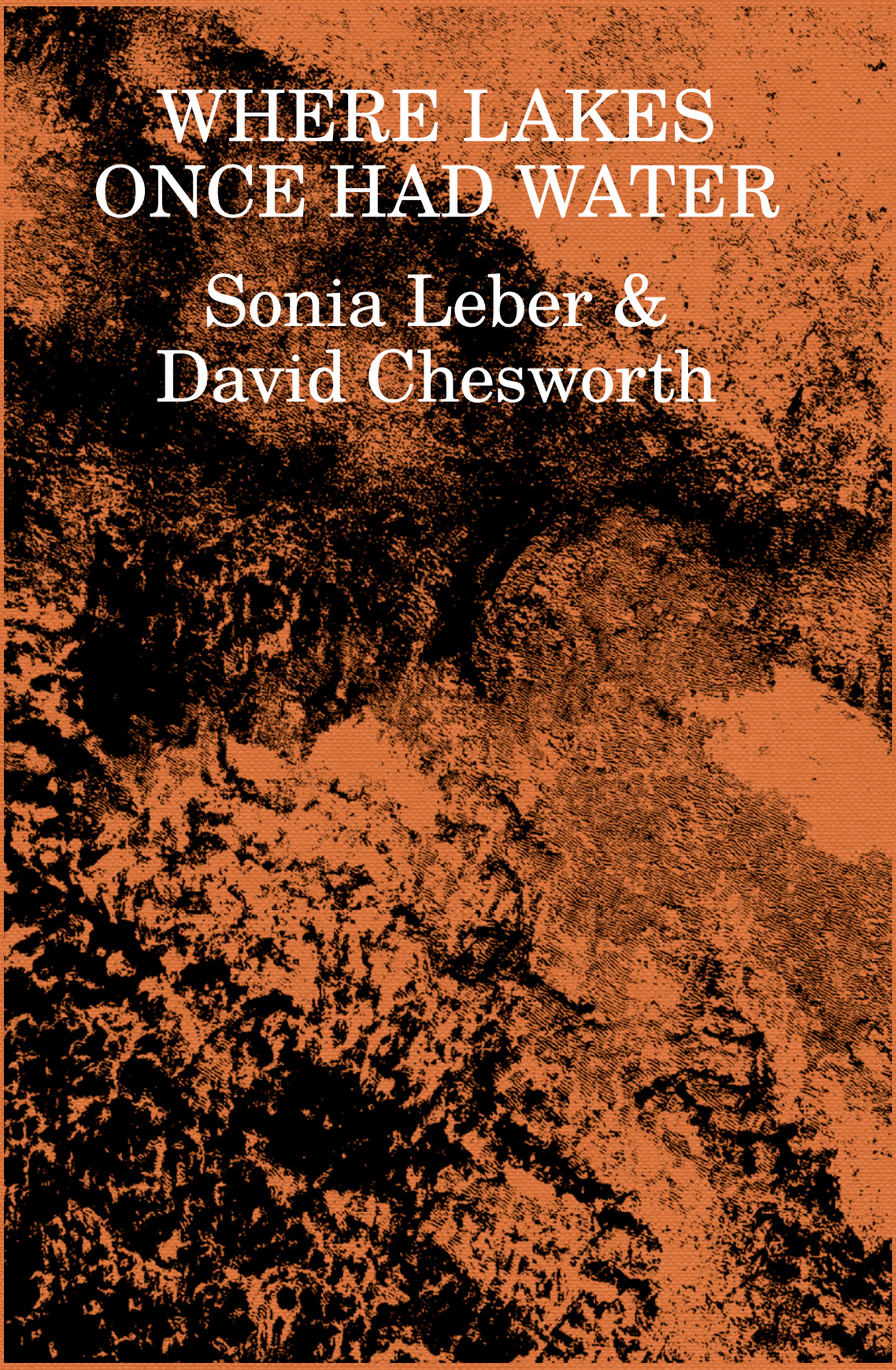
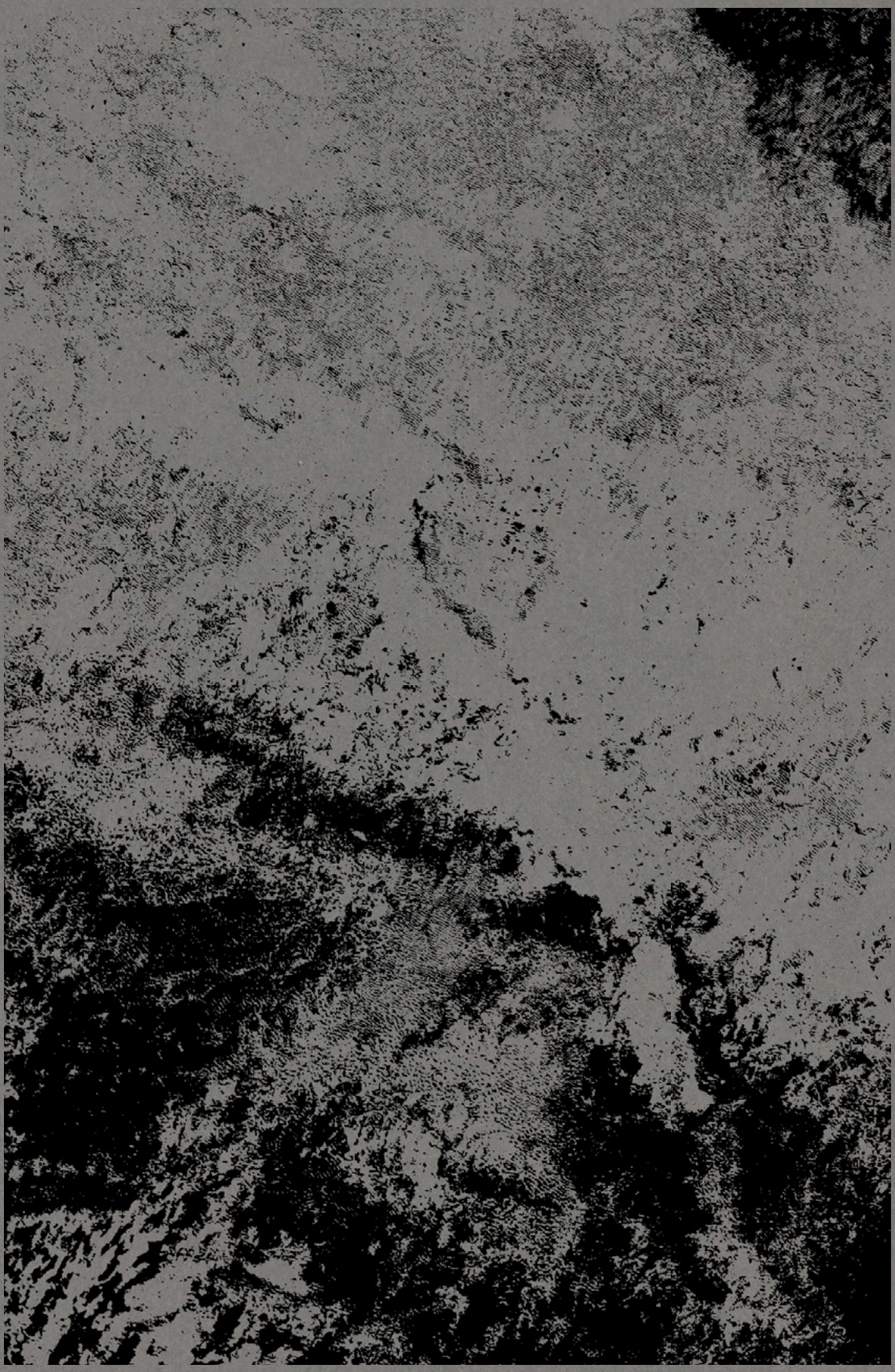
WHERE LAKES ONCE HAD WATER

Sonia Leber &
David Chesworth





Bundanon Trust acknowledges the Wodi Wodi people, the Traditional Owners of the sovereign land and waters upon which the Bundanon, Riversdale and Eearie Park properties are located. They share the Dhurawal language with the Yuin of the South Coast.

Where Lakes Once Had Water was filmed on the lands of the Mudburra, Marlinja, Jingili, Elliot, Jawoyn and Larrakia communities in the Northern Territory, Australia. We acknowledge Aboriginal and Torres Strait Islander people as the owners of the land on which we work, and pay respects to Elders past, present and emerging.

WHERE LAKES ONCE HAD WATER

Sonia Leber & David Chesworth

Bundanon Trust


00:57:03
We want to do the
right thing by you Spirits …


01:09:07


01:24:18
we have scientists working
here on Country …


01:25:00


00:16:15
we want you Spirits to
please stay here …


00:15:19

WHERE LAKES ONCE HAD WATER

Sonia Leber &
David Chesworth

Sonia Leber & David Chesworth: Where Lakes Once Had Water was commissioned as part of the Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage (CABAH) in association with Bundanon Trust. It is the first of four art commissions initiated in 2018 by CABAH's Education and Engagement program that aims to engage artists with a scientific strand of CABAH's research to make new works that respond to, question and interpret the research for broader audiences.

The artwork and scientific research featured in this publication have been supported by the Australian Government through the Australian Research Council *Centres of Excellence* funding scheme (project number CE170100015). The views expressed herein are those of the artists and authors, and are not necessarily those of the Australian Government or Australian Research Council.

Australian Government
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ENDMATTER

FOREWORD

Artists and scientists both recognise the value of experimentation. It is through their mutual practices of looking, testing, and looking again, that revelations emerge. While the methods and language of their research may differ, and their reading of outcomes diverge, it is their commitment to the investigative process that brings them together. Historically, the two strands of activity were integrated and it is only in more recent centuries, as the academy has evolved, that we understand their tasks in the world differently.

Where Lakes Once Had Water began with an invitation to two collaborating artists to join Earth scientists on various field trips. The resulting exchange of ideas between artists and scientists has found its place within the larger framework of the Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage (CABAH), which aims to map 'epic Australia' and reveal its hidden histories.

Sonia Leber and David Chesworth are alert and resilient artists, as excited to work in the middle of a desert as in an industrial wasteland. With heightened curiosity about the world as it doesn't always seem at first glance, they take us on a journey that is never linear and always full of the wonder that is hiding in plain sight. Their glorious videography and sound compositions capture the details of creatures and objects with acute veracity—things that listen and murmur, that issue a response not immediately audible or visible to the naked eye but revealed through the artists' lens and recordings.

The work of scientists Tim Cohen, Cassandra Rowe and their colleagues is transformed by this video and sound installation into a fascinating and seemingly endless journey of discovery. As they measure Earth's processes over cycles of deep time, we witness complex knowledge systems—Indigenous cosmology and the arcane world of scientific classification—and see the outcome of the fieldwork transformed into meaning in the space of the laboratory. It is revelatory and awe-inspiring.

Bundanon Trust embraces both empirical and imaginative research—science and art—recognising that they each enrich our appreciation of the world around us and, when brought together, can accelerate our understanding of our place in that world. For over a decade, Bundanon has worked closely with

the University of Wollongong, its students and faculty members in the delivery of many projects across a range of science and art disciplines. Working with CABAH is an extension of that relationship, and *Where Lakes Once Had Water* is the inaugural artist commission arising from Bundanon's role as CABAH's art adviser and cultural partner.

