

Listening for baselines beyond anthropophony: an interview with Bernie Krause

by D Ferrett

World-renowned soundscape ecologist and sound designer [Bernie Krause](#) discusses his field recording methods and ecological perspectives as developed over decades of recording wild soundscapes in this interview with [D Ferrett](#).



D Ferrett: During your career you have worked as a musician, a recording engineer and producer and, particularly in the 1960s and 1970s, you pioneered the Moog synthesiser sound in pop and electronic music as well as created sound effects for hundreds of films, the most often cited reference being *Apocalypse Now* (1979). What was the catalyst for the transition of your work into soundscape ecology?

Bernie Krause: I came to this field of study quite accidentally. In the late 60s, whilst writing and producing my first Warner Bros. album with my late music partner Paul Beaver, we needed to gather natural soundscapes for the compositions. There were no libraries of natural sound, then. So, we had to figure out a way to get these recordings by ourselves. Our album, *In a Wild Sanctuary* (1970), was the first on the theme of ecology, and also the first to feature natural soundscapes as a component of orchestration. Paul refused to record outside leaving the task to me. Turns out that new portable stereo recorders were just appearing on the market and

we were given a beta-test model to try. One October afternoon in 1968, I went to a local park near San Francisco, recorder and mics in hand, and rolled tape. The impact of the delicate acoustic fabric and space was so stunning and emotionally powerful, that I decided at that moment to dedicate the remainder of my life to the capture of natural soundscapes. Also, the soundscapes made me feel relaxed and centred for the first time, given my lifelong battle with ADHD. As a result, the transition was an easy decision. In 1979, after being fired 8 times whilst working on *Apocalypse Now*, I quit professional music, returned to university and earned a doctorate with an internship in bioacoustics and never looked back.



D: Previous interviews with you have riffed on the link between conceptions of the ‘apocalypse’ as environmental disaster and your field recordings of wild soundscapes which record and archive the deteriorating health of species and habitats over time, in some cases, to the point of extinction. Do you perceive this link between your work and a cultural/environmental sense of apocalyptic resonance? Did you purposefully endeavour to move away from the ‘drones’ of anthropophony?

Bernie: As a bioacoustic observer I merely reflect back what the sonic world, and specifically its biophonies, tells us through their very clear narratives. If apocalyptic resonance is what the transmission is telling us, then my guess is that we might want to pay serious attention to the lyrics.

D: In terms of bioacoustic observation, you identify with the field of soundscape ecology. How do you define soundscape ecology and how does it differ from acoustic ecology?

Bernie: Acoustic ecology, an older term that springs from the early work of R. Murray Schafer and Barry Truax, at Simon Fraser University (Vancouver, BC), tends to be a broadly-based traditional academic approach to enquiries related to the larger field of sound and the sound arts. But it has little to do with ecology, per se, which, to me, is why the label was always a bit confusing.

Soundscape ecology, on the other hand, is much more narrowly focused on the study of biological sound in marine and terrestrial habitats. Its expression is not only the source of academic publications, but it intersects with sound art designed to reach larger audiences who need to experience the effect of biophonic resonance. Although previously mentioned by Schafer and Truax in their 1978 publication, *Handbook of Acoustic Ecology*, as a fully-developed transactional discipline soundscape ecology was introduced by the late Stuart Gage, Professor Emeritus, Michigan State University, and I during a research project we initiated for the U. S. National Park Service in 2001 in Sequoia National Park, addressing the health of habitats as conveyed through their biophonies.

D: How does this distinction of soundscape ecology relate to your understanding of 'ecoacoustics' and its scientific aims and objectives?

Bernie: Given the relative novelty of this subject, it is important for scientists to establish some boundaries within which the field of ecoacoustics (aka soundscape ecology) can be explored and made relevant. Amongst the aims of these findings are fleshing out the quantitative and qualitative features of the three acoustic sources of the soundscape: geophony, biophony and anthropophony. Scientists need to define these parameters in order to establish a foundation, an acoustic lens from which to expand the bioacoustic body of knowledge.

D: Could this (or is this) 'foundation' be thought of as a 'baseline'...or a series of baselines that differ according to habitat?

Bernie: I'm not sure. But I suspect that there will need to be something like a range of dynamic equilibrium expressed over time that replaces the baseline concept. That will just take longer to establish and set the stage for much discussion in order to adequately define.

D: What have been some of the key technical, practical and conceptual moments in the evolution of your methods of recording? Bearing in mind your holistic approach to recording soundscapes, how have you settled on methods and equipment?

