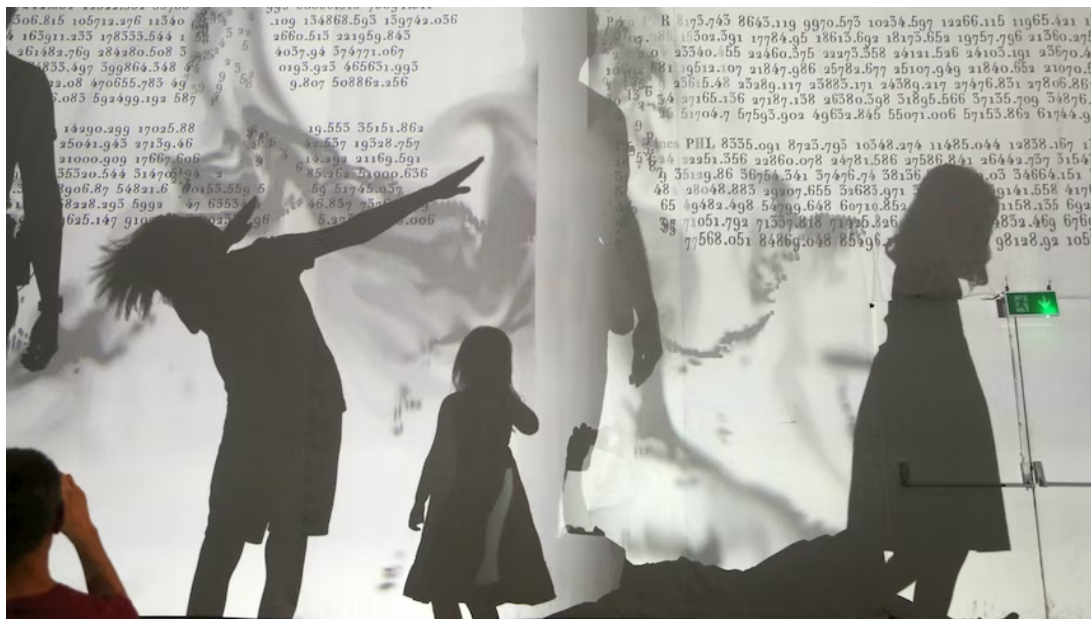




Rafael Lozano-Hemmer's Atmospheric Memory headlines Science Week at the Powerhouse with epic interactive exhibit for existential reflection

ABC Arts / By Anna Freeland

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Rafael Lozano-Hemmer has described Atmospheric Memory as "the most ambitious project" of his career. *(Supplied: Powerhouse/Jason Lock)*

If the atmosphere could capture every moment, every sound and movement, what "memories" would it house? It's a question that Mexican Canadian chemist-turned-artist Rafael Lozano-Hemmer has been pondering, and the hypothesis for his interactive exhibition Atmospheric Memory, showing at Sydney's Powerhouse Museum as part of Science Week.

The exhibit is a multisensory odyssey of immersive art that draws on AI, robotics and 3D printing, among other technologies, to make the atmosphere and its contents tangible.

Conceptually, its aims are lofty: The exhibition not only speaks to the ever-present challenges of climate change, globalisation, social justice and digital surveillance but also, by inviting the audience to interact with the work, cleverly co-opts them into it. (But no spoilers, yet.)



Among its tech-generated delights are a [voice-activated word "cloud"](#) that spells words with water vapour, and projections that evaporate using heat map technology — both part of a suite of 11 interactive artworks forming the backbone of the exhibition. Presented alongside these are technological relics, which serve as cautionary devices about the pitfalls of memory and permanence in the digital age.

"We live in a digital world where everything is recorded, but is that something that we want as a society?" he asks.

Atmospheric Memory was commissioned for the 2019 Manchester International Festival, but Lozano-Hemmer has collaborated with the Powerhouse to adapt the exhibition for an Australian audience, drawing on the museum's collection.

The show is a feat of technological experimentation, traversing 19th-century computation technology through to modern-day AI. But there is more to it than pure spectacle.



'Misusing' technology

Lozano-Hemmer's work toys with human complicity in deteriorating the atmosphere, from satellites and drones to pollution and airborne viruses.

A counter projected on the wall of one room shows carbon dioxide levels in the earth's atmosphere over time, comparing 284 parts per million (ppm) in 1891 with present-day levels of 423.5 ppm. (That's 73.5 ppm above the safe threshold.)

"[In art], these 'immersive' technologies are usually used to create some kind of idyllic world with little flowers, when the real flowers are out there becoming extinct. So we wanted to 'misuse' these technologies of control, of spectacle, and so on, to create something that can be more critical or poetic, that invites people to reflect on their own responsibilities, without pamphleteering [and] without being didactic or messianic," Lozano-Hemmer says.