We acknowledge the huge commitment of the artists Sonia Leber and David Chesworth to the creation of the artwork, and their contributions to this publication. We are very grateful to Richard 'Bert' Roberts, Amanda Lawson and the CABAH Education and Engagement team for their vision, support and enthusiasm for artist projects within CABAH, and to Tim Cohen and Cassandra Rowe for collaborating with the artists in the field. We are grateful to the Gordon Darling Foundation whose generosity enabled the production of this accompanying publication, and we thank contributing authors Tim Flannery, Fiona Gruber and Sophie Knezic for their insightful essays. We also acknowledge the artists and Michael-Shawn Fletcher for their thought-provoking conversation contained within these pages.

Deborah Ely AM
Chief Executive Officer
Bundanon Trust

INTRODUCTION

Our understanding of the world around us—and worlds long gone—is limited only by our imaginations. As theoretical physicist Albert Einstein remarked in 1929: ‘I am enough of the artist to draw freely upon my imagination. Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.’ Sonia Leber and David Chesworth unleash this spirit of imagination in *Where Lakes Once Had Water*, refracting the work of Earth scientists on the human and environmental deep time history of Australia through the artists’ lens.

The Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage (CABAH) was formed in 2017 to illuminate the hidden chapters in Australia’s epic story, stretching back from one hundred and thirty thousand years ago until the time of European arrival. This period witnessed some of the most momentous events in the history of the continent, including the waxing and waning of the last Ice Age, the demise of Australia’s giant animals and the settlement of Earth’s driest inhabited continent by Aboriginal and Torres Strait Islander peoples.

CABAH brings together a team of leading researchers, educators and communicators in the Earth and biological sciences, archaeology and Indigenous studies, based at universities, museums and other organisations across Australia and internationally. Working in partnership with Indigenous communities, CABAH’s mission is to transform our understanding of the unique cultural and natural history of Australia, and to help inform the management of our present and future biodiversity and cultural heritage.

We at CABAH are also engaging with the public across a myriad of platforms—such as this original artwork—to share new understandings of Australia’s epic journey through time in ways that respect Indigenous culture and knowledge, and capture the spirit of this interdisciplinary endeavour. Indeed, Leber and Chesworth’s *Where Lakes Once Had Water* is the first of four artist commissions for the CABAH Art Series, a key initiative within our Education and Engagement program. Through the Art Series, artists are engaged to interact—in the field or in the laboratory—with a scientific strand of CABAH’s research to create new works that respond to, question and interpret the research for public audiences.

Where Lakes Once Had Water transports us to the Northern Territory, weaving the sights and sounds of those uncovering the traces of these desert and tropical landscapes to offer a fresh perspective on Australia’s environmental past. We are taken on a sensory voyage of exploration and discovery with Indigenous custodians and CABAH researchers, searching for vestiges of the successive episodes of wetting and drying recorded in lake sediments—the boom-bust cycle of floods and droughts that defines the environmental character of this continent.

The core theme of this artwork—how we come to understand the environment, its stasis and change—is as old as time itself. Time is also one of the central elements, shifting between the organic and inorganic realms: from carbon—the fundamental building block of all life on Earth and the basis of radiocarbon dating—to quartz, a mineral used to tell when the sand grains that blanket Australia were last transported by wind and water.

Where Lakes Once Had Water traverses a huge sweep of time and spatial scales, from tiny individual pollen grains to the vast expanse of entire landscapes. In doing so, it invites us to imagine a bygone Australia, a land sprinkled with the lakes and waterways that sustained thriving populations of Aboriginal and Torres Strait Islander peoples connected intimately to the wonders of the world around them.

CABAH is grateful to the many individuals and communities on whose lands our research teams work and this artwork was filmed—the Mudburra, Marlinja, Jingili, Elliot, Jawoyn and Larrakia peoples in Australia’s Northern Territory. We especially thank Ray Dimakarri Dixon and Eleanor Dixon of the Marlinja community, Auntie Susan Kingston and Claudette Albert of the Elliot community, the Jawoyn Association Aboriginal Corporation Rangers and the Larrakia Rangers.

Richard ‘Bert’ Roberts
Director
CABAH

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

Sophie Knezic

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.

Sophie Knezic is a writer, scholar and visual artist who works between practice and theory. Her inter-disciplinary research is conducted across art history, visual culture, literary fiction and science fiction, with a particular focus on art theory and Continental philosophy. Sophie's current research concerns the moving image, sound art and humour in contemporary art. Her critical writing has been published in *Frieze*, *Broadsheet Journal*, *Art + Australia* and other prominent journals and magazines. Sophie is a Lecturer (Sessional) in Critical and Theoretical Studies, VCA and MCM, University of Melbourne.


