MACHINE LISTENING: SONIA LEBER & DAVID CHESWORTH'S ACOUSTIC TRANSDUCTIONS

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The opening sequence of Sonia Leber and David Chesworth's *Where Lakes Once Had Water* sets the scene. Two perspectives on the dry scrub and dusty earth of Lake Woods in the central desert region of the Northern Territory unfold across the two-channel video projection. One presents an aerial view filmed from a plane roughly ten thousand metres above ground where the dark line of a dry creek bed near Nitmiluk/Katherine Gorge meanders over the earth like a giant snake; the other shows Marlinja man Ray Dimakarri Dixon walking along the edge of the ancient shore at dusk incanting words addressing spirits of the land while flies buzz in the background, more audible than visible.

This structural set up underscores the non-singularity of what we are seeing: sights and sounds that cannot be reduced to a single perspective. Correspondingly, the expansive, arid, tawny-coloured earth is inhabited by multiple occupants. Lake Woods is under the custodianship of the traditional peoples of the Marlinja, Mudburra and Jingili communities, and the site has also attracted the interest of Earth scientists who periodically visit to extract sediment samples to study the long-term hydration levels of the extensive ephemeral lake, analysing the climate history embedded in its sediment. Dedicated to researching and preserving Australia's natural heritage and environment, the Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage (CABAH) has funded several such environmental science expeditions. As artists accompanying two of the expeditions, Leber and Chesworth filtered these dual relationships through the prism of their audio-visual artwork, adding another perspective on the multi-faceted land.

In *Where Lakes Once Had Water* these contrasting modes of occupation abut and overlap, suggesting a dialectic between Indigenous and scientific approaches to knowledge; parallel views figuratively embodied in the dual screen installation format. The allusion to ancient cosmogony is limned in one scene portraying Indigenous woman Auntie Susan Kingston crouching by a waterhole, speaking of Dreamtime narratives and ancestral connection to place. While the presence of Traditional Owners is a reminder of the land's ancestry, Leber and Chesworth's camera is captivated by the scientists and their meticulous actions of sediment extraction.

Scenes alternately show the digging of excavation pits, the extraction of core samples from beneath wet lakes or Alpha counters reading radiation levels. Across these varied depictions,

sound is key. The collage of sounds in *Where Lakes Once Had Water* ranges from the whinnying of black kites, the squawks of red-tailed black cockatoos and apostlebirds, the buzzing of flies and the lapping of water to the drilling, hammering and sieving of the scientists as they work. When screened at scale, the moving images in *Where Lakes Once Had Water* are grand in their immersiveness, yet it is the perpetual presence of these varied sounds—the soundscape—that provides the work's underlying drive. As artist and writer Salomé Voegelin reminds us, we are always situated within acoustic environments, continually surrounded by sound. The soundscape, she notes, can provide an alternative angle onto the landscape and produce new ideas of the world. 'Listening,' she suggests, 'allows us to focus on the invisible dynamics that are hidden beneath a visual perception and its linguistic organization.'[1]

The notion of the 'soundscape' was popularised by the Canadian composer and environmentalist R. Murray Schafer in the late 1970s in his eponymously titled text, where he defined the soundscape as any field of acoustic study but especially acoustic environments. Through the World Soundscape Project, Schafer advised acoustic analysts to discover the significant features of any soundscape through what he termed its component parts: *keynotes*, *signals* and *soundmarks*. He defined these as, respectively, underlying ubiquitous sounds, consciously listened to foreground sounds and sounds produced from landmarks themselves. This stratified sound typology characterised all environments, natural and human-made, formed by idiosyncrasies in geography, climate, wind energy, flora and fauna, as well as patterns of industry and urbanisation. But for Schafer, natural environments were privileged terrain offering more aesthetically complex acoustic fields than their post-industrial counterparts, coaxing attuned forms of listening.

