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**TRANSDISCIPLINARITY IN THE
DUNEDIN ART+SCIENCE PROJECT**

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TRANSDISCIPLINARITY IN THE DUNEDIN ART+SCIENCE PROJECT

INTRODUCTION

In confronting the realities of the global climate crisis, it seems as if we are living in a narrow window of “useful consciousness.”¹ Responding to and tackling the existential threat of the climate crisis requires transdisciplinary methodologies and cooperation. A series of multidiscipline art and science collaborations in Dunedin, New Zealand, focuses a lens on rapidly changing ecological and social effects as human activity encroaches on our planetary boundaries (Figure 1). Our approach allows for processing of the scientific data in bite-sized, digestible chunks and provides a means for storytelling through visual texts and narrative spaces – a methodology essential to connecting with community values and finding solutions to climate anxieties.

In 2013 staff, alumni and associates of the Dunedin School of Art and the University of Otago embarked on the inaugural Art+Science project.² The kaupapa³ was to create interaction and dialogue between various knowledge bases and imagination practitioners by calling for artists to respond to the research, rather than ‘illustrate’ the science. The entwined histories

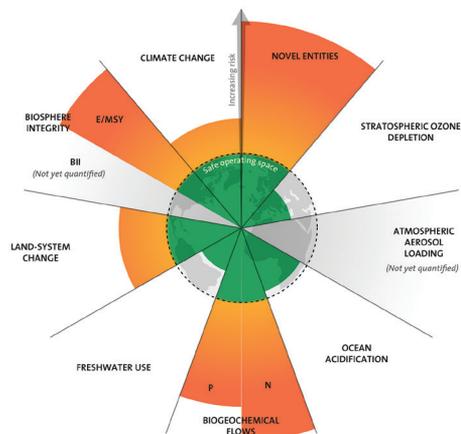


Figure 1. Diagram showing estimates of variables for seven of the nine planetary boundaries. The green shaded areas represent the safe operating space for human civilisation, while the outer reaches of the orange areas indicate overshoot and potential tipping points. For an introduction to the nine planetary boundaries, see Steffen et al., 2015.⁴ Image source: Wikimedia Commons.

of conceptual and contemporary art, science communication and illustration, Art Science, SciArt and ecological art reflected in the Art+Science series demonstrates a multifaceted and emergent way of working. There is no one-size-fits-all approach.

Basarab Nicolescu, in *La transdisciplinarité: Manifeste* (1996), gives a brief outline of the various ways of being in and conducting collaborative projects, which include multidisciplinary, interdisciplinary and transdisciplinarity. Multidisciplinary is an approach which enables research topics to be explored in several disciplines at the same time, but using the research frameworks of each discipline. With interdisciplinary research there is some trading of methodology between the disciplines. Transdisciplinarity shifts the goal posts, the boundaries and mixes up the players; it is “at once between the disciplines, across the different disciplines, and beyond all disciplines.”⁵ It is a more holistic approach, with a goal of understanding the world and finding a unity of knowledge. Nicolescu says: “A bridge can be built between science and ontology only by taking into account the totality of human knowledge. This requires a symbolic language, different from mathematical language and enriched by specific new notions.”⁶

I found the goal of the imperative of the unity of knowledge a useful starting point to consider. Unity of knowledge is an open but entangled concept. According to Harold Schilling, “All knowledge comes through awareness and creation, observation and interpretation. It is both empirical and theoretical. One meaning of the unity of knowledge, then, is that, while its objective and subjective elements are sometimes distinguishable, they are always inseparable.”⁷

Further on in *La transdisciplinarité*, Nicolescu sets out three axioms relating to the methodology of transdisciplinarity (ontological, logical and epistemological) and how they relate to his concept of the Levels of Reality:⁸

Reality is not merely a social construction, the consensus of a collectivity, or some inter-subjective agreement. It also has a trans-subjective dimension: experimental data can ruin the most beautiful scientific theory. (Or to take a more pointed example, collective denial of climate change will not stop warming seas from rising.) ... From a transdisciplinary point of view, complexity is a modern form of the very ancient principle of universal interdependence.⁹