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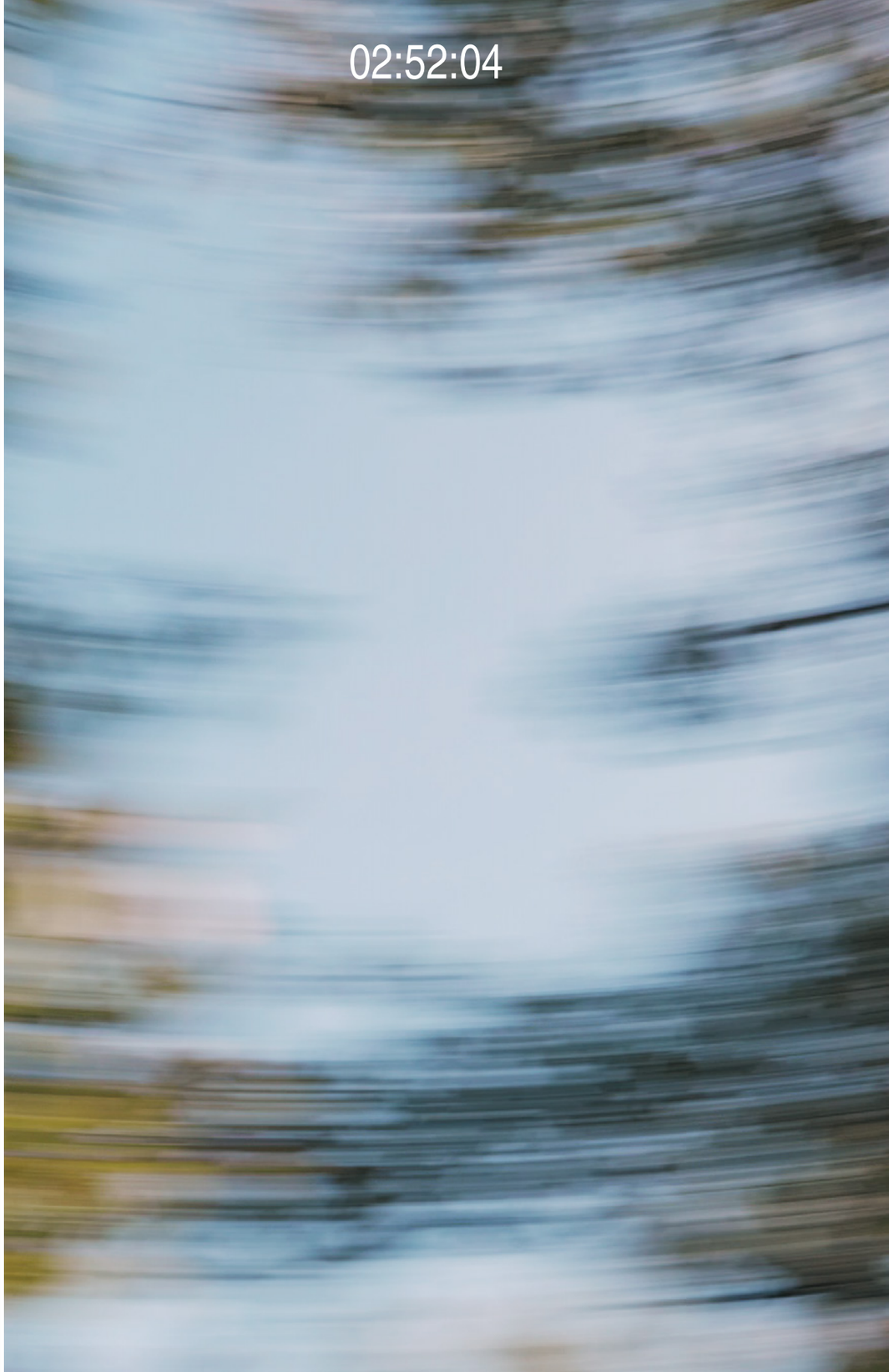
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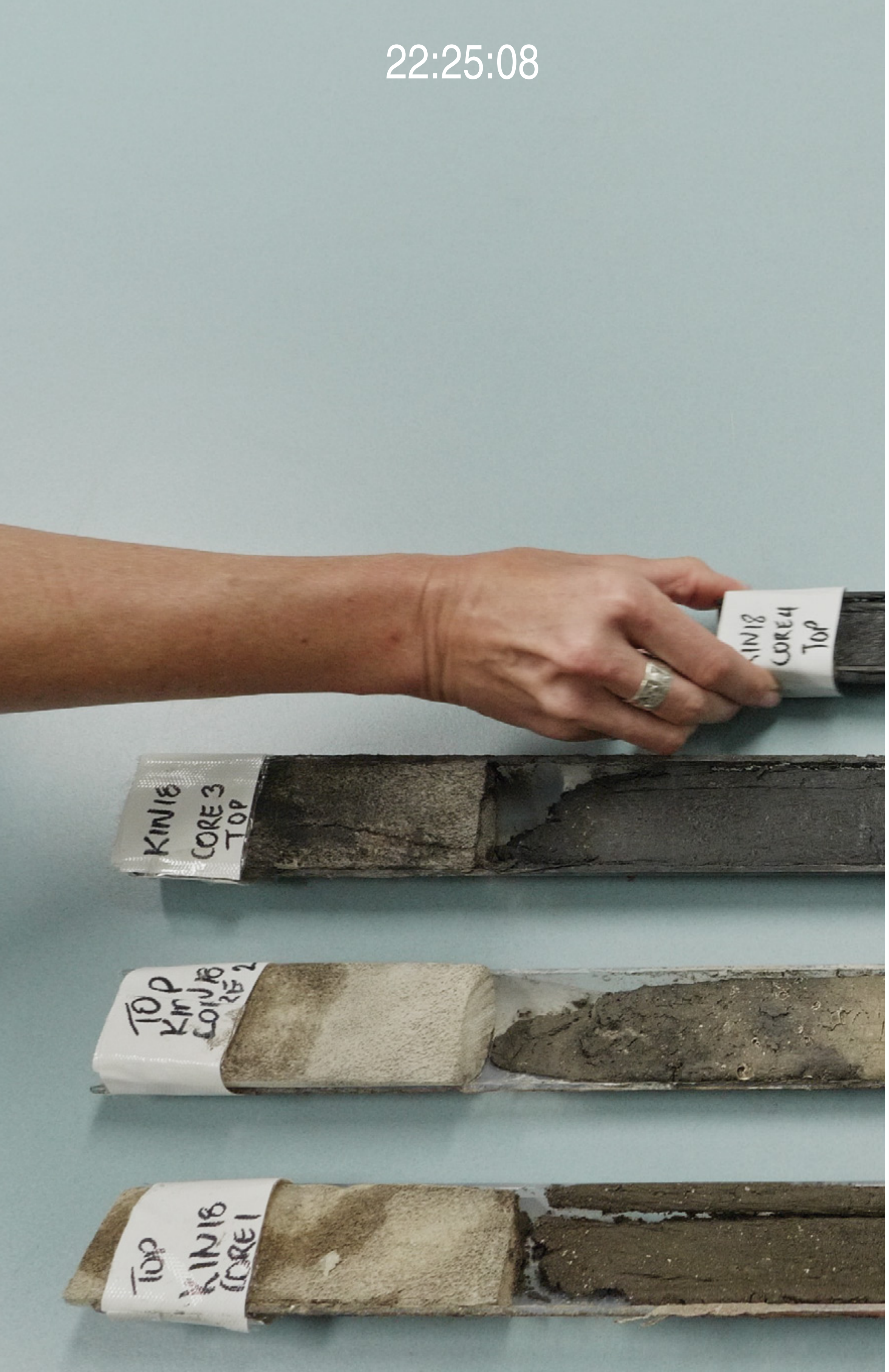
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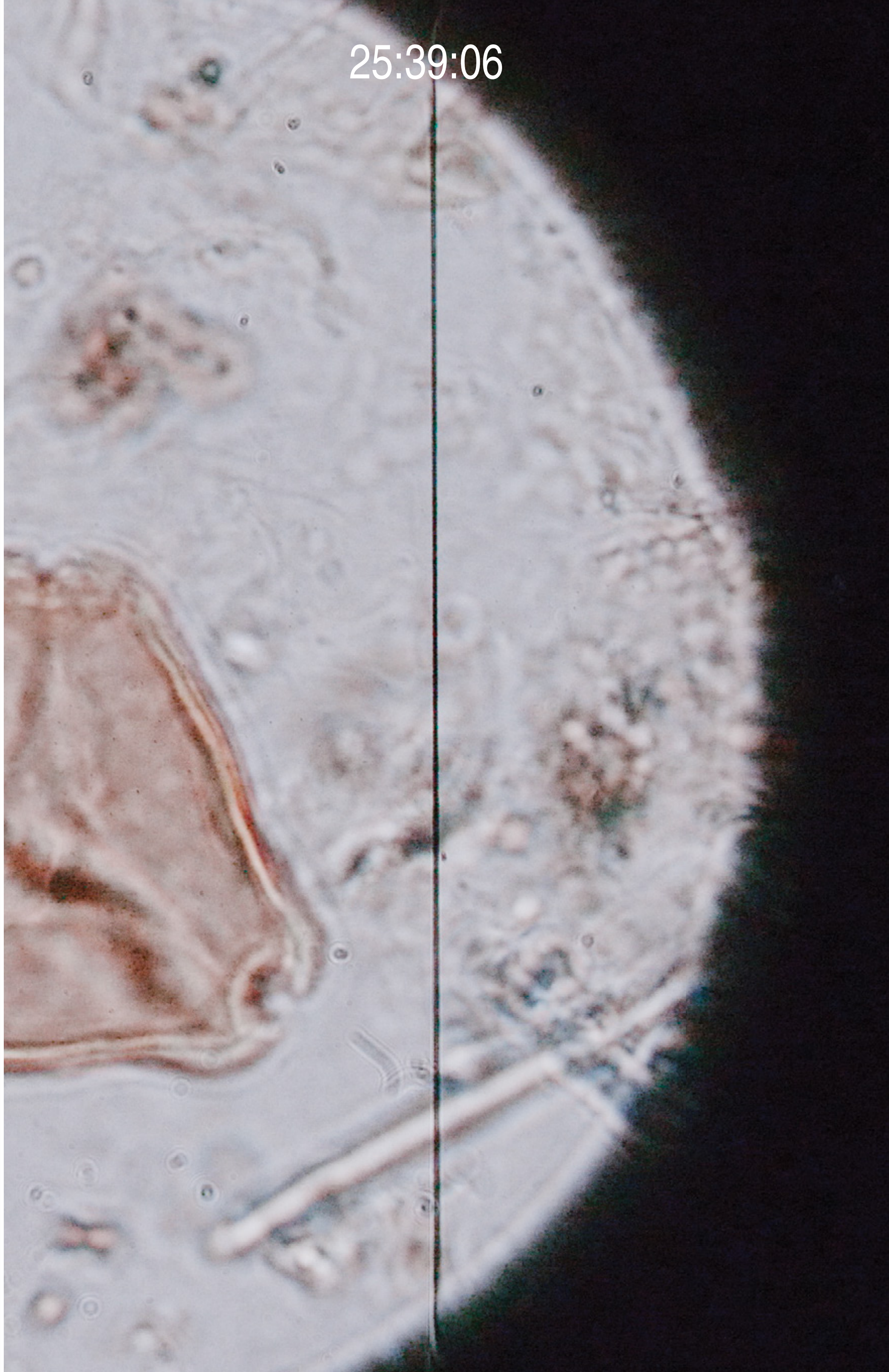
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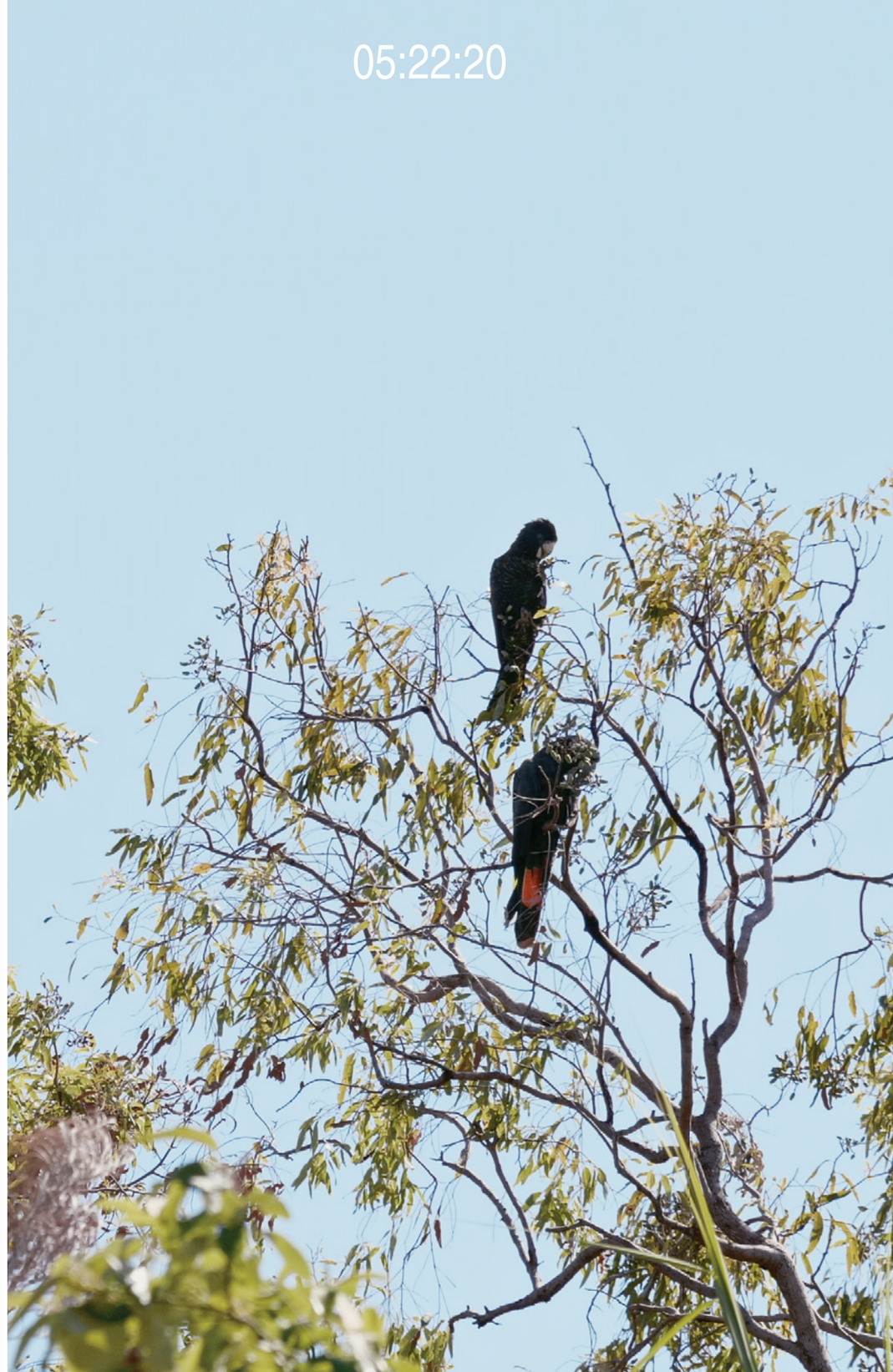
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ESSAY NO. 2

NOTES FROM THE FIELD

Fiona Gruber

Fiona Gruber follows Sonia Leber and David Chesworth on a journey of deep time investigation.

As they drive south from Darwin, geomorphologist Tim Cohen tells Sonia and David various facts. That the landscape they're looking at is much the same as it would have been one hundred and thirty thousand years ago. That, long before humans arrived over sixty-five thousand years ago, the continent's mountains were already worn down and much of the ancient soils were leached and parched. And that today these rocks and hills erode at a rate of one millimetre per thousand years, one of the slowest rates in the world.

Tim is the Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage (CABAH) Climate Theme Leader. Researching deep time climate cycles can take you to some harsh environments.

The bitumen flies past at 140 kilometres per hour. It's a seven-hour journey, and the view grows increasingly arid. Tim explains that in the last Ice Age, during the glacial maximum about twenty thousand years ago, the mainland climate grew colder and drier and Australia was covered in giant sand dunes. The seas were 125 metres lower than today but, unlike in other parts of the world, there was never glaciation to shape the valleys and grind the rocks.

And that, because our soil is so inert, the single greatest source of erosion is ants and termites.

The trees are really spindly now and the earth more parched. Black kites patrol the sky.

Lake Woods, their destination, is 660 kilometres inland, near the small settlement of Elliot. But this isn't a lake in the conventional sense of the word.

Screen One: An ancient escarpment thinly covered in sclerotic trees.
Screen Two: Fissures in the rock. A voice tells us: '*The sediment is waiting*.'

Sometimes the two screens are in dialogue; sometimes they juxtapose disjunctions or uncanny connections.

Tim is researching the deep past of an ephemeral wetland with plenty of backstory. Lake Woods is a freshwater terminal system of Newcastle Waters Creek, with a long history of cyclical, hydraulic changes reaching back to the Pleistocene epoch, 2,580,000 to 11,700 years ago. Today its size rarely exceeds 500 square kilometres, but at various stages in the past it has been much bigger, a mega lake ten times as large. Even recently, in 1974, a spectacular rainy season filled the lake to 2,392 square kilometres.

But now it's dry. Bone dry.

