land and the animals inhabiting it; a Western romanticized notion of settlement, belonging, entitlement, or an industrial view of the potential of wealth production, the gallons of oil, tons of ore, gold etc. and all the possible nuances between. Beyond these critical notions of land and place we can perceive an interplay of sharing commonalities, conflict and the transformation that occurs as the lobbyists and activists dance around each other over time.

The acoustic ecology of a space often tells a story of intervention and the relationship between the quality of the land surface, the vegetation, and the sounds of habitation, be they human or otherwise. Made up of two principal components, the acoustic ecology can be described as consisting of the substrate; the sonic properties of the land itself, the reverberation, the softness or harshness of the sound, the land's quietness. It also consists of a second principal component containing the sounds of activity of animals for whom the land is their habitat, the sounds of the critters, insects, birds, and larger animals [biophony], and non-sentient sound sources such as water, rocks, wind, weather [geophony] and above these naturally occurring sounds is a third dimension made up of human sounds [anthrophony], airplanes, motor vehicles, air-conditioning etc. - the sound of human presence, activity and intervention, sounds that often overlay the sounds of the natural habitat. These acoustic ecology dimensions indicate the rich and dynamic interplay between natural, cultural and industrial presence on any site.

This point is well illustrated by the experience of standing in the middle of the vast Soda Lake salt pan at 4:00 a.m., May 28, 2014. The terminus of the Mojave River in the Mojave Desert of California, contained within the Mojave Desert Preserve, one could hear the I15 freeway, some miles away, but reverberating across the flat surface of the

¹ See <http://www.ecolisten.org>, viewed 23 May 2015.

salt pan, the occasional air conditioner, maintaining comfort at the research station several miles in the opposite direction. Simultaneously one is aware of the soft enveloping acoustic of the site, established by a quietness, a fullness of air, characterized by the absorbent qualities of the salt lake surface, the reverberant qualities of the surrounding hillsides and the minimal bird and insect life active at that time of day. The sound of the freeway predominated the underlying acoustic of the site.

Soda Lake is part of the UNESCO Mojave and Colorado Deserts' Man in the Biosphere Reserve designated by UNESCO in 1984 to promote ecological conservation. The Mojave and Colorado Deserts Biosphere Reserve includes the Death Valley National Park (in the Mojave Desert), Joshua Tree National Park (in the Mojave/Colorado transition zone), the Santa Rosa Mountains Wildlife Management Area (in the Colorado Desert) and the Anza-Borrego Desert State Park (in the Colorado Desert). It is a vast land area which has a long history of human intervention and protection. What is now the Mojave Desert Preserve witnessed some of the first Spanish expeditions through eastern California in the late 18th century. In 1860, the U.S. Army maintained a fort at the site named Hannock's Redoubt, but a twentieth-century maverick gave it its lasting appellation, Zzyzx Mineral Springs and Health Resort which remained an active alternative community until 1974. In 1976, the California State University system negotiated with the U.S. Bureau of Land Management to establish The Desert Studies Center, a research facility that draws scientists and students year-round. Almost any site of human habitation could have as diverse a history. This evolution of occupation, intervention, and transformation is made explicit through the site's acoustic ecology in a unique manner. Listening deeply to the sonic environment makes one feel increasingly present – deeply present. Just listening for the delicate and intricate web of sounds that are there, but that one doesn't hear most of the time makes one aware that these spaces are neither silent nor empty. They reveal an ecology, made up of acoustic features - an acoustic ecology, that carries with it, even in the recorded medium, a sonic signature of the environment in which it was created, a sonic signature for the environment to which we have a somatic response – a bodily, phenomenological response. In this way, the I15 traffic noise, the distant sound of the air-conditioner at the research center, the quietness and softness of air, and the qualities of reverberation across the salt pan surface, all combine to provide an abstract, experiential history of the Soda Lake site. This experiential history is not a concrete, fact-based narrative but more a felt, somatic engagement with the qualities of the site through listening.

It should be noted that the terminology used in soundscape studies references sources – birds, wind, humans, etc. – but does not really address a notion of a baseline soundfield, a sonic a-priori.

R. Murray Schafer's key terms include:

- Keynote Sounds – sounds created by nature (geography and climate): wind, water, forests, plains ... including birds, insects, animals.
- Sound Signals - foreground sounds, which are listened to consciously: bells, whistles, horns, sirens, etc.
- Soundmarks – “sounds that make the acoustic life of a community unique.”[3]

A challenge that remains even with Stuart Gage and Bernie Krause's remaking of these terms into:

- Geophony - non-biological natural sources such as wind in the trees, water in a stream or waves at the ocean, and earth movement.
- Biophony - non-human, non-domestic biological soundscape sources of sound.
- Anthrophony - all of the sound signatures generated by humans.

