

Environmental Art as Remedial Action: From Meditating on to Mediating in Earth's Energy Imbalance

AUTHOR BIO

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ABSTRACT

Since 1992 the United Nations Framework Convention on Climate Change has met every year in an attempt to implement a global mechanism for averting runaway climate change. Over these 25 years the concentration of carbon dioxide in the atmosphere has gone from 352 Parts Per Million (PPM) to 408 PPM in 2017. Even at the time the UNFCCC was conceived, the CO₂ concentration was already above 350 PPM, the conservative notional maximum concentration that would not precipitate runaway climate change. Concentrations of greenhouse gases have resulted in Earth having a net energy imbalance since 1971, whereby more energy is retained in the atmosphere and hydrosphere than emitted back into space. In addition, the roughly four decade inertia of the climate system is such that the climate currently being experienced is due to emissions from around the time the Earth went into positive energy balance in 1971. Given the volume of emissions since then, a substantial increase in climate is already committed even if all releases ceased today.

In light of how global mitigation attempts have manifestly failed to decrease Earth's Energy Imbalance, the last decade has seen a substantial increase in scientific research and proposals for an altogether different response: intervention through climate engineering. The consequences of inaction (mitigation as intentional influence) or action (climate engineering as intentional intervention) have planetary scale consequences. In response, this article explores an emerging body of art practice that has shifted from meditating *on* the manifestations and consequences of climate change, to mediating *in* Earth's Energy Imbalance. The article explores this shift in practice of environmental art as remedial action from invoking forms of climate engineering to intentionally intervene in the causation of climate change. The discussion of this emerging body of practice speculates on how art that mediates in Earth's Energy Imbalance offers a portent of the Anthropocene as the re-making of the world-as-artifact.

KEYWORDS

Climate Engineering, Climate Policy, Remediation, Earth's Energy Imbalance, Anthropocene

The Endless Summer Revisited

In the future, leaves will turn brown
 When we want them
 And I don't have the right
 To interfere

“Interference,” *Tomorrow's Modern Boxes*. Thom Yorke (2014)

An 18,000-watt array of monochromatic sodium lamps is suspended in a semi-circle, high up on the Western wall of the Turbine Hall at the Tate Modern. The lamps exude a spectral, yellow light – radiating out across the Hall's cavernous 3,400 square metres. To increase the light's intensity, humidifiers distribute a mist of sugared water across the space. The light's intensity is further amplified by a mirror running along the entire length of the Turbine Hall at the juncture between the semi-circle of lights and the ceiling. The reflection makes the array form a sun-like circle, and casts the audience on the Hall floor into the sky-like reflective surface of the ceiling.

The Weather Project conjures up an artificial atmosphere, where a surrogate sun renders everything hues of yellow and black. The artist is the orchestrator of this engineered environment, creating the “atmosphere” behind a Wizard of Oz-like curtain, by operating levers that modify the amounts of light, water vapour and humidity. Writing in the exhibition catalogue, Susan May describes the installation as manifesting an “internal weather system of Tate Modern” (15). In the Turbine Hall, the non-linear system dynamics of this “weather system” are “catalysed not by atmospheric pressures and cold fronts, but by a timetable governed by the artist,” Olafur Eliasson, who modulates their ebb and flow throughout each day (15).

Through the energetics of this system, *The Weather Project* offers a proxy for how Earth receives and retains radiant energy from the sun. The cavernous Hall receives incoming heat from the sodium lamps, which create an energy gradient that visibly dissipates the smog-like thickness of the “internal weather system” (May 15). The building retains this heat by being largely sealed, other than the ground floor street entrance. The Earth entertains a similar relationship with incoming radiant energy from the sun. Greenhouse gases assist in retaining heat-energy in the atmosphere, versus fissures that facilitate the escape of heat into outer space, like the Hall's open street entrance.