Following the flow through these thoughts, I landed on Nicolescu’s notion of transdisciplinarity, but wondered where the audience sits in this model. The curator’s role adds a further disciplinary element, complexifying the scenario by targeting transdisciplinary knowledge towards wider audiences. This methodology builds depth with existing audiences and creates bridging opportunities with audiences outside the disciplines of the arts or sciences. The curator enhances the transdisciplinarity aspect and builds communities by inclusion of everyone, rather than just preaching to the choir.¹⁰ Transdisciplinarity, then, is essential to any methodology utilised in collaborations including Art+Science in the context of climate change. It moves beyond the boundaries of multidisciplinary, is multimodal in delivery and reception, and involves multiple levels of agency.

To illustrate this point, I offer a personal perspective on the multifarious nature of the Dunedin Art+Science project from my point of view as curator, and reflect on my curatorial practice that facilitates the transdisciplinary methodology in the context of art–science – a *practice of making* and a *practice of making available* to the public.

THE ART+SCIENCE PROJECT

The Dunedin-based project has attracted researchers from across the physical, biological and social sciences and from all studio disciplines in the arts, and has grown to become a respected and innovative project in New Zealand. Creative New Zealand recently commented that the project is compelling and rare in the artistic landscape of Aotearoa. “It brings together science and art and is one of the few in the country that successfully and actively works in this particular field ... producing artistic outcomes of high quality with potential and capacity to tour to other venues.”¹¹

The multi-year project takes a single word as a theme or lens of discovery for each year’s call for project. Past projects have explored themes relating to: *Anatomy* (2013), *Neuroscience* (2014), *Genetics* (2015), *Light* (2016), *Space* (2017), *Oceans* (2018) *Water* (2019), *Earth* (2020–2021) and *Air* (2022). The call for project invites participants to respond to a theme set in a wide context and scaling between the human and planetary, past, present and future, with views from the macro and micro worlds.

The projects have multiple outcomes. The “Art+Oceans” exhibition, for example, was the culminating art exhibition of the 2018 project, held at the HD Skinner Annex, Otago Museum, Dunedin, and later travelled to the Forrester Gallery in Ōamaru. Out of “Art+Oceans” came “Ōku Moana (My Oceans),” a satellite exhibition held during the New Zealand (International) Science Festival and Puaka Matariki Festival, at the Dunedin Community Gallery.¹² Further iterations of the exhibition were held at conferences and symposiums: Sustainable Seas National Science Challenge, Commonwealth Ocean Acidification Action Group workshops and “The Complete Entanglement of Everything” exhibition (2020), in association with the symposium Mapping the Anthropocene: Climate Change, Community and Research in the Creative Arts. A “Street Poster Exhibition” with Phantom Billboards was held in Christchurch and Dunedin and items were requested for display again at a later Otago Museum “Climate Change Pop-up” exhibition. Artworks have been woven into non-traditional events such as “Join the Dots” events in the Octagon, Dunedin, and at Techweek – along with electric vehicles, Suffrage 125 celebrations and talks – at the Dunedin Public Library.

ARTIST AS CURATOR

I am an artist and I am a curator. The terms “artist–curator” and “artist as curator” have been increasingly used since the 1950s in areas of collaborative practice and collective engagement.¹³ The 1960s were significant for the rise of curators such as Lucy Lippard, who stands out for her vision of the curator as mediator and social facilitator and a practice that was characterised by ethical activism.¹⁴ Lippard writes that the usefulness of art is to move people and to make an argument.¹⁵ Claire Tancons is an example of the new curators active in the collaborative arena. Tancons describes her role as coming out of personal interest and life experience, followed by empirical research and experimentation. She says that her style of curation is more akin to directing theatre: “In any event, my work is always research-driven, context-specific and, to a large extent, collaborative, in various degrees, and at various stages in the process. I like to allow for a mix of rigour and nimbleness at the same time.”¹⁶