Bernie: Coming to this field as a trained musician, it was clear to me from the outset that abstracting individual voices out of the context of their whole habitat was antithetical to an understanding of how all of the biophonic sources in a given habitat interrelate. Yet, for over a century, that has been the dominant model for larger collections of natural sound at institutions such as Cornell University and the British Library of Wildlife Sounds. Like I say in my TED Talk (['The voice of the natural world'](#) 2013), that approach is a bit like trying to demonstrate the magnificence of Beethoven's 5th Symphony by separating the sound of a single violin

player out of the context of the ensemble and hearing just that one part. So, I challenged that model favouring one more forthcoming and revealing.

D: Do you have any favoured recording equipment and methods that you would like to share? How did you arrive at a preferred set up? How do your methods of capture help with post-recording playback and data analysis?

Bernie: I learned early on that I could combine my field recording methodologies to meet two criteria: solid calibrated field protocols such that the data could be reliably quantified and accurate comparisons made in relationship to original baseline material. Also, because funding for this early work was not readily available through academic or commercial grants, I had to find a way to pay for the field work. I did this through licensing to film groups like Warner Brothers, Universal, Pixar, Zoetrope, and LucasFilm (Skywalker), for example. But because the latter group demanded the highest quality audio, I adapted their protocol to mine, addressing both the scientific paradigms and practical applications with high-end media production requirements. The recording model I implemented from the late 1980s was a dedicated MS (Mid-Side) system featuring two different kinds of Sennheiser microphones, a MKH 30 (figure-8 pattern) and a MKH 40 (cardioid pattern), piggy-backed, one on top of the other. My recorders varied as time progressed, beginning in the late 1960s with a Nagra IVs stereo tape recorder. That was followed in the late-1980s by a DAT (digital audio tape) device that served as a transition between analog and digital technology. And, finally, in the early aughts, I made the shift to hard drives, settling on the hard-to-beat Sound Devices 700 series, thus completing the digital conversion to the application of any of the Sound Devices 700 recorder series – a technology, along with the Sennheiser mic system, that I still utilize today.

I should add that the consequence of these MS recordings allows both scientists and media producers the greatest flexibility of any other format in post-production or analysis. For example, from a single recording, recordists are able to derive at least 5 options: (1) species-specific from the Mid mic, (2) general ambience from the Side mic, (3) a robust stereo-surround mix, with no 3dB centre channel dropout that occurs with typical stereo mixes, from a properly phase-encoded combo of the two MS tracks, (4) a mono mix, and (5) [assuming no signal-processing] the capability of a perfect reversion to the original MS track separation.

D: As I understand it, the terms you have developed in soundscape ecology divide between ‘anthropophony’ (human generated sound), ‘geophony’ (geophysical environmental sound) and ‘biophony’ (sounds produced by living organisms) with the focus of your work committed to careful listening to the biophony of a habitat through adopting a holistic approach to recording wild soundscapes as opposed to isolating certain sounds. Why is it important for you to approach the recording in this holistic manner?

Bernie: We’re a visual culture. As such, there are many words in our vocabulary to describe what it is that we see. However, there are very few to describe what we hear. The introduction of those terms – geophony, biophony, and anthropophony –

as categorical sources of sound begins to address that oversight (note the visual reference in “oversight.” Also, “I see what you’re saying.”)

It’s important to record and think of the sonic natural world holistically because that’s where the narratives of place exist...in the entire expression. Again, try to imagine Beethoven’s 5th by hearing just a solo cello playing its part. It cannot be understood absent its all-important context.

D: Bearing in mind context, when you are recording in the field, do you purposefully measure anything other than audio such as air quality, temperature and so on?

Bernie: Most important of all is a reliable methodology for archiving metadata. This is key to dependable analysis and determining which audio files would be applicable for production. Because there wasn’t a template for noting this information, I established my own protocol and data sheet, creating it from a FileMaker Pro app. Here is a typical page (see image below) taken from the thousands represented in my archive. Note that most of the fields have drop-down menus designed to drill further into the detailed minutiae of the subject.

This collection is designed such that if one copies the information in FILENAME (6th box down from the upper left-hand side of the page) and then copies that into a search engine, the sound-file instantly appears in Adobe Audition as the default sound app ready to either analyse or edit for media applications. (This app will accomplish both ends.)