Seemingly entranced by this artificial atmosphere, audiences experience a simulacrum of the way Earth receives and retains radiant energy from the sun. Yet *The Weather Project* could, alternatively, rupture the calm, contemplative experience connoted by meditating on this Earth-sun energy relationship. With its technological infrastructure deliberately laid bare and accessible, audiences could pull back the curtain on the Wizard, dispelling the illusion by walking underneath and behind the array of lights, and up to the emission-points of the staggered humidifiers. Instead, they lie down on the floor *en masse*, staring at themselves reflected in the ceiling, sending messages to and from one another by moving their bodies in the reflection. Some even

stage rehearsed “performances” within the installation, spelling out choreographed words and shapes with their bodies. In this artificial atmosphere, humans are reflected in the sky – every action visible back to themselves and to each other. For critic Brian O’Doherty it seems audiences are “intoxicated with their own narcissism as they ponder themselves elevated into the sky” (56).

Over the six months of its staging, from October 16, 2003 to March 21, 2004, over two million people visited the installation. A social experiment in artifice and artificiality, *The Weather Project* is Eliasson’s most celebrated work to date from his oeuvre of installations that act as catalysts for synthetic sociality. Whether it was the notoriously dismal London autumn-winter weather that repeatedly drew crowds in to bask under the “impossible beach” (Fava 184), *The Weather Project* appeared at a critical juncture for European sensibility toward both climate change, and the sun itself. The installation opened six weeks after the June-August European heatwave, which dominated media coverage as more than 70,000 people died from heat-related impacts. Even though the heatwave mostly affected Western Europe, discussion of whether it was a portent of climate change remained a hot topic in the UK, coinciding with the highest recorded temperature to date of 38.5°C on August 10.

Rachel Cooke, reviewing the installation three days after its opening, lamented how the real sun had changed her sensibility toward the artificial sun:

When, at the end of a sweltering summer, it was revealed that across the Channel the heatwave had killed thousands of people, that the mortuaries were full and the priests too busy even to pause for lunch, it was difficult to take the news in. I, for one, was incredulous. I remember listening to the radio, and frowning. Had the sun really done this? Was such a thing still possible?

With this context in mind, Cooke deduced Eliasson’s oblique “nod to global warming” in the work, because he “began work on the project during a month when the newspapers were full of little else.” She also remarked on “his references, which float unspoken on the ether” to “the idea of sustainable energy” regarding “the ‘sun,’ here housed in a former power station.”

As with *The Weather Project*, concepts for action in the arena of contemporary environment arts remain largely beholden to an “idea of sustainable energy” that does little more than provide an oblique “nod to global warming.” With regard to the former concept, of action by way of “sustainable energy”, it was not until September 2015 that Tate Modern derived any of its energy from renewable sources, beginning with solar panels installed on the roof of the Boiler House. None of the Tate’s released documentation about their energy usage or policy includes the amount or proportion of renewable energy. Instead, “sustainable energy” remains an “idea” obfuscated in promissory terminology. With regard to the later concept, of action by way of concerted

engagement with either climate change causes or consequences, the irony of using a former coal-turned-oil turbine hall was unacknowledged by Eliasson, or the Tate's press for the project. Instead, Eliasson referred to *The Weather Project* as encouraging a meditative modality. This was in keeping with the prevalence for classical and contemporary art to act as a meditation on a subject.

A meditative modality is also prevalent in art critically engaged with anthropogenic climate change. For instance, critic Jessica Lynne remarked how the 2015 visual art exhibition *New Dominion* “reflects the ruminations of an artist meditating on the relationship between the environment and collective consumption”. The terminology of a meditative modality is also used to describe other art forms, including performance art. The following year a multi-media performance called *Ice Cycle* was billed as an event that “meditates on the precarity of Arctic icescapes in an era of global climate change.” The organisers framed this meditative modality in the wider context of the performance as “a crucial example of the growing body of art that translates the abstract fact of climate change into sensory details and narratives that hold people’s attention” (*Ice-Cycles*).