Building on these ideas, I take the term ‘curator’ to imply a fluid process which involves a multifaceted approach to enabling and producing a project across a variety of platforms. These include but are not limited to the following: convening the participants from the various research

and studio disciplines around the theme; planning and strategic management of the project; curating the exhibition space; creative direction of publication; facilitating family-friendly public programmes; and mediating the exhibition experience for visitors during the exhibition run time by creating, nurturing and holding space during the exhibition. Although I have curatorial oversight of the project and exhibition, at the early proposals stage I ask various people for an independent perspective and advice on mātauranga Māori, and (later) regarding science communication and input on community engagement.

In *100 Atmospheres*, Lucas Ihlein and Ken Williams outline their ambiguous roles as artists in their multiple-paths approach to a socially engaged art practice. They provide examples of where they, as artists/facilitators, have created conversations between science, policy and community. Transdisciplinarity is foregrounded in this approach, where the result can be creating a community of interest around pressing site-specific issues.¹⁷ In the past few years, the exhibition format of the traditional artist floor talk has been expanded to a wider interactive public programme which includes meet-the-scientist sessions, hands-on art activities, demonstrations and workshops. The public programme moves the exhibition from traditional passive viewing to a more interactive experience, acknowledging the third partner in the Art+Science project, which is Community. In Ihlein and Williams' triple Venn diagram, at the heart or intersection of Science, Art and Community are social engagement and socially engaged arts for all.

The artworks in the Art+Science exhibitions are curated to provide accessible narratives and are also the setting for performances, storytelling and alternative means of communication. The exhibition can be read as a linear story, with the accompaniment of the catalogue/wall panels, or as a call and response across the room between artworks, and between artworks and activities. The narrative space is a hybrid space which enables aesthetic encounters and sensory engagements between measurements in the data and social and community relationships – what we see and feel (culture and community).

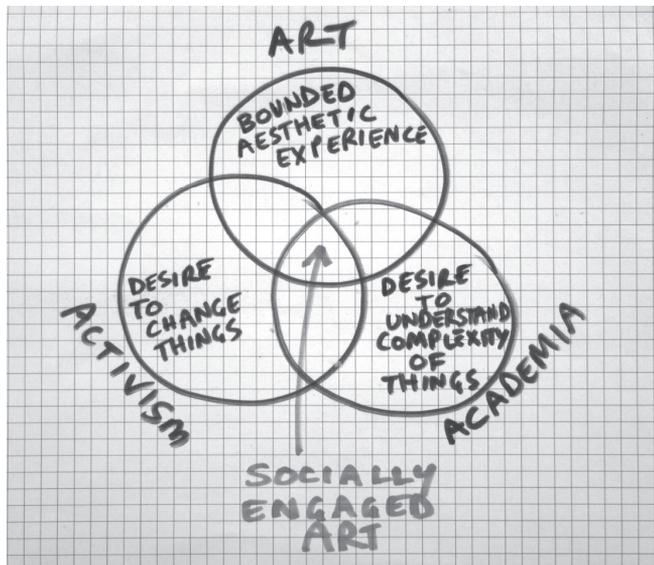


Figure 2. Overlapping methodologies in socially engaged art. See Ken Williams and Lucas Ihlein, "Two Places: Working and Walking with Waterways," in The Meco Network, *100 Atmospheres: Studies in Scale and Wonder* (London: Open Humanities Press, 2019), 345 (Figure 28).



Previously, in other articles, I have defined narrative space as a broad term, referred to in genres and settings as varied as novels and film (storytelling), theatre/drama and virtual reality (role-playing video games) and real-life environments (such as exhibitions and architecture).¹⁸ Marie-Laure Ryan asks if, as Kant says, time and space are two of the fundamental categories that structure human experience, then narrative is how we communicate the story or sense of that experience.¹⁹ It is a way of organising our experiences and making meaning. Is there actually such a thing as a non-narrative space? Since the Renaissance, narrative space in art has also provided a platform for what Lew Andrews calls “continuous narrative” in which several events can be shown in a single setting.²⁰ However, the story need not be a story in the traditional sense – a narrative space may be a space which is used to convey or explore a variety of themes and meanings, such as a time-scape in video games²¹ or a three-dimensional landscape.