Rather than immersive, he calls it "inversive" technology.

Lozano-Hemmer founded and leads the Montreal-based R&D studio Antimodular Research: A collective of 24 artists, scientists and programmers who collaborate on interdisciplinary art projects — including

Atmospheric Memory. Their work uses technology and art to interrogate social responsibility.

"As an artist, you generally want to make a contribution, to make a change. But we think of our work also as citizens, [asking] 'How can we be part of the conversation of social responsibility?'" says Lozano-Hemmer.

"[Our response to that is] to complicate things, ask questions, and take people through a journey."

Lozano-Hemmer studied chemistry before becoming an artist and describes himself as "a big nerd". He has long been interested in the history of early computation.

"Despite the fact that for the past 30 years I've been working with technology, I really dislike the term 'new media', because I think anybody who thinks that what we're doing is 'new' is somebody who hasn't studied history.

"I study history to look for precedents, to look for inspiration. I work with technology not because it's new, but because it's inevitable ... it allows us to create integrated media and connect disparate fields. It's the language of our time."

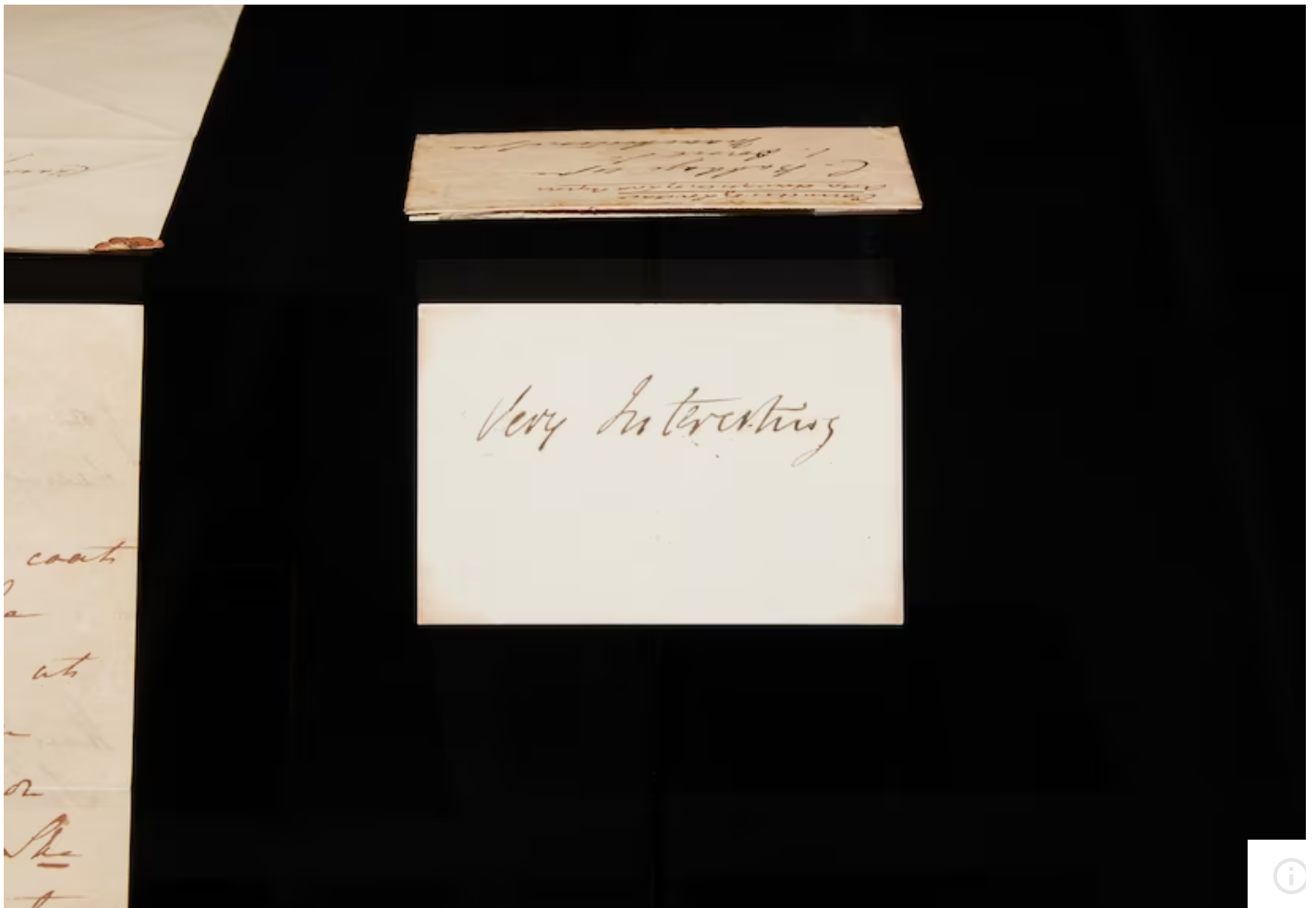
Charles Babbage's vast library of sounds