Library_ID_No Title
 Analog_Tape_No N/R Beg_time End_time
 Cassettee_No
 DAT Prog#
 Dig_Record_date 722 Take Number SampBit_rates
 FILENAME Duration

BIOLOGICAL DATA:

Category Biome
 Aquatic_Habitat Terrestrial_Habitat

Common_Name
 Species

Field_Notes

LOCATION:

Country Site State_Province
 Altitude GPS

DATE AND WEATHER:

Recording_Date Local_Time
 Season Temperature
 Weather Humidity

RECORDING DATA:

Recorder Microphone
 Mic_Pattern Type
 Recordist Quality

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D: During the recording, which can take long hours in the field, you are present for the duration of the recording – why is this physical and attentive presence vital?

Bernie: Biophonic expression is one aspect of a critter's behaviour. While we can collect huge amounts of data with remote monitoring, I believe it is critical, at least for some of the time, for the recordist to be present onsite if we're to begin to understand the more complex relationships between all the other behavioural aspects (body language, reactions to stimuli, etc) of the organisms we're recording. But, for me, more than anything it's personal; I just enjoy being outside whilst the recorder is running. I like the feeling of forest air on the surface of my skin. I like the smells of wet earth. I love the way sound plays out in different habitats, dry and humid. Most of all, being there simply makes me feel good and connected to life around me.

D: Again, with respect to listening practice, here perhaps suggestive of 'deep listening', do you feel things like identity, ego and indeed 'humanness' get in the way of listening? Is it possible or necessary to move beyond anthropocentric listening? Do you think that articulating biophony as 'orchestra' resituates the centrality of human conceptions of music, and/or, is the idea of The Great Animal Orchestra a way for humans to (necessarily) access the notion of 'harmonious' frequencies and the spaces, or 'niches', occupied by wild animal voices (before human disruption/intervention/destruction/organisation/chaos)?

Bernie: The idea behind The Great Animal Orchestra was to find some residue of humility in all of our bravado – especially when it comes to music and its origins. If, as I have come to believe, the origins of our musical expression were inspired by our early connection to the natural world, then that link deserves some attribution. For a long time, my sense of music – particularly in Western cultures – has been predicated on self-referential exercises where fealty is owed to the current dictates of whatever Academy holds sway. Perform Bach's Mass in B minor in a 13th century cathedral, and you primarily get back your own echo in return. With thick church walls blocking the sound of the extraordinary beauty of natural world outside, the reverberations of our own making were what we came to revere while the original life-affirming voice of God, the biophony, was left out in the cold.



Bernie Krause and United Visual Artists, *The Great Animal Orchestra*, 2016, multimedia installation, 1 h 32, Collection Fondation Cartier pour l'art contemporain (acq. 2017). View of the exhibition *The Great Animal Orchestra*, Fondation Cartier pour l'art contemporain, Paris, 2016. Photographer's credit: © Luc Boegly. Artist's credit: © Bernie Krause © United Visual Artists.

D: What do you feel the addition of (the visual) spectrograms in *The Great Animal Orchestra exhibition* (2016) lends to your sound archive? For myself, attending the exhibition that was held in London (The Strand, 2019), the experience of sitting and listening with others in a very dark space to the soundscape of habitats (oceans, parks and forests) with all their attendant animal sounds was a phenomenally powerful and humbling experience; the spectrograms visually identify and allow listeners to follow the frequencies of various voices across a certain duration. I wondered how you thought about the successes of the exhibition and whether you would rather take emphasis away from the image altogether so as to listen in total darkness?

Bernie: In response to your last question, we're not there, yet. We need to be more comfortable with sound art in totally dark places. The visual, which in this case is designed to support the soundscapes, thus turning a strongly held concept on its proverbial head, serves as connective tissue illustrating how the soundscapes in each of the seven different venues I created express themselves in terms of their unique organization and timbre.

As a scientist, if I happen to write and publish a paper, perhaps a dozen colleagues will read it. When I transform that data into a work of sound art, such as *The Great Animal Orchestra*, and generate directly related streaming visuals to support the soundscapes, the combination reaches across all cultures, ages, language groups to an extremely large audience without the need for explanation. Natural soundscapes

eschew cultural bias. It's no accident that over one million visitors have seen this piece in Milan, London, Paris, Shanghai, and Seoul. This coming fall it will have its U. S. premier at the Peabody Essex Museum in Salem, Massachusetts. Next spring it opens at San Francisco's Exploratorium.



