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The Importance of Listening to Mud

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Abstract

Mud is one of the most commonplace substances, but it defies attempts to describe it. Mud can be thought of as an archive in miniature, holding secrets about environmental change in deep time. This essay asks what we might be able to learn if we could listen to mud, to give voice to the history locked in its murky matrix. With examples from the arts and science, it explores mud as an environmental archive with the potential to provide rich, multisensory experiences of the past, particularly when transformed into soundscapes. By moving from scientific language to the immersive and empathic experience of soundscapes, knowledge can be shared more widely and everyone can play a part in interpreting environmental change.

Keywords

Environmental archives, ecological change, history, palaeoenvironments, soundscapes.

Introduction

What does mud sound like?[1] Sloppy, drippy, squelchy, oozing, belching, splattering – are these the words that come to mind? Or is that just a conception of mud from our limited human interactions with muddy environments? Come to think of it, what even is mud? If you say it's made of silt and fine sand, that is not entirely correct. If you say it's largely water, it's not quite that either. To define mud as living or non-living, organic or inorganic, liquid or solid, rotting or forming, animal or vegetable or mineral, putrid or life-giving, is somehow to miss mud's inherent murkiness and ambiguity.[2] It's as if we all know mud intuitively but find it difficult to adequately express what defines it. Perhaps this is because mud is so diverse in its contexts and its contents. From sluggish seashores to soggy peaks, from sombre lake bottoms to sparkling puddles, each drop of mud contains an amalgam of pieces of earth gathered from near and far. These chunks of geological history are squashed together with the detritus of countless past lives and the whole structure is inhabited by tiny creatures uniquely adapted to life in confined spaces.

Mud is a kind of living mausoleum, or an eclectic library whose pages are all stuck together. Like these places, mud is an environment that starts from nothing and then accumulates. Mud has a preference for collecting things that are miniscule, malodorous and apparently no longer wanted elsewhere. Collectively these things can tell a story, and that story could have its own soundtrack. From this point of view, if mud could speak it might sound a lot like the environments that contributed to making it.

Mud hosts and attracts a countless number of diverse biophonic sounds, like bird calls, insect chirps, croaking of frogs, splashes of water and mammalian voices. Listening to mud is a quite complex auditory experience, its geophony often marked by wind through the trees and vegetation, which adds a constant and sometimes eerie layer to the soundscape. The connection between mud and sound has been overlooked. Yet, where there is mud, there is sound. And sound is just like a microscope, it amplifies the unseen and sometimes the pretty obvious. While all of us have heard crickets, how many of us have *seen* one chirping?

Mud is unique in holding on to memories of its environment – traces and fossils can be preserved for thousands of years as an archive of past ecosystems in miniature. This essay explores the idea of mud as an archive of environmental change, one that can help piece together a richer, multisensory experience of the past.

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1 This essay was inspired by the many fascinating discussions about sound and environment that took place over the course of meetings of the Archiving Environmental Change Working Group of the SSRC Indian Ocean Collaboratory, funded by the Andrew Mellon Foundation. I am particularly indebted to Isabel Hofmeyr and Saarah Jappie for leading the group and elevating mud to the lofty status of 'archive'; to Nathan Badenoch and Sunil Santha for their engaging stories about how sound has entered language and folklore as a way of understanding environmental change; and to Bina Sengar and Mussa Raja for companionship and support. This publication was made possible by support from the Social Science Research Council's Transregional Collaboratory on the Indian Ocean, with funds provided by the Mellon Foundation.

2 L. Cortesi, 'The Muddy Semiotics of Mud', *Journal of Political Science,* 25, 2018, 617-637.

Why listen to mud?

Listening to mud as a link to the past is important for a few reasons. One, of course, is the pace of global change and the faultiness of human memory – as familiar landscapes and ecosystems shift beyond recognition, how do we find a solid point of reference to understand how much things have changed? Mud is generous in allowing repeated probing of its grey matter and scientists have found ingenious ways of revealing the secrets contained therein. Microscopic seeds, diatoms, pollen, charcoal, insects and crustaceans all have stories to tell about life in the past – each one a time capsule of lost ecosystems.[3] Ancient lifeways can be heard by paying attention to invisible chemical traces contained in mud that tell us where and what the ancestors were doing.[4] Science has developed various techniques to unfold the many layers of muddy history with high-powered microscopes, elaborate chemical treatments and painstaking attention to detail. But science perhaps does not listen very well, being a little bit too busy promoting universal truths that get published in big international journals. You can't hear much in a busy market. Schafer[5] advocated for 'ear cleaning' exercises to sharpen listening skills, as a way to become more aware of the sonic environment and calling our attention to the negative impacts of noise pollution.