The genesis of Atmospheric Memory is historical: Lozano-Hemmer was inspired by the philosophical musings of 19th-century English mathematician and mechanical engineer Charles Babbage, often dubbed the "father of the computer".

Among his most renowned inventions is what's known as the Difference Engine: a steam-powered device that produced complex mathematical calculations, previously (painstakingly) done by hand, and something of a precursor to the modern computer.

The Powerhouse collection contains Babbage's Difference Engine No 1, designed in the 1820s and later built by his son, which is on display as part of Atmospheric Memory.

Babbage then went on to bigger and better things: the Analytical Engine, which Ada Lovelace famously programmed, ergo becoming [the world's first computer programmer](#). (Correspondence between Babbage and Lovelace is also included in the exhibition.)



Lozano-Hemmer was particularly inspired by [Babbage's 1837 text](#) The Ninth Bridgewater Treatise, which he wrote while designing his computational engines. In it, Babbage fantasised about machines that could execute total recollection, and conceived of the atmosphere as "one vast library on whose pages are forever written all that man has ever said or woman whispered". Poetic stuff.

Lozano-Hemmer and his team took this idea of total recollection and used it as the exhibition's "design fiction", asking: "Is there an artwork that we can make that will make Babbage's idea possible? We know it's not possible, but let's try."

What is the atmosphere trying to tell us?

In one work within Atmospheric Memory, titled Banderoles, Lozano-Hemmer and his team have used OpenAI trained on Babbage's written works (including the Ninth Bridgewater Treatise) to answer questions. Participants step into a booth, hooked up with microphones and cameras that rely on facial extraction technology and fluid dynamics to capture words and record their mouths as they speak. Words are projected onto a screen via a disembodied mouth, inspired by a performance of Samuel Beckett's 1972 [monologue Not I](#), and accompanied by a text response vis-à-vis Babbage — or rather, AI Babbage.

Babbage's treatise is referenced elsewhere in the exhibit too, including in a vial of tiny gold particles: the remnants of a work he exhibited at Cornell University's nanotechnology library in the US, as part of which Babbage's text was printed on two million gold leaflets using nanotech engraving (the kind used for microchips).

"We took 50,000 of these leaflets and then went to the air conditioning of the museum and blew them into it so that, at any given time, we may be breathing in the totality of the book," says Lozano-Hemmer.

Babbage would be tickled.

Lozano-Hemmer's work often seeks to make intangible philosophical ideas tangible.

"There is a chapter in this treatise, where Babbage basically talks about the moment when we speak, we create a turbulence in the air, and he wonders what would happen if we had a computer that was so sophisticated that we could rewind the motion of all particles and recreate voices from the past," says Lozano-Hemmer.



To capture this "turbulence", Lozano-Hemmer has created a 3D-printed speech bubble, using laser tomography (the process of scanning and capturing cross-sections of an object) to map breath density, and photogrammetry (a process that captures images and stitches them together) to create a 3D model — which he then 3D-printed with steel.

"This is a piece that we invite people to touch and say that you can touch the atmosphere," says Lozano-Hemmer.

Elsewhere in the exhibition is a work titled *Field Atmosphonia*, which unfolds in a dark cavernous space under a canopy of 3,000 loudspeakers, each fitted with a little light.

The work uses LiDAR technology, a form of laser scanning that detects objects, to track your movement. As you move about the room, a soft glowing ring of light ripples out from the speakers and follows you, while hundreds of species of birds and insects chirp and machines whirr, along with the sound of fire, water and volcanoes — all emanating from 3,000 sound channels.



Lozano-Hemmer says: "It's an attempt to eavesdrop into what Babbage was imagining, being able to tune into the sounds of the past. We call it 'speaker as pixel'. The notion is that if you have a [single] pixel, it doesn't mean anything, but when you see it with neighbouring pixels, it paints a picture. So the question is, 'If we can have thousands of sound channels, is the result something different than the individual parts?'"

"The whole project starts with this 19th-century idea of being able to hear anybody from the past. But then the question [becomes], 'Do we want that? What are the implications of the atmosphere remembering everything?'"