Screen One: Red-tailed black cockatoos watch from the treetops.
Screen Two: Scientists, like industrious ants, excavate the soil of an ancient shoreline.

Both birds and diggers are listening, both are gathering information. Not all viewpoints are human, suggests the artwork. Humans may not be the top of the hierarchy. There may not be a hierarchy.

The dryness is par for the course, explains Tim. There are very few permanent lakes in Australia; the rate of evaporation is usually higher than the rainfall, which is seasonal. At Lake Woods the rate is five parts evaporation to one part rainfall.

For many months of the year, or for years at a stretch, lakes are basins waiting to be filled.

The first thing Sonia and David notice is the unceasing aridity. It's something you feel on the skin, it's a lack of moisture that irritates the eyes and it's accompanied by the continuous presence of flies that drone in your ears, crawl up your nose, stick to your back.

But despite the dryness this is a place teeming with certain lifeforms. Plants push through the cracks, birds perch on dead tree branches, lizards flick among the rocks, those ants and termites move mountains.

Screen One: An aerial shot reveals scars on the earth's surface; these swirls and snaking incisions are environmental hieroglyphs. They are not dissimilar to a sand painting.
Screen Two: In the middle distance a man on a path, intoning. He is exhorting the spirits to keep faith with the land.

Different scales in time and in distance.

Marlinja man Ray Dimakarri Dixon walks among the desiccated trees. 'We have scientists working here on Country,' he tells the spirits. 'We want you spirits to stay and look after Country.'

He approaches one of the core sample pits, an incongruous rectangle in a land where everything curves.

Ray shows Sonia and David his Country. He's an artist himself, a creator of sand paintings and songs—he brought out a CD in 2019—songs about protecting this sacred place.

Nayinyi kirda
Nyaunya kirda
Bali kurdij kayna
Bali kurdij yangala
Nginyaka ngurra …

My father your mother
My ancestors your ancestors
They have stood together
As one for their land …[1]

The land is not timeless. Cattle hooves churn its fossil soils. Commercial fracking explorations could disturb the precious aquifers. Climate change affects rainfall and salinity.

'Sense the signal.'

The disembodied and ambiguous voice urges us to both feel and to investigate, and to imbue investigation with feeling. What is this voice? It observes, it exhorts, but it doesn't explain. Is it even human? It's a provocation.

The metallic clicks and whining hums could be the machine talking to the earth, the dreams of ants, the chinking cadence of the coring tube being hammered through the red soil.

It's about sensing the world in a non-human way.

If you are human, how you read signs depends on your cultural framework, and what you're looking for. For Tim and his team, it's evidence of ancient climate changes that will inform the present and future.

For Ray and other Indigenous Traditional Owners, the land tells the story of a creation that is still going on and supports a community that has been here, as far as they are concerned, forever.

For Sonia and David, this is a story about the human desire to understand the world, to go into the environment, to experience it, to get to know it through various means. They are part of the story, as with all their work. It's participant observation, one where you land lightly, with a

1. Ray Dimakarri Dixon, 'Barlawa Kurdij Karrdi' in *Standing Strong: Mudburra Man* (CD: Finucane & Smith, 2019).

camera, some sound equipment and a couple of laptops. Modern tools for an ancient story.

Screen One: The stone-cutting tool, known as a Leilira blade, lies on the quarry floor. Local woman Claudette Albert indicates other blades, scraping tools, grinding stones and offcuts, which litter the ground.

'Quarry, tools, resources,' intones the voice.

For Claudette and her community, this has been a hardware store going back thousands of years. How old are they? So hard to say when they litter the surface. And as Tim observes, the termites and ants mess up the strata. It's a problem as much for archaeologists as it is for those Earth scientists trying to establish the far greater cycles of wet and dry.

'Digging. Measuring. Uncover the layer.'

Further north, CABAH's scientists take horizontal cores from the towering banks of Nitmiluk, also known as Katherine Gorge.

This river system has its headwaters in the Arnhem Land Plateau, and the 15-kilometre-long gorge is a corridor of glowing red sandstone with walls 60 to 90 metres high.

Here, scientists can measure both palaeohydrological events and the impact of an annual monsoon cycle that lifts the water levels by 18 metres and turns the river into a roaring torrent.

But now it's the dry season and the river is placid.

Screen One: The towering walls of the gorge. Vision is in dialogue with sound. The rocks fizz, there's an electromagnetic hum, a deep pulse. This is a landscape used to drama.

'There they are. Finding locations.'

Finding locations is the hardest part. The ancient soils, the monsoonal north, the evaporation; finding a location with continuous sediment record of climate and environment going back thousands of years is laborious and usually disappointing.

It took two full field seasons in the Northern Territory for CABAH Landscapes Theme Leader Michael Bird to find the Girraween Lagoon. And in the end fieldwork didn't come into it; a friend, flying into Darwin, spotted it from the air—a former sinkhole that had formed about two hundred thousand years ago and filled with water. An expanse of water 1.5 kilometres across, with layers of sediment going down 18 metres from the bed of the lake. 'That's the height of a six-storey building,' says Michael, 'preserved and ready to be analysed.'

Screen One: A microphone slips through the surface of the lagoon.
Screen Two: A closeup of lily pads and reeds.

The sounds of water are soothing, hopeful. There are many ways of listening, both with technology and with an open mind, the work suggests.

Placid nature turns to human activity. We see a raft assembled in the middle of the blue expanse. Winches, ropes, metal tubes.

Larrakia Ranger Kyle Hunt-Lew Fatt is part of the team assembling the coring mechanism. He grew up in Darwin divorced from traditional lore and customs and joined the Rangers in an attempt to learn about his Country.

'Bush tucker, native animals, native plants, the shoreline. It feels good looking after the country,' he explains. The Rangers conduct

scientific surveys, rid the land of introduced weeds, manage the savannah. He's learning about the traditional Gulumoerrgin (Larrakia) calendar, divided into seven seasons that respond to changes in the weather and plant and animal activity. This traditional cycle is helpful, too, in the analysis of sediment.

Girraween Lagoon is on Larrakia land but it's been part of the European pastoral landscape for decades and Indigenous associations have been erased. The terrain hasn't yielded any archaeological finds yet, though this must have been a highly significant spot for food and for materials to weave baskets and make shelters. A sacred spot, too.

Does deep time ecology evoke awe akin to religiosity? Sonia and David's work frequently hints at the metaphysical.

Today, the lagoon is a place of quotidian adventures, an attraction for weekend fishermen and boaters and, more recently, real estate developers. Its biggest claim to fame is as one of the locations for the 1986 film *Crocodile Dundee*.

Michael points out that in the past thirty years the lagoon has seen far greater change than in the previous two hundred thousand combined.

Screen One: A scientist leans over a microscope examining a core sample.
Screen Two: A heron stretches its elegant neck to inspect the water's edge.

Both investigating.

Cassandra (Cassie) Rowe is a palaeoecologist, specialising in using pollen and charcoal to reconstruct past environments. Her field

notes list the trees and plants found in the woods and grasslands surrounding the lagoon: *Eucalyptus tetradonta, Eucalyptus miniata, Erythrophleum chlorostachys, Melaleuca symphyocarpa, Pandanus spiralis, Banksia dentate, Nymphaea.*

Over the past two hundred thousand years the area has cycled through woodland, grassland and forest, depending on rainfall. Much the same flora, in different combinations. And in all that time pollen has been silently falling on the water and sinking to the bottom of the lake.

Screen One: The coring mechanism on the raft. Metallic, powerful. Scientist Michael Brand steadies the core as it pushes into the deep matter beneath the lakebed. Kyle assists.

Screen Two: Core samples are lined up in the lab, long segments of sediment, a spectrum of shades from pale beige to black.

Back at the lab, after a four-day drive to Cairns, it's time to crack open the core. 'It's always a time of great anticipation,' says Cassie.

Everything is reflected in this deposition, every variation in monsoon, temperature, bushfires, the era when humans first appeared. Pale means the water level was low, dark means lots of vegetation. At the height of the last glacial maximum the lagoon was 300 kilometres inland. It's currently 30 kilometres from the shore. Each deposition gives tantalising clues to climate cycles over tens of thousands of years, and enables a better reading of more recent climate changes.

Measuring, dating, analysing and imagining. Alongside the instruments and methodology used to build a picture of Lake Woods, Nitmiluk, Girraween Lagoon and other sites,

imagination is a very important tool. It's vital for telling a story rich in detail but maybe not big on drama.

'My big response to the lake and its environment is admiration,' says Cassie. 'All these trials and tests over two hundred thousand years. I admire the savannah's resilience.'

Final screens: The lake from above, a dark blue circle that holds the story of a continent.

Microscope slides, ancient pollen; fire crackling in the trees; hand-drawn pollen charts; ants scurrying across rocks; scientists picking at the soil; sticks casting shadows; shadows lengthening across the vast red plains.

The sediment is waiting.

Fiona Gruber is a journalist, essayist, broadcaster and radio producer who writes and makes documentaries across the arts and sciences. She's written on the arts for many of the major Australian and British newspapers and art journals including *The Australian*, *Art World Australia*, *The Guardian* and *The Times Literary Supplement,* and has been a regular contributor to *Cosmos Magazine*. Her work for the Australian Broadcasting Corporation's Radio National includes the ten-part series *Australian Portraits*, profiles of major artists including Sonia Leber and David Chesworth and science documentaries including the 2019 radio feature 'Searching for Doggerland'.