Another reason to listen to mud might be to escape from the limitations of rational language and appeal to our emotions as a way of *feeling* environmental change. If we say that a given landscape changed from an oak forest to a pine forest on the basis of tree pollen preserved in different layers of mud, that's a scientific way to put it. It's unemotional, an 'objective' description. However, without necessarily being able to describe it, we can hear and intuitively comprehend the difference between human footsteps on crackly dry oak leaves and on soft cushions of pine needles. Soundscapes are more than just sounds – they convey a sense of place 'experienced as an embodied encounter with sound'.[6] And each site has its own soundmark, one that defines it just like a landmark, and when listening, soundmarks are key to distinguishing auditory experiences that are shaped by the rhythms of nature and human activity.

Soundscapes are always changing and expressing change. Birdsong, for instance, can be a powerful indicator of environmental health, with greater inter-species communication in more diverse environments.[7] Artists and researchers have recognised the emotive value of soundscapes that take us beyond words and their limited meanings. Public archives have used sound to convey the multilayered meanings of their collection, like the National Museum of Australia's *Breathing Space*,

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3 J.P. Smol, H.J.B. Birks and W.M. Last (eds), *Tracking Environmental Change using Lake Sediments: Terrestrial, Siliceous and Algal Indicators* (New York: Kluwer Academic Publishers, 2002).

4 A.G. Brown, M. Van Hardenbroek, T. Fonville, K. Davies, H. Mackay, E. Murray, K. Head, P. Barratt, F. McCormick, G. F. Ficetola, L. Gielly, A. C. G. Henderson, A. Crone, G. Cavers, P. G. Langdon, N. J. Whitehouse, D. Pirrie and I. G. Alsos, 'Ancient DNA, Lipid Biomarkers and Palaeoecological Evidence Reveals Construction and Life on Early Medieval Lake Settlements,' *Scientific Reports* 11, 2021, 11807.

5 R.M. Schafer. *The Soundscape: The Tuning of the World* (Rochester, Vt: Destiny Books, 1994, 272.

6 J.A. Cohen, 'Current Directions in Ecomusicology: Music, Culture, Nature', *Music Library Association Notes* (Philadelphia), 74, 2017, 83–86.

7 T. Kleyn, M. da Cruz Kaizer and L.F. Passos, 'Sharing Sound: Avian Acoustic Niches in the Brazilian Atlantic Forest', *Biotropica*, 53, 2021, 658–670. R. Ortiz-Álvarez, M. García-Puig and L. Garate, 'Ecological Assembly of Natural Soundscapes in the Garajonay National Park (Spain)', *bioRxiv* preprint, 2022, https://doi.org/10.1101/2022.12.21.521439

a vast composition that is an ever-evolving evocation of deep-time history, ecological cycles and cultural change.[8] The capacity for sensory experience to connect us to the past is often exploited in archaeology.[9] For example, the Star Carr archaeological site in Britain has recreated a Mesolithic soundscape that conveys change in space and time by moving through different landscapes (seashores, riversides, windy moors, forests), different seasons and different times of day and night.[10] Juxtaposing natural and human sounds, both familiar and unfamiliar, creates an unseen connection between listeners and their Mesolithic forebears. The empathic language of sound blurs the lines that academic language tends to draw unintentionally and distils decades of archaeological and palaeoecological research into an accessible form that engages diverse audiences, including children.[11]

Immersing ourselves in mud

Scientific descriptions are very useful for communicating with other scientists but sit poorly with lived experience, poetic language traditions and diverse cultural perspectives on how environments are created.[12] Local people are the ones most affected by the impacts of environmental change and the ones most likely to respond to it directly. When it comes to ecological restoration, for example, local people are rarely given access to relevant scientific information, thereby depriving them of voice and agency.[13] Translating environmental archives into sound could be a way to transcend language and culture to experience environmental change in raw form. Not only sound – environmental archives of every sort can be brought together to reconstruct the dynamics of the entire sensory environment experienced by people. Scientific abstraction can give way to something more immersive, a holistic experience where the viewer or listener becomes an active participant in interpreting environmental change.