In a separate lineage, mid twentieth century experimental composers such as David Tudor and David Dunn sought to simulate and extrapolate natural acoustic environments. Using electronics, they produced compositions that mimicked rainforest sounds, such as Tudor's *Rainforest* (1968), or used sine-wave oscillators to generate sounds analogous to the exploration of physical terrain, such as Dunn's *Pleroma* series (1999–2000). Other composers like Max Neuhaus expanded the very notion of sonic agency, as in his work *Fan Music* (1967) where photovoltaic

1. Salomé Voegelin, *Sonic Possible Worlds: Hearing the Continuum of Sound* (London: Bloomsbury Academic, 2014), 10.

cells and fan blades installed on the rooftops of the Bowery in New York City activated loudspeakers in response to the fluctuating atmospheric conditions of light, humidity and temperature.

Where Lakes Once Had Water captures a field of acoustic biodiversity in Australia's central desert region: raptor vocalisations, reeds lapping in shallow water, burning bushland. But the focus is also on sounds that exist beyond the range of unassisted human hearing.

In one sequence, a termite mound is shown affixed with contact microphones and a subsequent frame depicts a hand slowly dragging a microphone across its undulating surface. Another frame shows the microphone trailing the edge of an excavation pit. These acts render the inaudible into sound, translating the craggy surfaces into high-pitched scratchy frequencies or bouncing low-pitched tones.

Yet in spite of the natural locale, mechanical sounds dominate the soundtrack, producing a polyphony of sonic textures. A metronome held against the lake's edge ticks its regular beat. A vehicle engine roars into gear. A single-grain luminescence reader emits a tapping code as each grain of quartz is delicately placed into a tiny metal grid. The hydraulic jackhammers of a coring rig groan and grind as they descend into the lakebed. The sound of a cranking winch meets the sound of threshing sediment, glazed by the sound of wind whipping a tarp. Overlaid across these different audio-visual segments is a series of buzzing frequencies and metallic tones, interacting with the heterogeneous sonic world that Leber and Chesworth's recording devices unearth. However, these rich sonic textures are not unadulterated, objective sounds—if such a even thing exists.

As Voegelin notes, sounds need to be heard in the complexity of their circumstances in order for us to understand how they themselves participate in the construction of an overall reality. Voegelin encourages us to 'listen to the soundscape not as a medium but as a material reality, to hear below the surface of the visible other possibilities of what could be actual.'[2] Voegelin's urge to listen to the acoustic environment not only as an aesthetically transportive mode but also as a means of deciphering how the world is constructed is analogous to a scientific undertaking.

Scientific research is commonly understood as objective and evidence-based, with verifiable methodological

2. Voegelin, *Sonic Possible Worlds*, 11–12.

tools of data sampling and analysis. But how objective is science? Through what processes does nature become scientific? These were questions posed by the philosopher Bruno Latour when he accompanied a botanist, a geographer and a pedologist on a soil science expedition to Boa Vista in the Amazon rainforest in the late 1990s. Paying close attention to the data sampling techniques employed by each Earth scientist, Latour witnessed at close hand the way in which the material fecundity of the forest was distilled into representative specimens of soil and leaves, and linked by coordinates mapped onto diagrams. Once relocated from their natural environment to the laboratory or archive room, the samples were evacuated of their local context, reclassified as data and transformed into combinable signs.

At each stage of relocation from the forest site to the scientific report, the dimensions of locality, materiality and multiplicity were lost. At the same time, each stage also led to an increase in calculation and extrapolation. In other words, losses through successive material reductions led to gains in scientific knowledge. Latour pithily summarised this mode of scientific procedure, this transposition from location to analysable sample, as a trajectory 'from a clump of earth to a sign.'[3] It was a procedure that made him declare: 'What a transformation, what a movement, what a deformation, what an invention, what a discovery!'[4]

The CABAH research extracting core samples from Lake Woods and analysing vegetation and fire cycles at Girraween Lagoon to form longitudinal studies of the territories' long-term climate history forms a project equivalent to Latour's case study. Alongside the CABAH scientists' extraction of earth samples, Leber and Chesworth gather a correlative yield of acoustic ecological samples. Through the technology of recording machines, the artists capture not only the sounds of native birdlife and insects but also—as a microphone is dragged across a termite mound or excavation pit—the very contours of the earth itself. Yet a key distinction remains. While the scientists focus their excavation on sediment samples (metres-deep core samples or tiny grains of pollen), Leber and Chesworth's acoustic samples not only document the environmental site but, with a focus on coring rigs and laboratory equipment, they also make

3. Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge and London: Harvard University Press, 1999), 51.
4. Ibid.

audible the very discipline of Earth science itself, offering a sonic montage of science at work.