Anthropologists have sought a more phenomenological approach. One approach being Steven Feld's phenomenological discussion of sensing place “as place is sensed, senses are placed; as places make senses, senses make place” and his term acoustemology: “one's sonic way of knowing and being in the world”; He talks about “how sounding and the sensual, bodily, experiencing of sound is a special kind of knowing.”²

These responses are subtle, somatic and yet profound – one might reflect here on Richard Shusterman's proposal of Somaesthetics – which is said to “foreground the role of bodily experience in aesthetic appreciation.” Shusterman says we must differentiate between representational foregrounding and experiential foregrounding. In the former, the body is seen and treated as an external object. In the latter, the body is a fundamental part or vehicle of lived experience. (n.b. also Dewey, *Art as Experience*, 1934).

In an attempt to move away from citing sound sources (the excitation - representational foregrounding) and acknowledge a baseline sonic atmosphere (experiential foregrounding), we might consider extending the existing terminologies to focus on whole being, direct experience of sound rather than sound as an external object and in so doing, recall Gregory Bateson's (Bateson, 1972) proposition that the patterns of mind (consciousness) and the patterns of matter are reflections of one another and part of an unbroken dynamic whole, suggesting that the body, the space, and the resulting sense of place are inseparable.

During a keynote presentation at the Ecomusics & Ecomusicologies 2014: Dialogues conference in Asheville, Garth Paine proposed the term: *Somaphony* - *Soma* meaning the subtle body and *phon*, denoting sound.³ Somaphony hints at a sense of being present – of being in a place that is defined as much by its baseline sonic signature as it is by

² Steven Feld, “From Ethnomusicology to Echo-Muse-Ecology” Reading R. Murray Schafer in the Papua New Guinea Rainforest,” *Soundscape Writings Essays 2001*, accessed 23 May 2015, <http://www.acousticecology.org/writings/echomuseecology.html>.

³ See Ecomusics & Ecomusicologies 2014: Dialogues, accessed 23 May 2015 <http://www.ecomusicologies.org/>.

the presence of sound signals and keynote sounds, an inclusive experience of “knowing and being in the world,” a “bodily, experiencing of sound [as] a special kind of knowing” whilst simultaneously acknowledging the sonic as an object as referenced by the standard acoustic ecology terminology. Paine is drawing attention to a whole-body mode of listening where perception is singular and cumulative and in line with Feld’s “ways of knowing,” rather than a concrete, separable and identifiable mode in the sense of traditional acoustic ecology concepts.

Embodied Interaction

Embodied interaction drives the technology development of the Listenⁿ project which includes a large-scale online field recording database, an Oculus Rift VR experience (EcoRift) and a set of tools for mobile devices that allow the users to translate their current geolocation into one of the documented UNESCO Biospheres and National Parks and to immediately make recordings, take pictures or write stories for upload to the Listenⁿ community portal. This strategy aims to engage users through embodied experiences in the rich potential of pristine natural environments.

Phase One

In 2014 two sets of field trips were undertaken and ambisonic and stereo field recordings were made in the early morning (dawn), early afternoon, and early evening (dusk) in each of the American Southwest desert Biospheres/National Parks named above. More than sixty hours of recordings were made, and subsequently auditioned and tagged before being added to a searchable online database which provides the public with direct multi-format access to listen to the documented sound fields from anywhere in the world. Five composers from around the globe, Ros Bandt, Leah Barclay, Ricardo dal Farra, Douglas Quin, and Garth Paine, used these recordings to create acousmatic compositions which were premiered in Tempe, Arizona in 2014.⁴ In addition, 360-degree photographic panoramas were created at the location of each recording. The recordings and images have been combined in several experiential media outcomes: 1) as a navigable panorama on the website which ties together the 360-degree image with realtime spatial audio navigation of the 360-degree audio recording made using the ambisonic technique. 2) This experience has been further developed for offline high resolution deployment as an Oculus Rift VR experience called the EcoRift which offers a truly immersive engagement with the represented high-value natu-

⁴ The compositions are: *Raptor* (Bandt); *Ground Interference* (Barclay); *Listening* (dal Farra); *Contested Landscapes: Singularities, Granularities and Sonorities* (Quin); and *Becoming Desert* (Paine). Paine also created the interactive work *Forest* (2015) which combines desert field recordings and live flute performance.

ral environment, providing full 3D Point-of-view and stimuli in both the audio and visual domains.

A website containing the above recordings and information about the project has been developed in a manner that enables each community near the featured National Park/Biosphere Reserves to add to the recordings made by the Listenⁿ team through audio, photographs, video, and text. The website is structured around each geographical location, with a single page for each site containing the 360-degree panorama, a description of the location, the UNESCO Biosphere Reserve data, a map showing the geolocation of the recordings available in the database, a search pane that provides direct listening access to the soundfields. It also offers a community PlaceStories portal where the local community can upload media related to the project using skills developed in Listenⁿ project community workshops and equipment left in the communities for this purpose.