Art has a powerful way of uniting the natural world with lived experience. In the works of John Wolseley, for example, mud becomes a central element in a collaboration between the artist and nature. By quite literally immersing himself in muddy environments, the artist turns mud into paint and bird carcasses into paintbrushes. His work 'Dystopia – the Last Wetland' in the 'Heartlands and Headwaters' exhibition expresses the brutal reality of once-flourishing wetland ecosystems killed by thirsty industrial monocultures.[14] The familiar yet strange sight of mud-spattered feathers

8 G. Lacey et al., *Breathing Space* (Canberra, National Museum of Australia: sound installation, 2023) https://www.nma.gov.au/exhibitions/breathing-space.
9 R. Skeates and J. Day (eds), *The Routledge Handbook of Sensory Archaeology* (Abingdon: Routledge, 2010).
10 J. Hughes, *Sonic Horizons of the Mesolithic Soundscape* (audio) https://soundcloud.com/jonhughes409/star-carr-sonic-horizons-rough.
11 B. Elliot and J. Hughes, 'Sonic Horizons of the Mesolithic: Using sound to engage wider audiences with Early Holocene Research', *World Archaeology*, 46, 2014, 305–318.
12 D. Monacchi and B. Krause, 'Ecoacoustics and its Expression Through the Voice of the Arts: An Essay', in A. Farina and S.H. Gage, *Ecoacoustics: The Ecological Role of Sounds, First Edition* (Chichester: John Wiley & Sons Ltd., 2017), 297–312.
13 Ş. Dorondel, S. Şerban and M. Tudor, 'Ecological Restoration in "Liquid Societies" – Lessons from Eastern Europe', *Nature and Culture*, 16, 2021, 86–117.
14 C. Leahy, H. McDonald and J. Wolseley, *John Wolseley: Heartlands and Headwaters* (Melbourne: National Gallery of Victoria, 2015) https://johnwolseley.net/exhibitions/john-wolseley-heartlands-and-headwaters.

silhouetted on watercolour paper sends a powerful message about environmental destruction in ways that written words cannot adequately convey. Krause[15] has extensively recorded natural soundscapes and studied the relationships between sound and ecological health, comparing historical recordings with recent data, detecting changes in biodiversity, presence of invasive species and impact of climate change. He demonstrates with easy-listening sound clips what changes have occurred to the environment, allowing even the least trained ear to easily trace the alterations.

Unlocking mud's hidden stories

Taking mud as an artistic medium to a new level, the *Seeds of Change* project is an example of how mud's stories can be brought to life literally.[16] The artist leading the project, Maria Thereza Alves, realised that mud can give birth to ecosystems that tell us about the things that society has thrown away. Ships' ballast, a by-product of global trade used to stabilise ships returning from abroad, has been dumped in harbours all over Europe. The ballast could be made of rock, soil and other bits and pieces. Seeds would often find their way into this ballast material as stowaways. These were not the seeds of 'desirable exotics' so eagerly sought by botanical explorers to feed the colonial horticultural craze,[17] but of tough harbourside weeds picked up by accident. Once dumped, the immigrant seeds mixed with local mud to create unique repositories of environmental change that kept the seeds viable over decades or even centuries. When taken up and sprouted, the ballast flora becomes a living expression of those forgotten trade connections, of far-flung dockside landscapes and of the homelands of transported slaves whose names were never recorded. By bringing these seeds to life, migrant communities in those European port cities have cultivated living connections to their ancestors. In doing so, they upend accepted history and disrupt colonial notions of belonging.

Mud and biodiversity restoration

This kind of time travel via immersion can generate new ideas and experiences, but there are also practical applications to delving into muddy archives. Perhaps now we could illustrate this with an example. For some years, environmental scientists have been conducting a joint archaeological-palaeo-environmental research programme in Mozambique's Inhambane province. The study area lies along the Indian Ocean coastline, where sand dunes intersect with the water table to create numerous lakes. Some of the lakes have thousands of years of accumulated mud in them and within these layers there are the tiny remains of plants and animals that died long ago. These archives are not complete in themselves, but together they build up a remarkably coherent picture of past environmental change.