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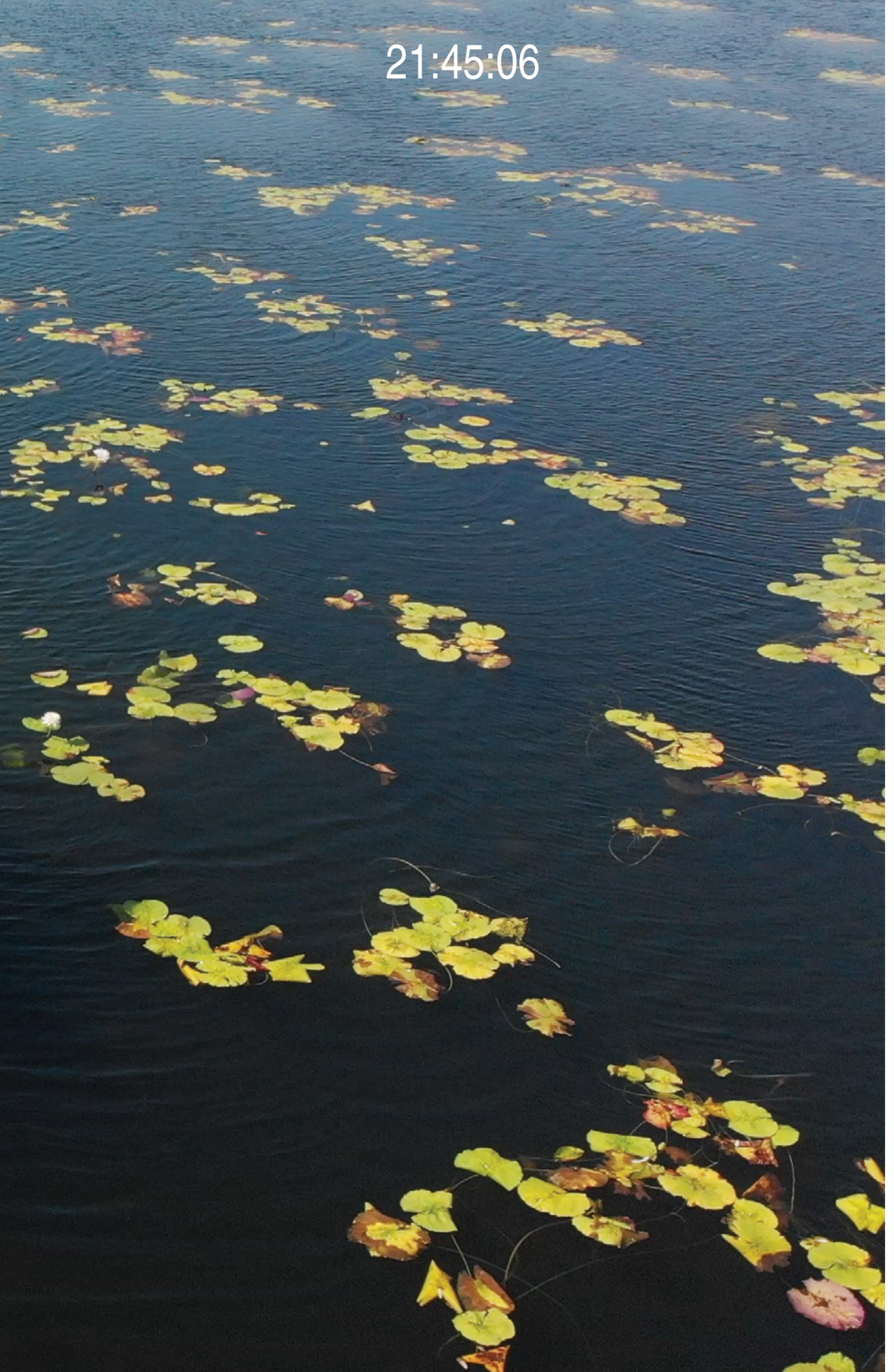
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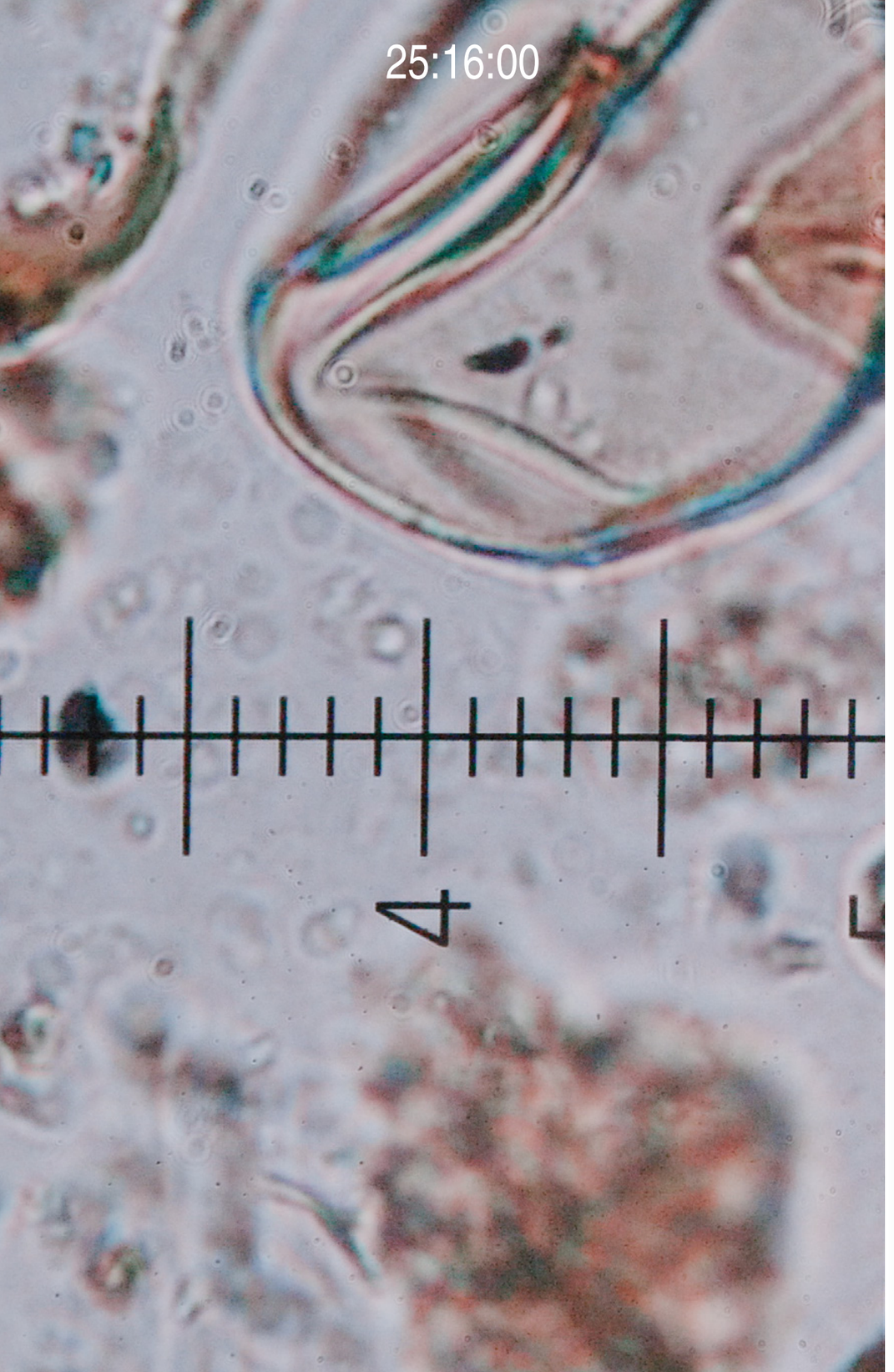
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ESSAY NO. 3

THE SCIENCE OF SUMMONING GEOLOGICAL MEMORY

Tim Flannery

Continents lay down memories, albeit geological ones, in the form of fossils and other materials that record past events and changes. These 'memories' are often held in sediments that collect in lakes, rivers and shallow seas. Most continents preserve rich memories of their past. But Australia is different. By virtue of its tectonic history and geographic location, it suffers from a great amnesia. Dry, flat and geologically comatose, Australia has relatively few rivers and lakes, its entire freshwater runoff adding up to just one percent of the Mississippi's flow. It has also largely missed out on the geological processes—such as mountain building, glaciation and vulcanism—that help generate the sediments that preserve geological memories.

Sometimes old people whose memories are not the best can surprise us with a vividly recalled event from their childhood. At a few special places, where conditions have been right for accumulating a record of past events, Australia can do a similar thing. The Riversleigh World Heritage site in Queensland is one such place, as is the Willandra Lakes Region World Heritage Area in New South Wales, which preserves exceptional early evidence of the human occupation of Australia. Lake Woods and Girraween Lagoon, which are the subjects of Sonia Leber and David Chesworth's artwork *Where Lakes Once Had Water*, may be less well known but, as the University of Wollongong's Tim Cohen and James Cook University's Cassandra Rowe have demonstrated through their research, both places retain extraordinary geological memories that reveal some of the changes that have shaped Australian wildlife, cultures and landscapes.

Science is just one way of investigating the world, and in *Where Lakes Once Had Water* Leber and Chesworth have created knowing of a different kind. Their exceptional video work witnesses the search for the past as carried out at Lake Woods and Girraween Lagoon. Both are in the Northern Territory but are nevertheless startlingly different. Lake Woods borders the desert, while Girraween Lagoon lies in a much wetter area, in the outer suburbs of Darwin.

As revealed in the opening scenes of *Where Lakes Once Had Water*, delving into the sediments preserved at these places begins with a simple act: a spade is thrust into sand or an auger is pushed through sediments that have accumulated in the lagoon. But much astonishing science follows this initial simple action. Because they are such different places, the two sites require different scientific techniques to unlock their secrets.

And when the appropriate kind of science is applied, it allows us to travel back in time, to a very different Australia—in our imaginations, at least.

Art is a wonderful vehicle for unlocking our imaginations and preparing us for the journey. After all, images are nothing more than pixels or patches of colour—it is our mind that creates meaning from them. The black kite's bird's-eye view of parts of *Where Lakes Once Had Water* transports us into a different world, urging us to soar above our ordinary perceptions of place to take a broader view. But the exceptionally fine granularity of the 4K filming, as well as the double screen, act as clues, directing us to look closely at the minutiae of these grand landscapes. Somehow, *Where Lakes Once Had Water* manages to hold these diametrically opposed concepts simultaneously, and in doing so it opens the work of the researchers to us, revealing a privileged window into the past.

At Lake Woods, the sand revealed by the shovel has been hidden away for tens of thousands of years, ever since wind or water piled it into a low dune by the lake shore. We know this because Earth scientist Tim Cohen subjects the excavated sand to a kind of dating analysis known as optically stimulated luminescence (OSL). OSL dating relies on the fact that each grain of sand is a quartz crystal, and that once buried in sediment they begin accumulating electrons in flaws in the crystal lattice. Sunlight drives the electrons from the crystal lattice, so the grains only start accumulating electrons after they are buried. The electrons that accumulate in the crystal lattice are the result of radioactivity in nearby rocks and sediments releasing energy, so if you know how much radiation is being emitted where the sand grains are buried, you can use OSL dating to determine how long they have been in the ground. In order to obtain an OSL date, researchers expose the sand grains to light in carefully controlled laboratory conditions, and measure the faint emissions produced when the electrons are released from the crystal lattice.

Australia may be poor in water and sediment-creating geological records but it is rich in sand, and the development of OSL dating has revolutionised studies of Australian prehistory. It has allowed for the accurate dating of many events right across the continent that, until the advent of OSL, were long lost in the mists of time. I am a co-author on the paper, published in 2001, that first dated Australia's megafaunal extinction to around forty-six thousand years ago. It was an incredibly exciting project,

and for a few treasured days I was one of only two people on Earth (the other being Richard 'Bert' Roberts of the University of Wollongong) who knew precisely when the great beasts—the diprotodons, giant kangaroos and titanic goannas—had vanished. Holding that secret for the few days before we shared it with a wider circle of colleagues was a magical time for me.

At Girraween Lagoon a different technique known as radiocarbon, or ^{14}C, dating is used. Radiocarbon dating relies on the fact that, in carbon-based life forms, the ratio of two variants of this element (^{14}C and ^{12}C) is constant. But once an organism dies, it stops taking in carbon of any sort, and the ^{14}C, which is unstable, begins to decay. Around half of the ^{14}C taken in by a creature over its lifetime is lost to decay every 5,700 years. So, by measuring the ratio of ^{14}C to ^{12}C, we can determine how long ago a creature, or plant, lived.