Facing existential questions (and crises)

Lozano-Hemmer's work often examines existential questions. A [New York Times review](#) once characterised him as a death-loving crowd-pleaser.

"I thought that was accurate because I think about death a lot, not just because I'm Mexican but in general, when we're making art, we're thinking about the fact that we're only here for a little time."

Quoting French Renaissance philosopher Michel de Montaigne, Lozano-Hemmer says: "'To philosophise is to learn how to die', and I think that artmaking is similar. We're trying to deal with the fact that we're all going to disappear."



Strung up on a wall in a roomful of object-based art and artefacts, is the captured "last breath" of accordionist and avant-garde composer Pauline Oliveros, who popularised the practice of "deep listening". Before Oliveros died in 2016, Lozano-Hemmer captured her breath for this work, asking her to breathe into a paper bag. Her breath is now pumped back and forth between a bellows (an accordion-like device that moves air) and the paper bag via a bespoke respirator — 10,000 times a day.

It's an attempt to capture breath as Babbage had imagined, but also "an absurd and slightly perverse attempt to capture the essence of a person," says Lozano-Hemmer.

"The fact that [an accordionist] is now living inside a bellows is kind of hilarious ... but she [Oliveros] had a sense of humour."

This writer found it to the contrary: quite moving.

As you journey through the exhibit, Babbage's utopian idea of total recollection becomes fodder for contemplating some of today's more pressing existential crises and dystopian applications of data capture.

In one display cabinet is a taxidermied canary — the proverbial canary in the coal mine — sitting beside a respirator mask and a military clock salvaged from Maralinga following nuclear testing carried out by the British in the 50s.

Opposite the clock is a vitrine bearing hand blown glass orbs by Kokatha and Nukunu artist Yhonnie Scarce, [whose sculptures and installations meditate on colonial dispossession](#) and the ongoing impacts of nuclear testing.

"This is an object that is very pregnant with the history of the devastation of the Australian atmosphere, in dialogue with Yhonnie Scarce's work," says Lozano-Hemmer.



A nearby display features a tinfoil phonograph, among the earliest sound recording devices designed by Thomas Edison in 1877, from the Powerhouse's permanent collection. Juxtaposed beside it is a cross-

section of an Amazon Echo smart speaker, revealing "the seven microphones that are constantly tracking you in your home," Lozano-Hemmer points out.

"Not only can they track everything you say ... they can triangulate your position in the house. So this idea of total recollection starts to become a little bit dystopian because now everything is metrics and we are just feeding these algorithms controlled by a very small group of oligarchs."

Not quite what Babbage had in mind.

From spectator to spectacle

The exhibition is as much a philosophical experiment as it is an artistic or technological one.

Projected onto the 11-metre-high walls in the penultimate room is a constellation of letters drawn from the collected works of Babbage and Lovelace. The projections transform with heat-mapping technology as participants roam around, creating a kind of shadow play. The effect is mesmerising, and intentionally distracts you from the fact that you are being tracked.

It's at this point that Lozano-Hemmer's critique of the idea of total recollection comes to the fore: The space includes 24 military-grade surveillance cameras, used to track participants and project footage of them onto the walls. The spectator becomes the spectacle.

"You realise that this entire exercise is an exercise in tracking," the artist explains, adding that he and his studio "acknowledge our complicity with what we denounce".

"It's right between the seduction of participation [akin to] reality TV, selfies and whatever, and the violence of the tracking and the more sinister applications of it."



Lozano-Hemmer says the data collected via visitor participation "dies" with the show.

"At the point of sale for tickets, everyone is advised of the data policy of the production. Every new person attending Atmospheric Memory 'completes' the artwork by adding their image and voice, their data. Then their data is supplanted by the next person attending. And so on," he explains.

He describes it as a "memento mori", Latin for "remember that you will die," and assures ABC Arts that "all data is destroyed at the end of the installation".

Entry to the exhibition is timed, and it's worth pacing yourself so as not to miss the pseudo-panopticon at the end.

The overall effect leaves you pondering the value of collective memory; which historical moments need to be recorded and, importantly, learned from, and which are better left in the past.

Without issuing an edict, the work seems to suggest that there is value in transience, and Lozano-Hemmer agrees.

"The opposite of remembering is forgetting, and forgetting is an important part of being human. In genetic code, forgetting is mutation: [the code] forgets how to do something and that's how you evolve; you mutate

to change. Forgetting is also the passage of time, the capability for us to have perspective. There is healing in forgetting.

"And sometimes that is the most liberating thing of all: letting go."

[Atmospheric Memory](#) is at Powerhouse Ultimo till November 5.