As a result of this complex interplay of elements, the public programme also includes a variety of activities. Visitors have the opportunity to contribute to co-created community artworks facilitated by an in-gallery artist. Interactive elements encourage further dialogue, collaboration and public engagement and the sharing of ideas and skills.

This approach draws on the philosophy set out in the New Zealand Early Childhood Education curriculum, the *Te Whāriki* framework. *Te Whāriki* is an emergent curriculum that provides a framework which is holistic in outlook and an approach for “learning to learn for life.” *Te Whāriki* encompasses four founding principles interwoven with five strands: mana atua – wellbeing, mana tangata – contribution, mana whenua – belonging, mana reo – communication, mana aotūroa – exploration.²²

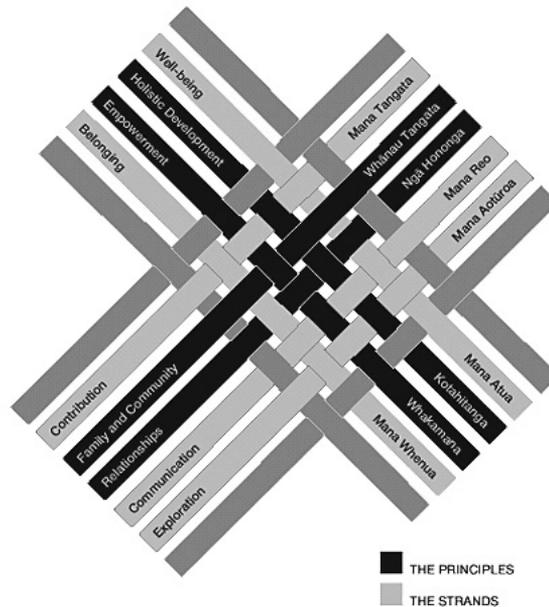


Figure 3. The name *Te Whāriki* is a word in te reo Māori meaning “woven mat” (see the diagram). It weaves the foundational principles, strands and goals together to represent the interrelatedness of these components of the New Zealand Early Childhood Education curriculum. The curriculum itself is provided by the people, places and things in the child’s environment including adults, the other children, the physical environment and the resources available. *Te Whāriki* does not provide any guidelines for content or teaching methods. These are designed at a local level and reflect the diverse families, multiple communities, cultures and tribes that are represented in early childhood education in New Zealand.²³

This framework offers ways whereby we can evaluate our own practice. The responses from the Art+Science exhibition audiences are evaluated through participants' own narratives –their recorded observations and artefacts created in the gallery. This is a mode of reflection and assessment borrowed from *Te Whāriki*. In this way, our records of dialogue, that include the responses of the participants themselves, can generate our data points.

The project also fosters relationships with local organisations. During the “Earth: Caught in Stone” exhibition, Waitaki Whitestone Geopark brought a little of their fossil world into the gallery as an activity, and in return we encouraged a visit to the Geopark. Similarly, Orokonui Ecosanctuary brought a little bit of the forest into the gallery, and we encouraged families to go and experience a day in the full forest on another occasion. In “The Sense of Wonder,” Rachel Carson emphasised the importance of sharing and developing connections with the natural world with children: “If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow.”²⁴ Carson advocated for a sense of (bio) curiosity in observation, drawing and participation as important tools towards understanding nature and re-establishing our ecological relationships.²⁵ We need to have empathy with the “more-than-human”²⁶ or, as Donna Haraway puts it, come to know that all creatures on Earth are kin.²⁷

CURIOSITY AND IMAGINATION

In an article looking at brain-body imaging Madeleine Gorges et al reported a sense of alarm at how much a general audience might add their own interpretations to their understanding of the “science”. From psychology we have learnt that we do not experience reality as it is. We experience reality as it seems, to *Us*. Our picture of reality emerges from an interaction between information arriving at the senses and *Our* expectations drawn from memory. In reverse in the arena of contemporary art we are seeking audience interpretation. What does *It* mean? Gorges and her colleagues suggest the ways that a sense of curiosity, creative thinking and desire to have a greater understanding and sharing of our understanding of the world bring artists and scientists together in collaborative projects.