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15 B. Krause, *Bernie Krause: The voice of the natural world*, *YouTube*, 2013.
16 W. Lukatsch and C. Kuoni, eds., *Maria Thereza Alves: Seeds of Change* (New York: Amherst College Press, 2023).
17 R. Subramaniam, 'Notes for a Seedy Politics', in W. Lukatsch and C. Kuoni, eds., *Maria Thereza Alves: Seeds of Change* (New York: Amherst College Press, 2023), 90–99.

Today's landscapes and those of living memory are very different to the ones that the ancestors would have experienced. Today's savannas of the Inhambane Coastal Miombo type have two signature tree species[18] – *Brachystegia spiciformis* (Msasa) and *Julbernardia globiflora* (Munondo) – but surprisingly these trees only appear in recent centuries in the pollen record. Over the last 7000 years, there have been several major ruptures in ecological continuity, times when the vegetation shifted towards denser woodland or opened into grassland, but at no time is there any suggestion of dense forest. Fires were frequent throughout. What this would have meant for human–environment interactions is a key question for the research programme.

This area of southern Africa is home to extensive tracts of species-rich savanna thought to have interacted with human communities for a long time.[19] Very little is known about when they came about, how they were formed and what events have shaped them. It's been suggested that much denser coastal forests once prevailed here – the Eastern Africa Coastal Forests Ecoregion.[20] Many botanists believe that these forests declined due to indigenous land management practices in the past. If that's the case, these areas could be excellent candidates for reafforestation. Indeed there are several community projects under way to restore forests in current savanna zones.[21] There is also growing pressure to develop massive afforestation projects in Africa to offset carbon emissions from industrialised countries.[22] However, if these areas were not dense forests in the past, or if the vegetation had a different species mix to what botanists assume is natural, then such restoration and afforestation efforts could be misguided.

Scientific misconceptions about the history of African savannas are nothing new and stem from researchers categorising landscapes as 'natural' or 'anthropogenic'.[23] Uncertainty about the past ecosystem state has potential to impact on human livelihoods. Local communities are encouraged to restore habitat and may be offered financial incentives, such as biodiversity grants or the possibility of generating income from the sale of carbon credits. These incentives are attractive, because in many communities financial and food insecurity are commonplace and opportunities for local employment are scarce. But if the desired ecosystem state is something that has never been achieved in thousands of years of environmental and cultural change, then there is a probability that restoration will fall short of its target, leaving communities financially exposed and undermining savanna biodiversity.

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18 M. Lötter et al., 'Historical vegetation map and red list of ecosystems assessment for Mozambique – Version 2.0 – Final report', 2023 (Maputo: USAID/SPEED+, AFD/FFEM), https://sibmoz.gov.mz/ecosystems/.

19 N.S. Ribeiro, P.L. Silva de Miranda and J. Timberlake, 'Biogeography and Ecology of Miombo Woodlands', in N.S. Ribeiro et al., eds., *Miombo Woodlands in a Changing Environment: Securing the Resilience and Sustainability of People and Woodlands* (Cham, Switzerland: Springer Nature, 2020), 9–53.

20 K. Mugo (ed), T*he Eastern Africa Coastal Forests Ecoregion: Strategic Framework for Conservation 2005–2025* (Nairobi: World Wide Fund for Nature, 2006).

21 This Includes one project in Chibabava in which author Simon Connor is involved as an adviser – 'Kurarama Kuthemba Muty ("Kukumuty"): Projecto comunitário de enriquecimento de Miombo e agrofloresta em Sofala, Moçambique.'

22 D.V. Schmid, 'Are Forest Carbon Projects in Africa Green but Mean? A Mixed-method Analysis', *Climate and Development*, 15, 2023, 45–59.

23 Duvall, C. 'Biocomplexity from the Ground Up: Vegetation Patterns in a West African Savanna Landscape,' *Annals of the Association of American Geographers*, 101, 2011, 497–522.

There are potential dangers in biodiversity baselines and restoration targets developed without local community input and without reference to environmental archives. Eastern Australian forests have become the stage for increasingly catastrophic fires in recent years. For years, the dominant cultural narrative was that tall, dense forests had always existed here. While that's true on one level – tall trees have existed there for thousands of years – evidence from Indigenous oral histories, historical paintings and pollen in mud tells us that many areas of dense forest had understoreys that were quite sparse in the past, kept open through the deliberate application of cultural fire.[24] Over the generations, people forgot what the forests used to look like and believed conservationists when they said fire was unnatural here. Years of fire suppression have now conspired with climate change to invite fires whose scale and ferocity was unknown in the past.[25]

This is where the translation of environmental archives into soundscapes or multi-sensory experiences could assist local communities in assessing things for themselves, based on their inter-generational knowledge of the land and allowing people of all ages, genders and abilities to participate in sensing environmental change.