Furthermore, these acoustic samples participate in the exact process of construction that Latour refers to and Voegelin hints at, whereby the reality of the world is actualised. For it's important to remember that these acoustic samples are not raw specimens but acoustic *effects* produced through skilful processes of extraction and transposition.

Latour understood that fundamental to the transformation of a specific environmental site's ecological complexity into the standardised language of scientific data is the process of transposition; a kind of relay across sign systems and discourses. Scientific practice turns matter into abstract knowledge precisely through this regulated series of transmutations, as progressive shifts across material and epistemological modalities of specimen, map, diagram, analysis and report. It was this that Latour termed science's 'circulating reference'.

But this process of successive transmutation enacts another parallel—with the acoustic phenomena of transduction. In broad terms, transduction denotes the process of converting energy from one form into another. The term derives from the Latin *transducere*: 'to lead across, transfer' (from *trans*: 'across, beyond' and *ducere*: 'to lead'). In cultural anthropologist Stefan Helmreich's analysis, acoustic transduction typically transmits energy across media—from antennas to receivers, from amplifiers to the human ear. Phenomena such as electromagnetic waves cannot be heard by the human ear alone but require a transducer to transform the frequencies into sound. 'A loudspeaker is a transducer. A microphone is a transducer. A telephone is a transducer.'[5] These electro-mechanical devices are sonic receivers and so, concomitantly, audio-visual recording devices can be loosely understood as modes of machine listening. However, these devices do not simply record neutrally—they also alter the nature of the signals they receive through processes of transduction. Directed towards the alternately arid and wet environments of Lake Woods and Girraween Lagoon, Leber and Chesworth's listening machines reconstitute these vistas into new audio-visual forms that 'lead across', transferring us to new virtual locales.

5. Stefan Helmreich, 'Transduction' in *Keywords in Sound*, eds. David Novak and Matt Sakakeeny (Durham and London: Duke University Press, 2015), 222.

Late twentieth century experimental composers such as Alvin Lucier and Christina Kubisch pioneered forms of acoustic transduction, using technology to expand the spectrum of perceptible sound. Lucier's *Music on a Long Thin Wire* (1977) attached electrified piano wire and a magnet to an amplifier connected to a sine wave oscillator, converting magnetic signals into eerily atmospheric stereo sounds. Kubisch's exploration into electromagnetic induction also began in the late 1970s, and by 2004 she developed the first of her *Electrical Walks* (2004–17), using wireless headphone transducers to convert the electromagnetic fields in urban environments—emanating from hotspots such as automatic tellers, neon lighting and wireless communication—into audible phenomena.

Emphasising the move across technical apparatuses, Helmreich underscores the way transduction operates through modulating inputs and outputs, forming chains across media. This transversal process draws a coincidental parallel with Latour's summary of science as a series of moves from the material to the discursive. Both acoustic transduction and scientific method, it seems, are processes of transposition.

But transduction operates on a further level within *Where Lakes Once Had Water*, in a manner that pulls the work out of a direct affiliation with these precedents. Floating across the panoramic visual footage and variegated diegetic sounds is an acousmatic voice. Invisible and unsourced but insistently present, this voice is post-human and artificial, even as it evokes traces of the human. It is an omnipresent consciousness offering a meta-narrative on what is seen and heard; remote yet proximate. 'There they are, finding locations' it intones, as if watching and listening from an elevated perspective, like a bird, an insect or a spirit. 'Digging. Measuring. Uncover the layer.'

The voice also registers duration, identifying the land's alternating patterns of moisture and aridity: at nine thousand years announcing, 'here, it's wet'; at one hundred and forty thousand years, 'a long dry cycle.' If the true definition of machine listening denotes a class of applied artificial intelligence capable of rendering audio intelligible to machines, then the disembodied voice in *Where Lakes Once Had Water* personifies machine listening. But it goes a step further in its capacity to see through time. Akin to the voice-recognition algorithms of personal assistants, such as Apple's Siri and Amazon's Alexa, *Where Lakes Once Had Water*'s acousmatic entity appears

correspondently birthed from signal processing, auditory modelling and pattern recognition.