There are three main points in which artists and scientists might overlap in collaborative projects: the question, the process, and the product.”²⁸

However, the abstract symbols used to express scientific truths are sometimes too abstract for viewers from outside scientific disciplines, and we need to build a bridge back to the lived experience of the world through visuals and the telling of new and old stories. One of the world's great contemporary storytellers, Salman Rushdie, says that Man is the storytelling animal, the only creature on earth that tells itself stories to understand what kind of creature it is.²⁹

During the exhibition, the curator brings the underlying ideas of the science to the fore so that the artworks give audiences a space to negotiate their implications at their own pace and from the bedrock of their own cultural background and experience. Art can evoke an emotional response – as in the climate-change artworks of Zaria Forman, who says, “Art moves us in a way that facts may not.”³⁰ Alex Evans in *The Myth Gap* argues for the importance of the visual arts and storytelling. We do not learn by fact alone, he says. Facts suppose a flawed model of reasoning. We are not “brains on sticks,” computing inputs by reason. Rather, Evans argues that we are narrative animals,

“framing and making sense of our lives through stories, both at individual and communal levels ... We resonate emotionally before we process rationally.”³¹ In an interview with biologist Robert Sapolsky, Abbas Milani describes Sapolsky’s writing as “the artform that defamiliarises reality, making us recognise the complexities of the things we thought we understood, and making simple the things we thought were complicated.”³² Often science presents reality as a graph as if this is a *fait accompli*, but this fails to capture our imaginations. We need a narrative to understand. Evans says: “Our imaginations are ‘captured’ before our intellects are engaged.”³³

To assist this process, the project exhibition creates opportunities for visitors to engage in the co-creation of community artworks. To paraphrase Lorna Cruickshanks and Merel Van Der Vaart, who argue for the value of *citizen science*, we view art and audience participation through positionality as a means of learning through *citizen art*.³⁴ Art adds at least two things, value and dialogue, resulting in the sense of value that comes from a dialogic engagement when the viewer is an active participant. Neither the artworks nor the associated activities discount the data, but they provide a handle for the viewer that opens out their imaginative capacity. Neuroscientist Antonio Damasio talks about reason and creativity as a chain of operations forming the relationship between emotion and cognition.³⁵

At the transdisciplinary interface, the exhibition is a means of multi-layered communication. There are different modes in which to encounter the artworks, from passive encounter with a traditional exhibition catalogue to a more interactive mode in discussion with one of the exhibition guides/interpreters. In the gallery, we also have a virtual presence of the scientists via a Pecha Kucha-style presentation of the underlying ideas in the group show. We proceed from the assumption that people like people, and we have received feedback from our audience that they appreciate the extra efforts made to connect with them. The exhibition catalogue is made available online (free) before the exhibition. There are also the hands-on, creative ways to respond to the exhibition through the in-gallery activities and workshops during the public programme. The resources are also made available to local educators for classroom use away from the exhibition space.

MULTIVALENT AND MULTIMODAL FEEDBACK

Art’s potential to create the opportunity to build capacity for inter/action can be illustrated in the responses we gathered during the exhibition “Ōku Moana (My Oceans)” (2018), in the written words, drawings, musical and social media responses.³⁶ The artworks set the scene, providing a greater narrative space.³⁷ In-gallery artists and scientists were on hand to tell the stories and answer questions. In return, visitors questioned, continued or emphasised the storylines in their responses through dialogue, written feedback and co-made artworks, including performance and waiata.³⁸

When we look back at the multimodal records of people’s voices, using “Ōku Moana” as an example, we see a measure for successful engagement. Over 600 written messages were left across all the recording activities during five days, and they revealed diversity in content. Different languages were used in the written responses, which suggested both ease and engagement for participants of all ages. The ‘visitor book’ recorded a constant community ‘stream of consciousness,’ as did the aspirations and responses incorporated into the ‘wishing tree.’ In all, there were three co-created community artworks plus takeaway art activities produced during the exhibition run of five days. These were all ‘arty facts’ of audience participation and engagement.³⁹

AGENCY

How can we go about using art to raise awareness? Art viewership at its best is an active process, in which notions of truth and values are consciously tested and remade through thinking. Art imitates life.