Initial experiments with the EcoRift system have shown that realtime dynamic movement through both the visual and auditory domains produces a strong sense of presence and immersion in the represented natural environments. We postulate that this is because the ambisonic soundfield provides full 3D auditory cues, and that linking the head-tracking to roll, pitch, yaw and zoom in the auditory field provides the same ability in the EcoRift experience of moving the head slightly to determine or check auditory spatial coordinates as would be experienced in the real world. When synchronized with a 3D panoramic visual representation of the recording site, users have reported a very strongly embodied experience of being present in these natural locations.

The final aspect of the first phase of this project is the development of a mobile platform application that allows users to select one of the documented National Park/Biosphere Reserves they wish to walk through; they then select a walking route in their local environment - perhaps their route to work through an urban environment - wearing noise-cancelling headphones and push go - the app geo-locates them in the desert soundfield as they walk through their local environment, providing an embodied experience of traversing, or sitting and listening in a unique natural environment. This application also uses ambisonic sound sources providing full spatial panning and zooming in the 3D soundfield and constructs contiguous soundfields by extracting features from conjoined static recordings to form a seamless sonic space.

Phase Two

In 2015 the Listenⁿ team made public presentations in Joshua Tree and Sequoia & Kings Canyon National parks and offered workshops for young people on listening and field recording as part of National Parks Week. A further two periods of immersive community engagement will take place in each location. The first involves workshops on listening and recording natural environments and an exploration of the ideas of acoustic ecology for school children and visitors to the park respectively and a work-

shop focusing on field recording by the Listenⁿ team in locations suggested by the community followed by introductory and advanced workshops on listening, acoustic ecology, and ambisonic audio recording. The final stage of this period features participatory opportunities, including the sharing of field recordings on the Listenⁿ Database and the publishing of digital stories around listening to desert sounds on the Listenⁿ PlaceStories portal.⁵ The longer workshops take place in collaboration with local community groups who will support volunteers in a long-term endeavor to re-record the acoustic ecology of each site at monthly intervals for the next decade(s), forming the basis for comparative studies of changing sonic ecologies due to changing climates, land use and habitation.

The second workshop period involves collaborations with the community in creative responses to the environmental field recordings made in the first workshops. The workshop participants will have the opportunity to make their own media art using Listenⁿ project recording equipment left in the communities in the first workshop period. Participants will create solo and collaborative sound and media artworks based on environmental and heightened auditory engagement.

These Listenⁿ project sound and media artworks will be curated into a touring exhibition and concert. The exhibition will include a dynamic website streaming the environmental field recordings for exhibition attendees (and local and global audiences). It will also offer unique 360 EcoRift VR experiences. The concert will feature immersive sound compositions disseminated on three listening stations and multi-channel acousmatic musical works drawing on the field-recording database. The exhibition and concert will premier at the ASU Art Museum in 2016.

Transmedia Approach

The Listenⁿ project may remind of a number of endeavors involving nature sound recordings. However, it is unique in its scope, its many different and interdisciplinary components, its innovative technologies, its extended time span (designed to evolve over several decades), its concentration on national parks in the American Southwest, and its focus on community engagement.⁶ The PlaceStories software, for instance, inspires the formation of strong cohorts by establishing a framework of Community, Project, and Story.⁷ It allows for the development of extensible and

⁶ Neither Marc Anderson's *Nature Soundmap* (a database of binaurally recorded nature soundscapes and satellite images), nor James Bulley and Daniel Jones's *Living Symphonies* (a work with sounds from British forests recorded in 2014 and sounds performed on Western musical instruments) or Canada's 2011 National Parks Project (involving nineteen film makers and thirty-nine musicians to create works about Canada's national parks) engage local and global communities directly in creative place-making in such a multi-faceted manner as does the Listenⁿ project.

⁷ See <http://placestories.com> viewed 23 May 2015.

dynamic communities by supporting the storytelling and communication needs of groups with a common interest. PlaceStories's application in the domain of acoustic ecology is well demonstrated by the Biosphere Soundscapes project founded and directed by Listenⁿ team member Leah Barclay in 2012.⁸ Biosphere Soundscapes has built communities committed to "listening to the environment and exploring the value of sound as a measure for environmental health in UNESCO Biosphere Reserves." The Listenⁿ project builds on the success of such trans-disciplinary ventures.