Both techniques have their limitations. OSL, for example, is able to date events going back hundreds of thousands but not millions of years, because after a time all of the flaws in the crystal are filled with electrons, meaning that no more can accumulate. And we must remember that when using OSL dating, we are only determining when sand grains were last exposed to sunlight. To determine the age of a bone or artefact buried in the sand requires lots more research. It's not uncommon for objects to be buried, exposed and then reburied in a new context. Radiocarbon dating can only extend back fifty thousand years and, for dates older than around forty thousand years, great care must be taken to ensure that no carbon from elsewhere contaminates the sample. This is because so little ^{14}C is left in these samples that even a tiny amount of contamination can result in a very different, more recent, date. Old carbon, from coal for example, can also contaminate a sample, leading to a false reading that is too old. All of this means that the science of dating requires great precision, and always comes with some level of uncertainty.

The layered sediments preserved in lakes and lagoons can be thought of as a kind of gigantic, environmental tape recorder—in effect, a series of static memories stacked one atop the other to form the equivalent of a soundtrack. Each layer, from the surface one down, is older than the overlying one, and the various layers record the changes in conditions that led to their distinctive colour, thickness and composition. Read the changing conditions in those layers, and we have a geological recording of environmental conditions over time.

The soundtrack of *Where Lakes Once Had Water* is seductive and strange, reflecting this geological tape recording. It is partially derived from the sounds created by the scientists as they go about their work. We hear the machines whirring, clicking and grinding as they labour on our behalf, revealing lost landscapes and environments. It feels to me as if we're listening to a great collective thinking, one in which machines, scientists and artists are creating a vision of a very different Australian prehistory. It's a journey just begun, and many changes of perspective, new discoveries and surprises lie in store.

By dint of a huge amount of careful research, OSL, radiocarbon and other dating techniques have revealed that astounding climatic changes have occurred in Australia over the past hundred thousand years. At different times places like Lake Woods have indeed, as the title *Where Lakes Once Had Water* alludes to, contained water in abundance. Understanding just how and why this occurred has been the work of generations of scientists. And in this era of changing climate it is work of particular importance.

The past is so different from the present that sometimes it's hard to comprehend. Can you imagine an Australia with a very different shape caused by a lowering of the seas, one in which it's possible to walk from New Guinea to Tasmania on dry land? That Australia existed for at least three quarters of the time that humans have lived in Australia. It was only around ten thousand years ago that sea levels began to rise rapidly, creating the Australia that we recognise on the map today.

The lowering of the sea was caused by the accumulation of ice at the poles and, when the ice reached its maximum extent, Australia had a very different climate. Had you been able to see that Ice Age Australia from space, you would have been struck by the great cyclonic swirl of sand dunes that dominated the inland. These dunes were not like the sand dunes of the inland today, which support a variety of vegetation. Instead they were bare, active dunes, like the dunes of Saudi Arabia. And the oculus of the great sand-cyclone lay at Uluru. Back then Australia was a dry, cold land. But paradoxically, many of the inland rivers flowed strongly. That's because there were few trees and grasses to soak up the rain that did fall, and low temperatures reduced evaporation. Imagine swiftly flowing, clear rivers running through vast, sandy dune fields, and you get a sense of the Australia that existed when the sand grains around many Australian lakes last saw the light of day.

Girraween Lagoon offers a very different insight into the vanished landscapes of Australia, for its sediments preserve both charcoal for radiocarbon dating, and pollen. The pollen grains are microscopic, beautiful things with extraordinary detailed surfaces, making some look like imaginary miniature space craft. They can be preserved in abundance in lake sediments, and their unusual shapes and symmetry allow the plants that produced them to be identified to species. Typically, most of the pollen preserved in lake sediments comes from plants that grew locally, around the lake margin. But some kinds of pollen can be blown on the wind for great distances. This makes pollen useful for understanding both the local *and* regional environment.

The evidence provided by fossil pollen can be transformative. When I was still studying for my master's degree in geology at Monash University, I took part in a palaeontological dig at a site in western Victoria. We excavated the bones of a red kangaroo that were around twenty thousand years old. Guided by this find, I imagined that the region, which is today lush volcanic plains grassland, was once a desert. But the palynologist who worked with us was seeing something different. She showed us fossil pollen retrieved from the mud that had come from plants that today only grow hundreds of kilometres to the east, in Australia's alpine country. Later we found seeds of the same alpine plants, so they must have once grown at the site. Seeing the tiny grains on the glass microscope slide altered my imagined past, transporting me not to a desert but to a distant Australia when the lush western district was arid but also cold—a place where red kangaroos could coexist with alpine plants. Today, nothing like this exists in Australia. It is a truly vanished landscape with no analogy in the modern world. The experience acted as a powerful lesson to me that we must look at all the data we have, and be open to the unexpected, as we imaginatively time travel into Australia's deep past. *Where Lakes Once Had Water* provides a powerful stimulus to making that imaginary leap.

Tim Flannery is one of the world's most prominent environmentalists. In 2007 he was named 'Australian of the Year', arguably Australia's highest honour. He delivered the 2002 Australia Day Address to the nation. In 2013 he founded, and is now Chief Councillor of, the Australian Climate Council, Australia's largest and most successful crowd-funded organisation. His latest book is *Europe: A Natural History*, Text Publishing, 2018.


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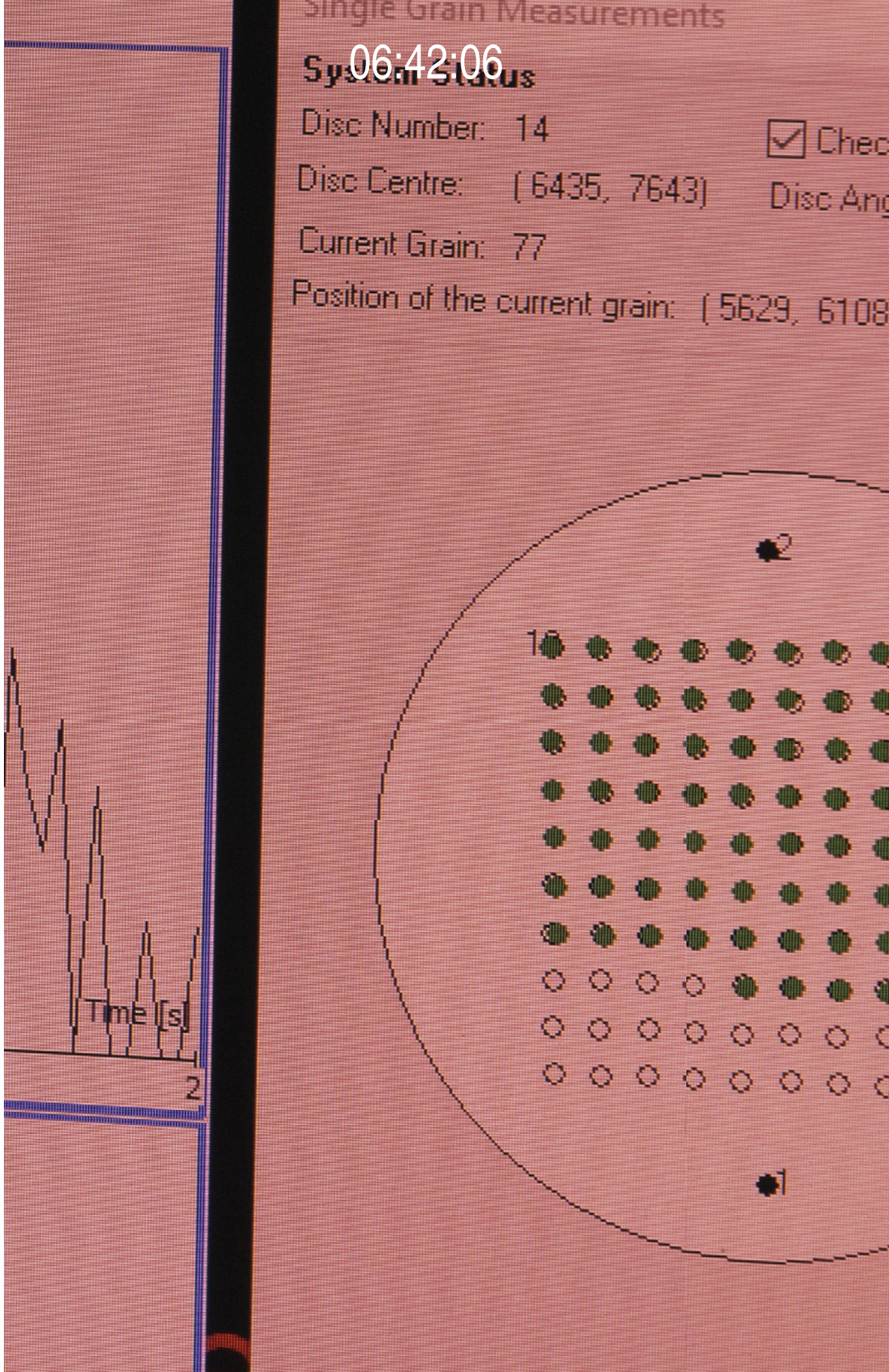
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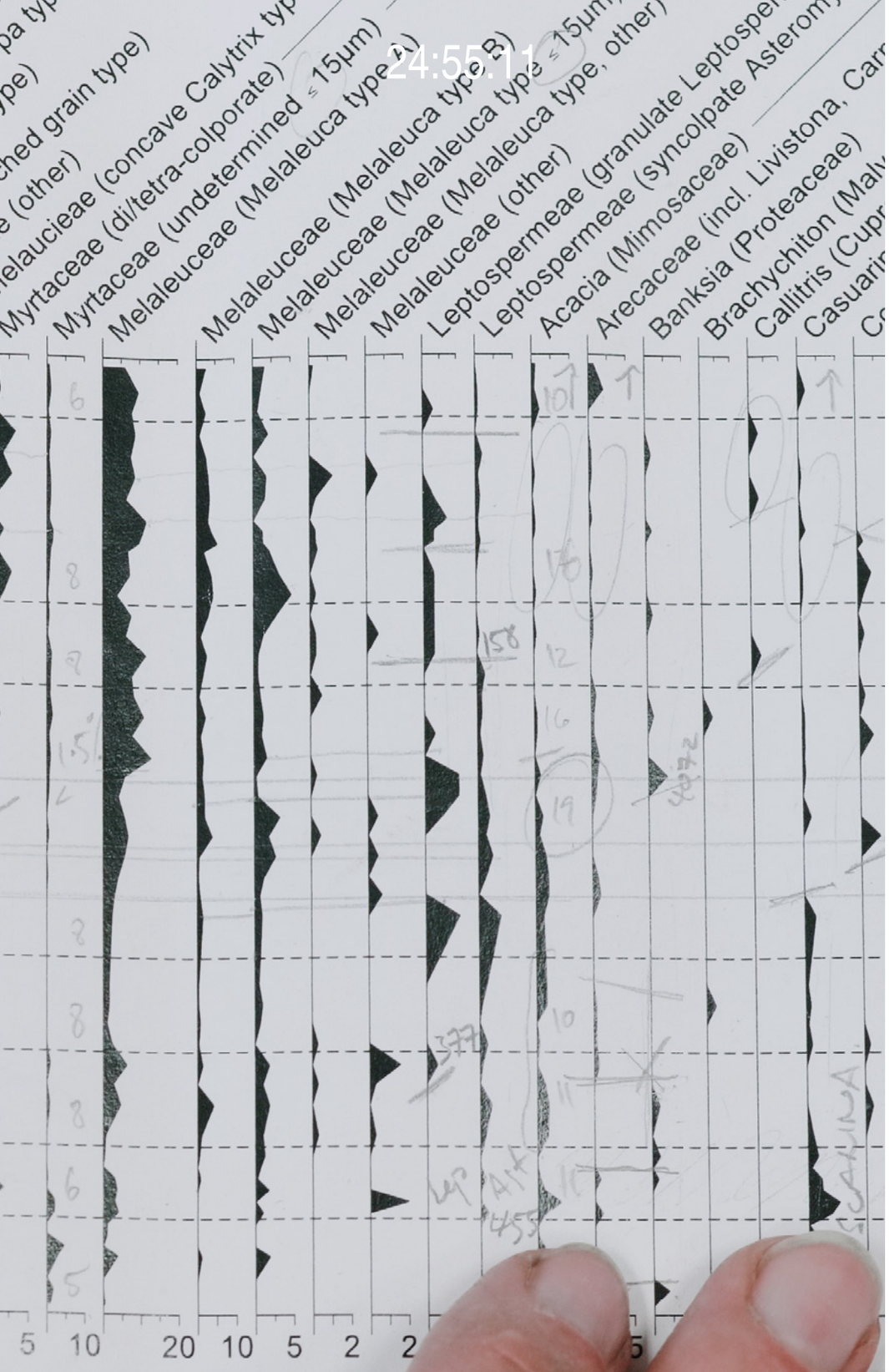
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IN CONVERSATION