Inasmuch as art provokes thought, it is a provocation. Inasmuch as we hope that art will inspire climate action,⁴⁰ it is activism. Artists tell us about what is happening in our society, they reflect our world – everything from human emotions to the politics of the times. This is a well understood role of an artist in our society.⁴¹ In the 1980s, East Coast Australian arts collective Mambo countered art's imitative role for a more active role with the catchphrase "Art irritates life."⁴² As regards climate activism, Leimbach and Armstrong argue that "Arts-science projects have the ability to engage diverse publics with the potential to 'do' social, cultural and political work, helping reframe partisan political debates ... The learning opportunities they provide for both collaborators and audiences may therefore also contribute to the development of skill sets and knowledges capable of confronting the massive challenges of the 21st century."⁴³

Does art have agency? Can art be a catalyst for change? In social science, agency is the capacity of individuals to have the power and resources to fulfil their potential. Human agency is the capacity for human beings to make choices and for those choices to have an effect on the world. As people working in the arts and sciences, we find ourselves at the crossroads where both the sciences and arts are under attack. Historically, the arts have been a cornerstone of social movements. Often working at the margins, the arts have the capacity to challenge the status quo.

A provocation in thinking these issues through was provided by an interview with art historian Peter Stupples in 2017. Speaking on the revolutionary art of Russia, Stupples argued that the impact of art was negligible as an agent of change during the revolution. Its role was rather in the area of discourse of change – that is, coming during and after key events. "The humanities teach you to think," says Stupples. "Visual culture doesn't really change people's behaviour. It usually follows, or it supports or emphasises."⁴⁴ He argues further that art's role in informing debate doesn't lead to action, rather "the action comes from another part of the field."⁴⁵

Running counter to this view, and paraphrasing Kieran Long's "95 Theses" for contemporary curation, art has been seen as having an important role to play in the public realm. Art creates an agora in which to provide "a space for the public to encounter itself."⁴⁶ Long's idea that discourse is change is revolutionary. This is the kind of action that art can bring to create paradigm shifts. Recently, a group of art activists, Culture Declares Emergency, born out of the United Kingdom's Extinction Rebellion movement, declared:

Science and technology alone cannot play the role of interpreting the existential crisis we face. ... Participation is key to many of today's cultural and arts practices; building creative skills, lost crafts, and learning through doing and engaging. Drawing on patterns of belonging, empathy, kindness, stewardship ... culture energises people's courage and capacities for action to respond collectively to challenges faced."⁴⁷

This view is shared by former US advisor on climate change, Gus Speth, who sees a role for culture as a necessary agent in transformational change:

I used to think that top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation. And we scientists don't know how to do that.⁴⁸

For those who feel overwhelmed by the sense that we are standing on a precipice, art has a certain capacity to engage with the affect of climate change⁴⁹ – the embodied experiences of uncertainty, fear and hope. Janet Stephenson, a social scientist working at the Centre for Sustainability at the University of Otago, concurs when she says that “action reduces anxiety” and that the ability to do something or express yourself is important in moving pathways towards adaptation.⁵⁰ Again, Culture Declares Emergency says that “Creativity is the antidote to despair.”⁵¹ According to arts administrator Carla van Zon, artistic collaboration is pivotal to our climate crisis response:

Artists working together with scientists may be a way to reach many people and help us all to respond. Science has identified the problem and provides solutions. But it's the arts that are pivotal in telling us about who we are and what we want to be – and providing narratives of hope to help shape our response to the biggest challenge of our era.⁵²