Developing a bigger picture

Listening deeply to mud is one way to learn about the past, but a much richer understanding can arise by bringing together different ways of thinking and approaching environmental archives. Each one can be considered like a piece of fabric, complete and beautiful in its own right, yet also just a part of a larger patchwork of understandings that cover the whole cosmos. Past soundscapes can be brought to life with ancient words from living languages, from old songs, sonic memories of communities and rituals revived from the historical record, or from long-forgotten practices known only to archaeology.

Sonic reconstruction is quite a challenging exercise, as well-established databases of recorded soundscapes are a rarity. In addition, as certain species become extinct or rare, their sounds disappear and may be replaced by invasive species and human-made sounds. A successful reconstruction can only be achieved through the integration of multiple disciplines supported by sound technology and a strong appreciation of place.

In a quiet headland on Botany Bay, Australia, there is a colonial memorial for the first landing of Captain James Cook and his crew. A white obelisk marks a significant place in Australian colonial history as the purported birthplace of British influence on Australia. It was here in 1770 that Joseph Banks made his fame through 'discovering' plants new to European eyes. It was also where he hatched his plan for a colony on the

24 B. Gammage, *The Biggest Estate on Earth* (Melbourne: Allen and Unwin, 2011).

25 M. Mariani, S.E. Connor, M. Theuerkauf, A. Herbert, P. Kuneš, D. Bowman, M.-S. Fletcher, L. Head, A.P. Kershaw, S.G. Haberle, J. Stevenson, M. Adeleye, H. Cadd, F. Hopf and C. Briles, 'Disruption of Cultural Burning Promotes Shrub Encroachment and Unprecedented Wildfires', *Frontiers in Ecology and the Environment*, 20, 2022, 292–300.

Australian continent, a convict colony that unleashed irreparable waves of torment, violence and dispossession on Indigenous peoples. The landing place seems quietly oblivious to the roar of airplanes overhead and nearby chemical plants tainting the air with fumes.

Some years ago, it was decided to balance the site's glorification of colonialism with an evocation of what was lost. In a collaboration between artists and the local Indigenous community, the 'Landing Place' exhibition at Kurnell was created.[26] A winding dirt path takes you through vegetation much like what existed there before Captain Cook's buckled boots touched the shore. This vegetation is known from Indigenous oral histories, remnant patches of bushland and the environmental archives contained in the area's mud.[27] Audio speakers hidden in the undergrowth replay sounds you might have heard before that fateful day – sounds of everyday life, birdcalls, conversations, children singing, fires crackling, tools being made, ceremonies taking place. It makes its impression with great subtlety and emotional depth, immersing the hearer at the heart of both an ecological and cultural community. There's an inescapable quality to it, so grounding is the link between cultural memory, environmental memory and place. It's an example of how recreated soundscapes can be a powerful form of truth-telling and a statement of ownership in colonised places.

Conclusion

This essay considers what we can learn from listening or paying attention to mud, and what the environmental stories archived in mud might sound like. Like soil, mud disrupts common notions of living and non-living, biological and geological, life-giving and toxic, natural and social.[28] Unlike soil, however, mud has a capacity to flow and endlessly moulds to its surroundings. Mud finds its way into societies as the sacred (ceremonial body adornment), the profane (mudslinging, mud wrestling), the curative (mud baths) and the domestic (mud bricks). Here we probe mud's impenetrability to reveal hidden stories that blur the artificial lines drawn between human and natural history, revealing the ongoing processes of ecological and environmental change in which all of us are entwined.

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26 S. Leber and D. Chesworth, *Landing Place* (Kurnell, Sydney: sound installation, 2009). https://leberandchesworth.com/public-spaces/landing-place/

27 A.R.H. Martin, 'Kurnell Fen: an Eastern Australian Coastal Wetland, its Holocene Vegetation, Relevant to Sea-level Change and Aboriginal Land Use', *Review of Palaeobotany and Palynology,* 80, 1994, 311-332.

28 C. Granjou and G. Meulemans, 'Bringing Soils to Life in the Human and Social Sciences', *Soil Security* 10, 2023, 100082.