While machine listening implies ubiquitous surveillant potential, Leber and Chesworth's speculative entity ultimately seems less sinister. Intoning its meta-commentary in disembodied space, this post-human voice acknowledges the layered processes of environmental shaping, attuned to the transmissions of energy across media. Indeed, it appears as a vocalisation of the very process of transduction itself. After the last images of *Where Lakes Once Had Water* fade to black, only sounds remain; flickering, tapping and ticking—sonic conversions from a space beyond.

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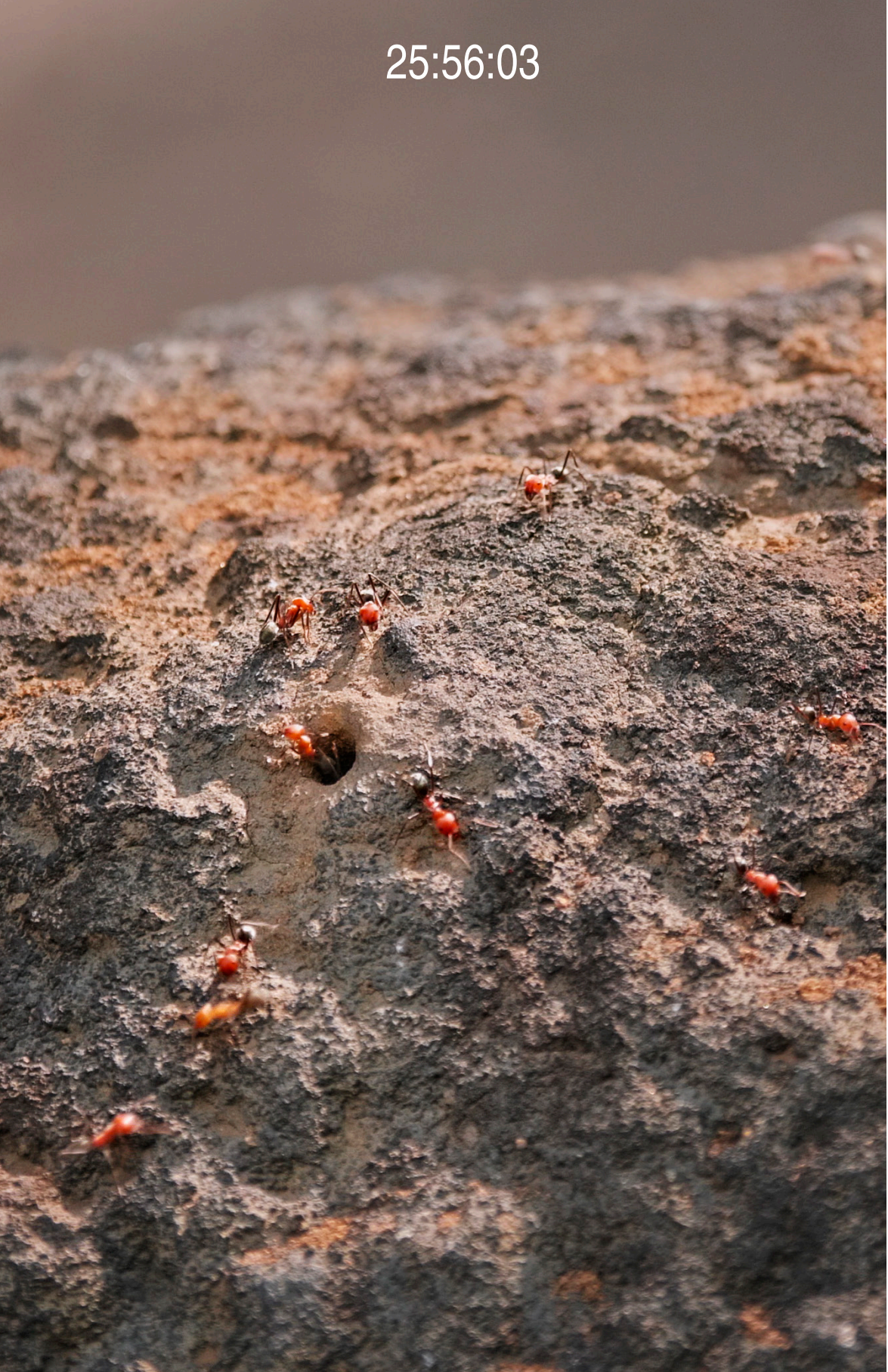
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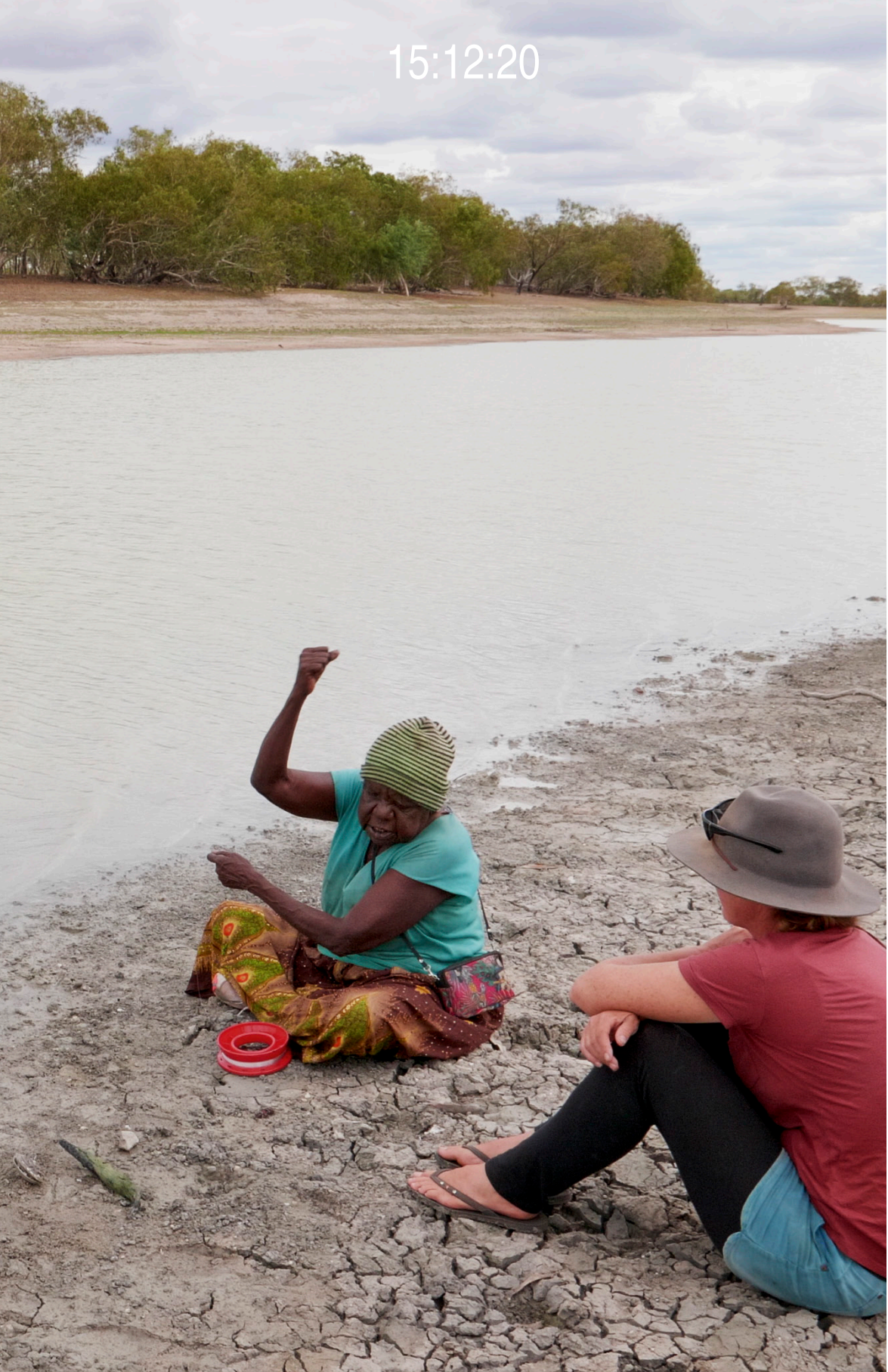
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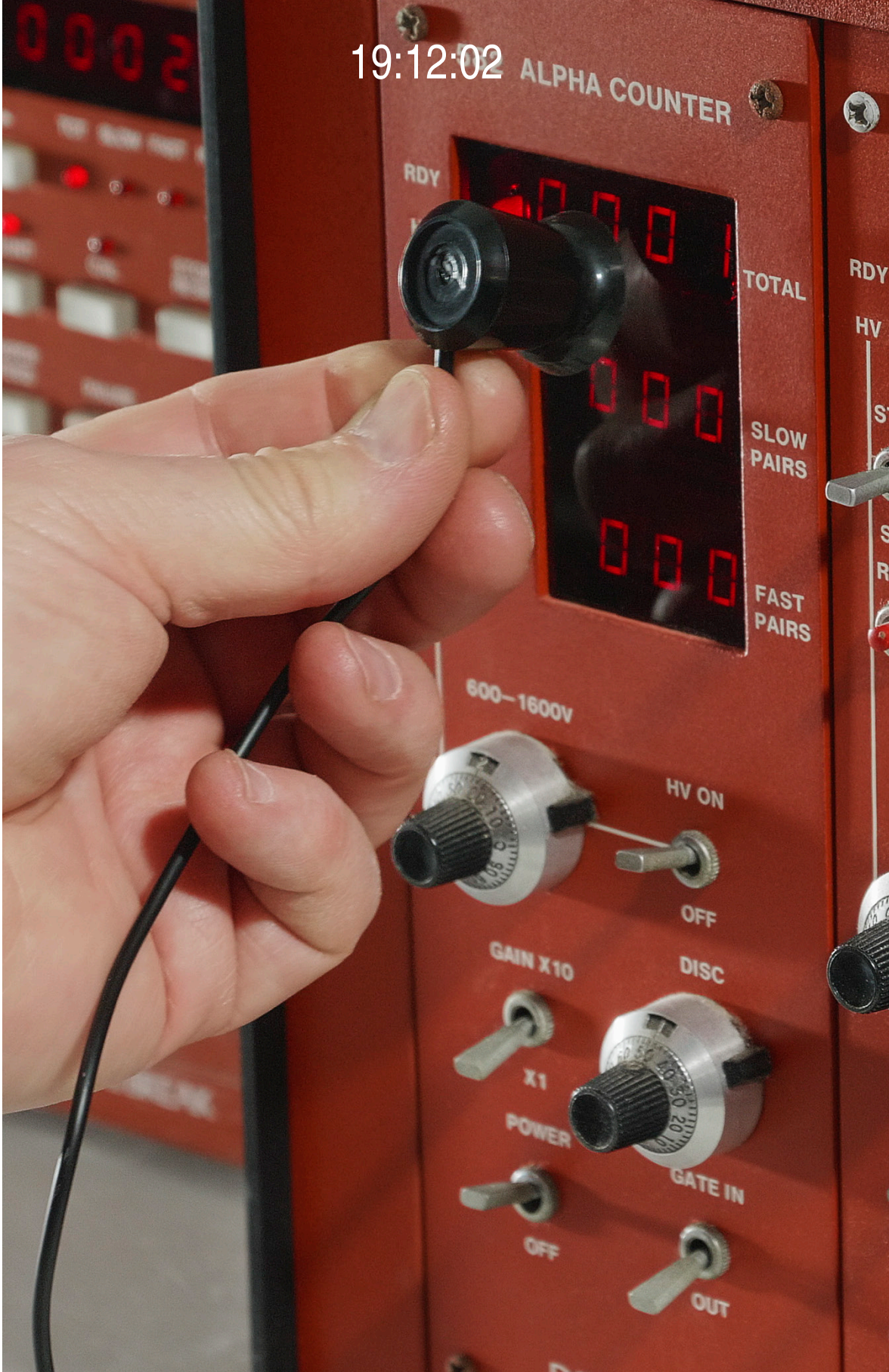
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