Bernie Krause and United Visual Artists, *The Great Animal Orchestra*, 2016, multimedia Installation. Photographer's credit: © Luc Boegly. Artist's credit: © Bernie Krause © United Visual Artists.

D: What I remember vividly about *The Great Animal Orchestra* exhibition is that, whilst I listened to incredible soundscapes of different habitats and watched various light spectrograms travel across huge screens, I became increasingly wary of the dark spaces – the spaces without light (where light is representative of sound/voice). In other words, I began to feel the dark space of silence as the onset of grief... an intense and incomprehensible loss. Related to this, towards the end of your Ted Talk 'The voice of the natural world', you relay the devastating story passed on to you by a colleague who was recording in the American mid-west around a pond that was formed, in part, by a beaver den. Your colleague witnessed two game-wardens drop a stick of dynamite into the den, killing the female beaver and her kits. You go on to playback the sound of the male beaver "crying out inconsolably for its lost mate and off-spring", describing this voice as the saddest sound you have ever heard made by a living organism. Perhaps my questions related to this are too human-centred but, given you are recording and listening to disastrous ecological loss over time, over decades, as well as singular instances of destruction and loss such as embodied by the cry of the beaver, how do you cope with and process the feelings related to that listening? Is grief necessary for action or is it debilitating? Do you think your recordings can facilitate a less human-centred listening able to conceive of the expression of other life on earth? Is this the hope offered by listening... a listening that encourages humanity to question the hierarchy of

expression and feeling? Can listening in this way encourage humans to value life and to feel compassion as elicited by animal voices? Do you have faith in this potential?

Bernie: As I once told a colleague who accused me of being anthropomorphic: “My morph is definitely anthropophic.” I have no idea how others cope with the feelings that these acoustic revelations induce. In my case, I feel lots of complex and sometimes competing emotions. I can feel the same sense of deep sadness that the critter who loses a mate or offspring feels. At the same time, feel grateful that something is left that conveys that feeling and that I was able to hear and capture that moment to play for others so that they, too, can hear the consequences of human action. I can also celebrate the fact that I get to share that moment through my art with the hope that it may compel others through either grief or anger to express themselves with explicit (and, hopefully) positive action. Life goes on no matter the level at which we choose to participate. The natural world is crying out to us to pay some attention before it’s too late. Where my wife, Katherine, and I live that point may have already been breached (Bernie and his wife Katherine lost their home in a [wildfire, Northern California, 2017](#)). Each morning, when I swing the old gams over the side of the bed and seek vertical purchase, I ask myself what I’m going to do if I’m fortunate enough to make it. Lately, whilst I’m not terribly optimistic, I am still hopeful.



Bernie Krause and United Visual Artists, *The Great Animal Orchestra*, 2016, multimedia Installation. Photographer’s credit: © Luc Boegly. Artist’s credit: © Bernie Krause © United Visual Artists.

D: What is the importance of your soundscape recording archive and what needs to happen to it? Do you remain of the opinion that “science is under siege” (a sort of noise pollution)? And, in general, have recent catastrophes and crisis (including your

own experience of fleeing forest fires) and the global pandemic informed your thinking on the relationship between soundscape ecology and the future? From your perspective what are some of the recent significant developments in soundscape ecology and how is it or will it become important to the conversations on climate emergency?

Bernie: In an immense wasteland of intellectual denial and scepticism, an environment that underlies much of what explains the America I have chosen to live in, there resides a streak of anti-science that is beyond comprehension. One of the reasons I got my library offshore when the last administration was voted into power was because I was warned by colleagues in NASA and the Environmental Protection Agency that my data, partly funded by government grants, might be compromised if I didn't. I felt a bit like I was living a scene in *Fahrenheit 451*.

The most important objective for those working in the life sciences is to get the word out there about our findings in a manner that will compel life-affirming action at all levels, political and cultural. In my case, I've re-arranged my work and life so that whatever energy I have left is spent transforming my data collection into works of art that reach way beyond the limited interests and scope of just the academic community. Key to our success will be what's referred to as citizen-science and attracting much larger audiences to our efforts in relation to the looming crises that confront us. My idea of art is to create performances of wonder I most want others to hear and see manifest in the world.

At this moment, my collection is still actively seeking an interdisciplinary academic home, one where the full extent of its vast scientific and cultural possibilities will be proactively explored.

D: Your work seems at once scientific and artistic or at least the work is interdisciplinary to the extent that you emphasize the science in some of your responses to these questions and the artistic in others. How do you interpret the interdisciplinary aspects of your work and do you feel you are relatively unique in this respect?