Michael-Shawn Fletcher with Sonia Leber and David Chesworth

SL/DC We are having this conversation on Larrakia Country, on the waters of Girraween Lagoon in Australia's Northern Territory. Together, we respectfully recognise Larrakia Elders, past, present and future.

Michael, you are currently part of a team of Earth scientists that travel here annually to work on a purpose-built raft in the centre of the lagoon, extracting sediments from the lakebed. On this trip the science team has been joined by the Larrakia Rangers. Why is this environment particularly useful as a site for investigating Australia's long-term climate record? How does this site contribute to your own understanding?

MSF As a biogeographer, I am interested in the way that the environment works and how it has come to be, and understanding the processes and various factors that have given us the landscapes we have today. I have very much a time perspective on the landscape; my interest is in how those environmental processes and biological compositions have changed through time. I am a descendant of the Wiradjuri, which is an Aboriginal group in central-southern New South Wales. My Indigenous heritage has definitely shaped the way that I view the world. It has influenced the importance that I place on forms of knowledge other than Western science in trying to understand the world that we live in, and how we live in it. My heritage is very influential in the way that I go about my science. I'm very open to different forms of knowledge and integrating different types of knowledge into understanding the records that I retrieve from sediments in the landscape.

Girraween Lagoon, where we are now, is about 30 kilometres east of Darwin in the Top End, in the savannah country. Girraween Lagoon is a rare permanent lake. Lakes and bogs and other places like this that accumulate sediment are essentially recorders. They are recording

history. The sediments at the bottom of the lake are preserving pictures of the landscape—every second, every minute, every day, year after year, for as long as they are wet. So, with various techniques, we can extract these sediments and read the history of a site.

I'm interested in this particular location because these Top End savannahs of Australia are anthropogenic landscapes. They are cultural landscapes that have been shaped and created by humans over tens of thousands of years. However, I am particularly interested in what has happened since the cessation of Aboriginal management. Aboriginal land management was severely disrupted when the British invaded, and I am interested in how that has influenced the landscape we see today. So, by extracting the sediment that has been accumulating through that more recent phase, we can understand how the changing fire regime in response to that change in land management has influenced the landscape we see around us.

This is important because time is an often-overlooked dimension of the landscapes we live in. We have a particular lifespan and rhythm to our own human lives that is not matched with the rhythms of the landscape evolving around us. For instance, say, some of the things that are living around this lake have very fast life cycles while, at the other extreme, some of these trees have been around here for many hundreds of years prior to that big land management shift after the British invaded. So, the reason we're interested in time is that often our observation window—the time that we've been observing the landscape around us and gathering information and trying to understand how it works—is a lot shorter than the actual dynamics of a system. You have very long-lived species that exist for hundreds if not thousands of years in some ecosystems that have a rhythm,

or are beating to a drum or following cycles, that far exceed our window of observation.

One of the only ways we can get information on how these systems operate—how they respond to change, how they respond to different dynamics—is by looking at what we call the fossil or sub-fossil record, the information stored deep in the sediments in these lakes and swamps.

Girraween Lagoon and other similar places are essentially history books. Information is being recorded constantly. We as scientists use all of our techniques to get that story, that history, out of these sites in an attempt to read and understand how things have changed through time.

SL/DC It's interesting that the scientists here are trying to understand environmental processes over vast time frames by analysing some of the tiniest grains of this environment, through sediment captured under the waters of this lagoon. Those compact metre-long cores filled with layered sediments and ancient pollens can be taken back to the laboratory and studied for years. Why is the selective capturing of sediment so important?

MSF The reason we are using sediment stored in the bottom of these lakes is because plants and other organisms are constantly producing material that is passed into the atmosphere. Whether that be through chemical processes where different chemicals are being released into the atmosphere, through pollen or charcoal from fires or through particulates from industrial processes, they are all bound up in the sediment that lies at the bottom of these lakes. If the lake is permanently wet, then that becomes a great preserving medium. There's not much oxygen down there at the bottom of a lake or in the mud found in swamps, so things preserve really well. And the fundamental thing about the microfossils that we look at is that they are

abundant, so we can get a lot of information. One of the complications when looking at big fossils or macrofossils is that there are fewer in number and so often we have big gaps in our understanding. They are also randomly located so you get a patchy record. But the smaller things that are produced so abundantly and constantly through time are always depositing in some environments. So, if we can find environments like Girraween Lagoon that have been recording information for almost two hundred thousand years, a gobsmacking amount of time, we can unpack that record and retrieve plenty of information.

One of the central themes of ecology is scale: there is scale in terms of space, and scale in terms of time.

SL/DC Yes, we have noticed that every Earth scientist we meet clearly identifies the particular time period that underpins their own research, and this can be wildly variable.

MSF One of the most influential factors of ecology is that at different scales different processes become important. At smaller scales weather is very important—when fires occur, this sort of thing. At longer timescales climate is more important, which is the weather averaged over a long period of time. So, long-term shifts become important in governing the ecosystems and what can or can't grow, and what does and doesn't happen. We can also study even longer time periods like orbital, planetary shifts and wobbles, where variations of the Earth's tilt and the shape of its orbit around the sun influences the overall climate, driving really big shifts such as moving in and out of Ice Ages. Over even longer timescales, slow processes like continental drift become important because the slow drift of continents drives profound changes in climate and results in the isolation and connection of groups of organisms. All of these

sorts of things are very important, but they only influence really long scales, tens of thousands to millions of years.

The sediment cores that we extract give us information on the scale of tens to many thousands of years. This resolution is important, as we can pick up some of those slower processes that are invisible to our direct observations, such as the Little Ice Age about six hundred years ago, during which there was a slight contraction of the monsoon and a drying out of the landscape around Girraween Lagoon. Our shorter-term daily to annual rhythms are embedded within these longer-term shifts, and many of the trends we observe are actually responses to the longer-term changes that ecosystems are constantly reorganising themselves around. The sediment data we collect means that we can target responses to these significant slower changes that are occurring through time, and that will continue to occur into the future, at the appropriate scale of time. This is fundamental now, because we are currently experiencing the greatest rate of change to the climate system that we know of—the pace of change that is, not how hot it's been or how much carbon dioxide is in the atmosphere. Never before have we seen such a pace of change.

So, by interrogating the records from systems like Girraween Lagoon, we can understand how these ecosystems respond to changes in different directions and that gives us the ability to effectively manage or anticipate or predict what the effects of changes are going to be in these systems.

SL/DC While the scientists have been working at Girraween Lagoon, you have been joined by Larrakia Rangers on site every day. How are Earth scientists across Australia working with Indigenous rangers and Traditional Owners?

MSF One of the really important things is engaging with knowledge holders, with people who are custodians of the landscape, like the Larrakia people. Here at Girraween, and wherever you are in Australia, there is knowledge about how the landscape is managed. When we scientists get these sediments out, we can say there was fire, there were less or more trees, less or more grass. But we don't know anything about the methodology, the cultural purpose, the intention, the way landscape was managed. So scientists can provide a very coarse lens that needs to be filled in with understanding. Traditional Owners are custodians of an incredibly rich and detailed understanding about how this landscape operates, how it used to be, and how it can and maybe should be managed into the future. So, it's fundamental that we do our science in concert with the knowledge Traditional Owners can provide.

SL/DC Do you find that Indigenous people in Australia experience time differently to settler colonial thinking? We were struck by a common alignment around ideas of deep time between the Earth scientists and Indigenous groups in the field, while many in the general Australian population have lost a connection with deep time. How are scientists shifting their own thinking?

MSF I'm by no means a social geographer, but I think our current world is so much about what's going on now that we potentially overreact to things that are going on in our environment. The one thing about traditional knowledge is that it is knowledge developed in place, over long periods of time. You never really see Traditional Owners as alarmed as we are. They are concerned about their environment, but I think their knowledge base is more in tune with the way nature has rhythms that occur through time. Although I

think that nature itself isn't really a concept within many Indigenous ontologies.

Essentially, contemporary Australia is still very much rooted in European ideologies and a lot of the environmental methodology based on the practices, ideology and knowledge that white people have brought to this country is ill-fitted. At first it was a conquest mentality, to change the country to make it more like what Europeans were used to, and now there's an increasing realisation that that's not possible and it has really negative effects. And there is still a lot of knowledge across Australia residing with Traditional Owners about how to appropriately behave in a landscape and how to view your position within a landscape. In Australia, the master/servant relationship or the subjugation mentality is not working. It has failed in most cases. We are starting to see the catastrophic effects of that as things like climate change ramp up the pressures on the landscape. The kinds of mismanagement causing fish deaths in the Darling River, for instance, are a consequence of the layered effects of poor management and modern climate challenges. I think we really can learn from Indigenous knowledge, even if it's not direct knowledge. We can learn about how to view ourselves, our role and our capacity in the environment.

SL/DC We like to think of sediment cores, when extracted from a location, as a signal of a 'deep present'. The material extracted from a particular site is like a needle through time that complicates our sense of being both in the present moment and connected across vast timeframes. We love your idea that the sediment core connects us not only with past environments but also with a lineage of people who managed those environments. For you, environments from the anthropogenic era are 'cultural environments'. What is it for you to retrieve and gaze at a core in the field? What do you see?

MSF I guess in an abstract way, in the attempt to merge different knowledge types, I find that looking at a core is a kind of universal experience. When we retrieve a core with these beautiful bands, we get really excited. Everyone knows that you're looking back through time and that something must have happened at a period of time to create these visual changes. The physical core is a place where people with different knowledges about a landscape can connect, because one thing we all have in common is a sense of things occurring before that led to today.