Increasingly, mass and social media are controlled by sponsored algorithms and entrenched narratives from those most responsible for environmental degradation.⁵³ Amitav Ghosh, in *The Great Derangement: Climate Change and the Unthinkable* (2016), laments that despite the climate emergency, sci-art as a vehicle to create discussion has gained little traction among the art community. He fears

that this moment in history might end up being remembered as ‘a time when most forms of art and literature were drawn into the modes of concealment that prevented people from recognizing the realities of their plight. The scalar and temporal magnitude of the phenomena of climate change poses a unique representational and aesthetic challenge in depicting ‘the long emergency.’⁵⁴

The twentieth century brought us the term Anthropocene, which is now used to characterise the effects of human activity as the dominant influence on the climate and the environment. It is also an acknowledgement that nature is no longer seen as discrete from human activity. In a critique of Bruno Latour's *Politics of Nature*, TJ Demos calls on artists to counter the “complex actor-institutional network that motors the global fossil-fuel ecologies of unsustainability” that has resulted in “the manifold violence that is climate change.”⁵⁵

Irrespective of tribe or culture, research shows us that we need to use story and we need to “make Art as if the world matters.”⁵⁶ For those who are uninformed, unconvinced or habituated in denial, artworks can be a pathway to introduce ideas in a non-confrontational manner. By sitting at the intersection of personal values, knowledge and society, art can help us to look at things differently. Art can be an entry point for people to engage on an issue – it opens dialogue. Talking about his work *Ice Watch* (2014), Olafur Eliasson asserts that art's power lies in providing a “safe space in which to have difficult conversations where we can share *without* having to agree.”⁵⁷

Interactions with artworks in the exhibition have the capacity to form ripple effects either through aesthetic interaction and unexpected encounters, or through the art activities that run alongside

the works on display. Art activities that the public can engage in during the exhibition – for example, the embossed prints on rag paper (“Coccolithophores Impressed”) organised at “Ōku Moana” by the Sandpit Collective⁵⁸ – can be of a high quality and are likely to be retained and valued for some time to come. Barbara Stafford (2008) calls such works echo objects⁵⁹ – creations that encourage participants to share memories about the event in the subsequent days or weeks. This is more likely to occur if memories are based on an artefact that the audience member attaches value to because they have made it themselves during an event, if it is of high quality and/or it is a memento of an enjoyable experience.

CONCLUSION

Investigations in the hard sciences are essential to understanding our world and the significant issues we are facing. We are all living in an age of unparalleled quantities of information, and it is easy to feel lost or despair in this deluge of data. As art makers in the Art+Science project, we work collaboratively using a transdisciplinary methodology to ‘ART-iculate’ the data. Through these works, artists seek to engage responses from the community through an aesthetic encounter which recognises the complexity of raw facts, but expresses them in terms of visually recognisable representations or communally relatable patterns. By creating narrative spaces, we invite the audience to partake in the ideas behind the data and encounter the storytelling via the visual, written, spoken and/or performed word. Through the variety of audience responses, we gain an intrinsic measure of audience response through their engagement, participation and feedback. We are *Homo narrans*⁶⁰ and as artists we use visual texts to tell our stories. It is the role of the curator to create space for conversation and re-imagination of the world in dialogue with those experiencing change. If as artists we make art as if the world matters, we send a signal that we care. We bring hope to hubris – hope that we can mitigate the changes humanity is creating at the planetary scale. A reminder that hope was the first gift that Prometheus gave to humanity.⁶¹ We hold the hauora of the community at the heart of what we do by learning through doing in a process of reciprocity.

The Art+Science project gives people an opportunity to view, to wonder, to discuss, to understand, to create their own artworks and explore from their own bedrock of understanding in the multiple ways of the exhibition encounter.⁶²

Pam McKinlay has work and research histories in applied science, art and publishing. Her work is concerned with the transference of ideas and knowledge – the process and practice of making and the process and practice of making available to the public. She has been the artist–curator of the Art+Science project since 2018.

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