Bernie: I've never considered myself unique or special. I'm more likely a consequence of some weird DNA and errant social engineering, at best. And some funky meals, at worst. I guess you could blame my approach on the generalist I've turned out to be. The voice of my life is just my naturalist way of seeing/hearing/feeling a world that I've spent my time navigating through. Others have managed by shredding the natural world into its component parts and then trying to understand the whole. I just happened to begin with the whole ball of particles with the certainty that I'd be completely unable to put Humpty-Dumpty together, again.

D: In your paper '[Climate Change is Breaking Earth's Beat](#)' (Sueur, Krause and Farina, 2019), you and your co-writers discuss how climate change threatens the Earth's natural soundscape. Sorry for simplifying, but is this largely due to the ways in

which climate change is destabilizing the ‘acoustic niche’ of animal vocalizations and geological sound?

Bernie: Probably. For example, spring is occurring in many temperate regions literally weeks before it did in the early 1990s, a very rapid shift in climate. In my area, spring occurs two weeks earlier than when I began recording here in 1993. The birds, migrating as they do along routes established millennia ago, are reliant on stable food sources, vegetation, and weather. However, they find that conditions aren’t as they have evolved to expect. Depending on the species and the bird’s ability to adjust, the consequences of these changes will vary. Some will simply die off, unable to adjust. Others will thrive, although diminished in some capacity. And others will have the ability to move on unaffected by a different but supportive biome. The habitat is affected by virtue of the changes in both density and diversity of species. In the example noted above, those changes are as profound and troubling as the biophony is unrecognizable when compared to the healthy ones I first recorded 28 years ago.

D: What is the particular significance of recordings made at dawn and dusk for soundscape ecology?

Bernie: Both dawn and dusk choruses during the spring and early summer months in most of the Earth’s habitats are the times when the density and diversity of most creatures is expressed at its fullest.

D: You are, to use your turn of phrase, “paying attention to the lyrics” of extinction and impending catastrophe. Maybe this is incorrect of me to say, but your work does seem to establish a narrative in that it relies on time as well as space and place; the degradation of habitat and animal voices is measured over time across decades...? What happens then if, or when, the ‘beginning point’ of your narrative or the narrative of soundscape ecology loses its beginning... or rather the sense of baseline recordings by which the decline or loss is measured? Do you sense a time when the speed of change becomes so rapid that the type of analysis you do is no longer possible?

Bernie: This is a problem that all folks involved in the biological earth sciences are going to have to address. Over the past year, I’ve noticed that even in a new habitat, I cannot rely on my recordings as being indicative of baseline information because the other permutations (weather, climate, vegetation, precipitation, temperature, wind, humidity, etc.) are all shifting so rapidly that the older concepts of what a baseline was, no longer hold. We need to think of this differently, now. And, so far, neither I nor any of my colleagues have managed to figure out an approach.

D: The scale of destruction is overwhelming. Is there for you a moral imperative in listening as a practice that, for instance, ignites something like radical compassion and/or action?

Bernie: It reminds me of a line by the late author, Ed Abbey, “I stand for what I stand on!”

...or, another way of looking at this...

When the Berlin Wall fell in 1989, it wasn't Communism that died. The Soviet version was moribund to begin with. It was democratic capitalism that breathed its last. I'll never forget the images on the TV news where folks were lined up with shopping bags at the E. Berlin border flooding the West determined to buy whatever they could. They'd been so starved for “stuff” they didn't think they could do without. But the corporate world, the one that had been restrained by competitive moral imperatives, was now free of those constraints. Now, it could alter the operational paradigms with regard to how it treated employees, resources, and the financial reward gaps between workers and management throughout the entire international business community. And how did that affect natural resources?

Every financial model depends, ultimately, on access to the Earth's finite abundance. Since we've plundered those resources relentlessly, unless we stop and reconsider the consequences of that paradigm we will – if we haven't already – find ourselves beyond a point of no return where key reserves have been depleted or compromised beyond restoration.

We have to find inspired ways to change those pernicious behavioural patterns to those more compatible and life-affirming sooner rather than later. Right now, every sign at this crossroad points to “critical.” As Tolstoy is reputed to have said on his deathbed, “I don't know what I'm supposed to do.”

D: In 2021, is it possible to hear and listen to ‘wild voices’?

Bernie: Yup. Go no further than your own backyard.