Cores are incredible as a visual tool, and there has never been a time when I have extracted a core in the presence of Traditional Owners or scientists that they weren't in awe of and engaged with what they saw in front of them. You can see that in their heads they are placing their own sense of history and trying to understand where it fits in relation to the storybook that's in front of them. As a scientific phenomenon, it's gobsmacking to think that I've cored a site that has been a lake for nearly a million years, and you can see these beautiful changes through all of this time. There is a history book there in those cores. Even a core with a recent history of the last two hundred years is fundamental, in fact it is more important than longer-term information in how we manage contemporary Australia. The cores provide a great nexus, a great joining of place across time, where different knowledges can fuse and converse.

Michael-Shawn Fletcher is a descendant of the Wiradjuri and a geographer interested in the long-term interactions between humans, climate, disturbance, vegetation and landscapes in the southern hemisphere, with a particular emphasis on how Indigenous burning has shaped the Australian landscape. Michael-Shawn is Deputy Dean (Indigenous) and an Associate Professor in the Faculty of Science at the University of Melbourne and a panel member of the Australian Research Council College of Experts.


TOP
KIN16
CORE 3
TOP
KIN16
CORE 1


NIKKO

ENDMATTER

ARTIST BIOGRAPHIES

Sonia Leber and David Chesworth are known for their distinctive installations using video, sound, architecture and public participation. Developed through expansive research in places undergoing social change, Leber and Chesworth's works are speculative and archaeological, responding to architectural, social and technological settings. Their highly detailed, conceptual videoworks emerge from the real but exist significantly in the realm of the imaginary.

Leber and Chesworth's artworks have been shown in the central exhibitions of the 56th Venice Biennale: *All the World's Futures* (2015), the 19th Biennale of Sydney: *You Imagine What You Desire* (2014) and a parallel exhibition of the 5th Moscow Biennale (2013).

GROUP EXHIBITIONS INCLUDE *The Last Reader*, annex M, Megaron, Athens (2018); *The State We Are In: Collection of Museum of Modern Art in Warsaw*, Galeria Labirynt, Lublin, Poland (2018); *And Tomorrow And*, Index – The Swedish Contemporary Art Foundation, Stockholm, Sweden (2018); *The Score*, Ian Potter Museum of Art, Melbourne (2017); *Looking at me through you*, Campbelltown Arts Centre, Sydney (2017); *Call of the Avant-Garde: Constructivism and Australian Art*, Heide Museum of Modern Art, Melbourne (2017); *I don't want to be there when it happens*, 4A Centre for Contemporary Asian Art, Sydney (2017) and Perth Institute of Contemporary Arts, Perth (2017); *The Real and Other Places*, Centre for Contemporary Photography, Melbourne, at Photofairs Shanghai (2017); *This is a Voice*, Museum of Applied Arts and Sciences, Sydney (2017); *Borders, Barriers, Walls*, Monash University Museum of Art, Melbourne (2016); Substation Contemporary Art Prize, Melbourne (2016); 64th Blake Prize, Casula Powerhouse, Sydney (2016); *Melbourne Now*, National Gallery of Victoria, Melbourne (2013–14); Gold Coast Art Prize, Gold Coast (2014); *Cooperation Territory*, 16thLine Art Gallery and Makaronka Art Center, Rostov-on-Don, Russia (2013); *Spaced: Art Out of Place*, Fremantle Art Centre, Fremantle (2012); *Animal/Human*, UQ Art Museum, Brisbane (2012); *Stealing the Senses*, Govett-Brewster Gallery, New Plymouth, New Zealand (2011); Melbourne Prize for Urban Sculpture, Melbourne (2011); *In camera and in public*, Centre for Contemporary Photography, Melbourne (2011); *Madrid Abierto,* Madrid, Spain (2007); *+Plus Factors*, Australian Centre for Contemporary Art, Melbourne (2006); and the visual art program of Melbourne International Arts Festival, Melbourne (2004).

SOLO EXHIBITIONS INCLUDE *What Listening Knows*, Messums Wiltshire, UK (2021); *Architecture Makes Us: Cinematic Visions of Sonia Leber and David Chesworth*, Centre for Contemporary Photography, Melbourne (2018), UNSW Galleries, Sydney (2019) and Griffith University Art Museum, Brisbane (2019); *Zaum Tractor,* Fehily Contemporary, Melbourne (2014) and Gridchinhall, Moscow, Russia (2013); *The Way You Move Me*, Fehily Contemporary, Melbourne (2012); *Space-Shifter*, Detached/MONA FOMA, Hobart (2012), Perth Institute of Contemporary Arts, Perth (2011) and Conical, Melbourne (2009); and *Almost Always Everywhere Apparent*, Mildura Arts Centre, Mildura (2008) and Australian Centre for Contemporary Art, Melbourne (2007).

Leber and Chesworth were awarded the Substation Contemporary Art Prize (2016), Gold Coast Art Prize (2014) and Screengrab International Media Arts Award (2014). They were finalists in the Blake Prize (2016), Incinerator Art Award for Social Change (2016 and 2018) and the Melbourne Prize for Urban Sculpture (2011). They have been commissioned to create site-specific works for public spaces in Australia, New Zealand, Wales and Slovenia.

Their work is held in numerous public collections including the Museum of Modern Art in Warsaw, National Gallery of Victoria, Art Gallery of Western Australia, RMIT Gallery in Melbourne, Gold Coast City Gallery, Mildura Arts Centre, University of Wollongong Art Collection and Australian Centre for the Moving Image.

Sonia Leber is a Senior Industry Fellow in the School of Art at RMIT University and David Chesworth is a Vice-Chancellor's Postdoctoral Fellow in the School of Art at RMIT University.

The artists live and work in Naarm/Melbourne, Australia.

www.leberandchesworth.com

ARTWORK DETAILS

Sonia Leber and David Chesworth
Where Lakes Once Had Water
2020
2-channel 4K UHD video, 5.1 audio
28:14 minutes
University of Wollongong Art Collection, Australia

CABAH Art Series Commission in association with Bundanon Trust

FILMING, EDITING AND SOUND DESIGN
Sonia Leber and David Chesworth
COLOUR GRADING Peter Hatzipavlis
VOICE Bec Plexus
TOURING PROJECT CURATOR Judith Blackall

FEATURING Ray Dimakarri Dixon, Aara Welz, Tim Cohen, Nicola Stromsoe, Matt Forbes, Amanda Arnold, Yasaman Jafari, Claudette Albert, Auntie Susan Kingston, Ceri Shipton, Will Reynolds, Fabian Boesl, Alex Wall, Wallace Godilla, Cassandra Rowe, Michael Brand, Michael-Shawn Fletcher, Kyle Hunt-Lew Fatt, Jessica Puntoriero, Kylie Carroll

A project history can be found at:
leberandchesworth.com/filmworks/where-lakes-once-had-water

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IMAGE CREDITS

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Sonia Leber and David Chesworth, *Where Lakes Once Had Water* (detail of video still), 2020, 2-channel 4K UHD video, 5.1 audio, 28:14 minutes. University of Wollongong Art Collection. CABAH Art Series Commission.

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Sonia Leber and David Chesworth, *Where Lakes Once Had Water* (installation view), 2020, 2-channel 4K UHD video, 5.1 audio, 28:14 minutes. University of Wollongong Art Collection. CABAH Art Series Commission. Photo: Sonia Leber.

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Sonia Leber & David Chesworth:
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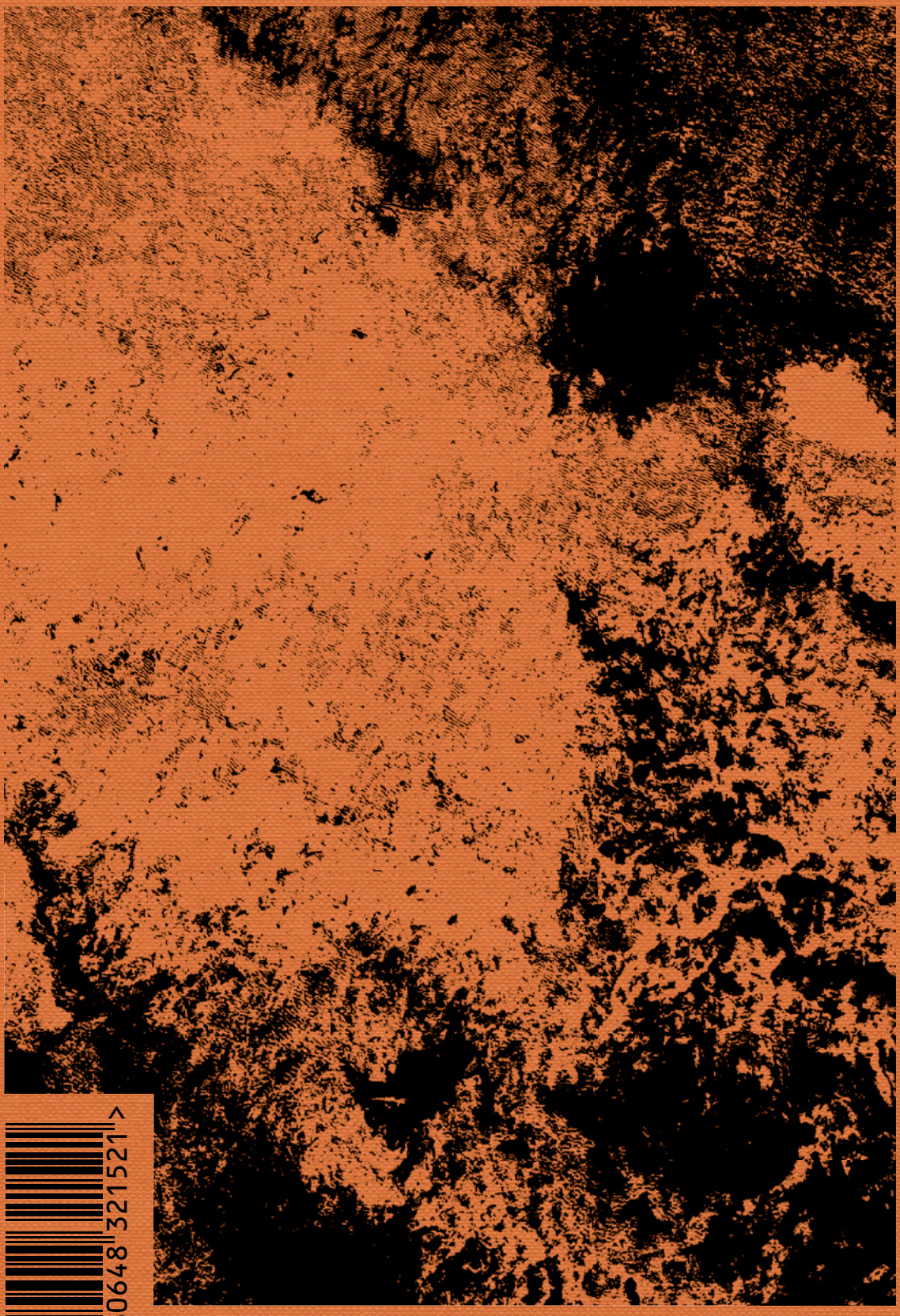

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