The distinctive components of the Listenⁿ project combine in a single interface - each feeding into the overall vision of the project. This multi-platform approach is essential in our accessibility strategy and community engagement methods. The contemporary practice of a trans-media methodology requires cultural assets that fuse not just audio and visuals, but also design, interactivity, and a host of other disciplines. The multiplicity of digital distribution channels, balanced by the ease with which they connect to each other, demands that the artist of the future designs cultural assets that can seamlessly blend across multiple platforms. We are reaching an age in which audiences are consciously creating and viewing the narrative of their own lives across various platforms (e.g. via Instagram, Flickr, Facebook). Artists and humanities researchers should be aware of this trend when designing forms of community engagement and outreach. Listenⁿ combines highly accessible outcomes (such as listening to high-quality field recordings) with technologies at the forefront of entertainment (such as the embodied EcoRift and mobile geo-locating walk experiences). It does so to enable communities to take agency in this project and to foster stewardship in their local environments whilst contributing to and/or driving the discourse of the project over decades and beyond.

Conclusion

Listenⁿ gives voice to a wide range of constituencies: to communities living in proximity to the featured sites; to communities distant from these sites; and to the non-human and non-sentient constituents of these sites. The digital tools and dynamic website facilitate both a disruption of traditional visitation of pristine natural environments and simultaneously through this remediation, a broadened access. Listenⁿ uses technologies to question embodied experience and to encourage new forms of embodied actions. It integrates significant discussions about sound, sustainability, and the place of human experience through creative storytelling, digital mapping, and community collaboration. Listenⁿ builds important connections between the humanities, the environmental sciences, and media arts through development of new technologies, interdisciplinary research, creative endeavors as well as educational and outreach initiatives. It seeks to foster new en-

⁸ See <http://www.biospheresoundscapes.org> viewed 23 May 2015.

vironmentally aware communities who through social media can use their voice as stewards of these protected, yet vulnerable landscapes.

Given such ever-growing challenges as environmental degradation and climate change, the multifaceted outcomes of this project will hopefully nurture more sustainable lifestyles and stabilize park ecosystems. The participating communities will learn to critically interpret their relationships to natural and built environments through new forms of listening enabled by technology. Across each of these outcomes, sound plays an important role for establishing and cultivating individual/community agency and environmental stewardship. In giving voice to individuals and community members to articulate their own positions in these natural spaces, Listenⁿ opens up new opportunities for exploring the importance of place and the vibrancy of sound for its audience.

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Authors' Biographies

Garth Paine is internationally regarded as an innovator in the field of interactivity in experimental music and media arts. He is a Professor of Digital Sound and Interactive Media in the School of Arts Media + Engineering and a professor of composition in the School of Music at Arizona State University. As an Associate

Professor in Digital Music at the University of Western Sydney, Australia, he established and directed the Virtual, Interactive, Performance Research environment (VIPRe). He is fascinated with sound as an exhibitable object, which has led to several interactive responsive environments where their inhabitants generate the sonic landscape through their presence and behavior. It has also led to music scores for dance works, generated through real-time video and/or bio-sensing of the dancers. Paine is widely published, retains positions on editorial boards of in the USA, UK, and Australia and performs his own compositions regularly at international festivals.

Leah Barclay is an Australian composer, sound artist and creative producer working at the intersection of art, science and technology. Her work has been commissioned, performed and exhibited to wide acclaim internationally and she has directed and curated interdisciplinary projects across the Asia-Pacific. Barclay's PhD involved site-specific projects across the globe and a feature length documentary exploring the value of creativity in environmental crisis. Her research has been published internationally and her creative work has been selected for major international festivals and conferences. She is currently an artist in residence at the Australian Rivers Institute investigating the creative possibilities of aquatic bioacoustics, the president of the Australian Forum for Acoustic Ecology and the founder and artistic director of Biosphere Soundscapes, a large-scale interdisciplinary art project connecting the soundscapes of UNESCO Biosphere Reserves across the world.

Sabine Feisst is Professor of Music and Senior Sustainability Scholar at Arizona State University. Focusing on twentieth and twenty-first century music studies, she published the monographs *Ideas of Improvisation in New Music* (Studio Verlag, 1997) and *Schoenberg's New World: The American Years* (Oxford University Press, 2011), as well as numerous essays in European, American and Australian professional journals, essay collections, and encyclopedias. She is currently editing the *Oxford Handbook of Ecomusicology*. With Denise Von Glahn, she is editing the book series *Music, Nature, Place* for Indiana University Press.

Daniel Gilfillan is Associate Professor of German Studies at Arizona State University. His research focuses on twentieth-century literature, film and media studies in the German-speaking sphere, with particular interests in avant-garde/experimental approaches to new forms of media in the past (radio, film) and the influence of these earlier instances of new media on contemporary artistic and cultural practices with telecommunications media. His first book, *Pieces of Sound: German Experimental Radio* was published by University of Minnesota Press (2009). He is currently working on a second book titled *Sounding the World: Sustainability and the Art of Sound*, which explores the role of sound within the key concepts of resilience and precariousness as they function across complex adaptive systems, and these systems' need for sustainable infrastructures.