Similarly, *The Weather Project* privileged sensory engagement that captivated audiences’ attention, rather than self-reflexive institutional critique of the ironic resource intensity of 18,000-watts of fossil-fuelled energy used to make a surrogate sun, or the site-specificity of the former use of the Turbine Hall as a coal-turned-oil powered station. For his own catalogue essay, “Museums Are Radical,” Eliasson framed *The Weather Project* as not only being experienced through contemplative meditation, but also through being mediated upon. He cites, as a source of inspiration for the project, his observation that:

Every city mediates its own weather. As inhabitants, we have grown accustomed to the weather as mediated by the city. This takes place in numerous ways, on various collective levels ranging from hyper-mediated (or representational) experiences, such as the television weather forecast, to more direct and tangible experiences, like simply getting wet while walking down the street on a rainy day. (*Museums Are Radical* 129)

In contrast to demonstrable anthropogenic perturbations *on* the weather, Eliasson maintains that “the weather as mediated by the city” solely pertains to mediating the anthropocentric experience *of* the weather. This is not exclusively true. Rather, a city literally mediates *in* the weather through the Urban Heat Island effect. The cumulative heat absorbed then radiated by urban infrastructure – including tarmac, concrete, steel, and glass – mediates *in* weather systems by altering their behaviour. Beyond the more obvious effects, such as raising a city’s temperature relative to surrounding non-urban areas, an Urban Heat Island also mediates *in* the weather outside of a city, by unintentionally redirecting substantial portions of rainfall downwind (Shepherd et. al. 690).

The Urban Heat Island effect provides a mesocosm of planetary-scale anthropogenic climate change, just as *The Weather Project* provides a microcosm. The former exerts an unintentional influence on local climate. The latter manifests an intentional intervention in an “internal weather system” (May 15). Scaling up from the microcosm to the mesocosm and onto the macrocosm of the entirety of the Earth we find a similar conflation between unintentional influence and intentional intervention. And yet artistic engagement with climate change has overwhelmingly favoured meditating *on* rather than mediating *in* Earth’s Energy Imbalance. In response to this dearth, my aim is to reconceptualise the notion of action that is commensurate with the empirical state of this imbalance. The means for prefiguring proposed remedies is through provocations in the environmental arts as they relate to Earth’s Energy Imbalance. The notion of seeking to remedy this imbalance is highly contentious. Any remedial action that is actually commensurate with the temporal and spatial scale of this imbalance invokes the moral quagmire of climate engineering. Thom Yorke expresses this quagmire in his lyrics with which this article opened. Taken from his 2014 song “Interference” Yorke laments a futuristic scenario of climate engineering that has sought to control the seasons where “leaves will turn brown/When we want them.” Over the course of the song he ruminates over whether he has the “right/To interfere” in an intentional intervention in anthropogenic climate change. To consider whether, how, and whom could have any such right, I will first turn to disambiguate the notion of “mediating” in relation to climate change and the arts.

Mediating in the Projected Weather

The distinction here between “mediating X” and “mediating *in* X” is substantive rather than merely semantic. In December 2003, mid-way through *The Weather Project*, two scientists central to conceiving of the Anthropocene and validating its scientific veracity argued “Earth is currently operating in a no-analogue state” (Crutzen and Steffen 251). By this, Paul Crutzen and Will Steffen meant that anthropogenic influence on the Global Earth System is so pronounced that there is literally no analogue for the present or the ensuing “no-analogue future” (Williams et. al. 35). Crutzen and Steffen derive such insights from Global Circulation Models, which mediate climate data to reconstruct historical and project future trajectories. As a result of climate modelling, no longer does the 2003 heatwave present an aberration in living memory, or even in millennial proportions of being the hottest recorded summer in almost 500 years. Neither does “every city mediate its own weather” (Eliasson, *Museums Are Radical*, 129). Instead, anthropogenic forcing has also mediated *in* the entire functioning of the Global Earth System.

The principal means for precipitating the “no-analogue state” (Crutzen and Steffen) and “no-analogue future” (Williams et. al.) of the Anthropocene is the ratio between incoming and outgoing solar radiant energy. From the cumulative effect of combusting fossil fuels, Earth’s energy balance shifted from negative to positive in 1971, where it has remained and has since grown increasingly positive (Murphy et. al.: Nuccitelli et. al.). Since 1992, when the

UN Framework Convention on Climate Change (UNFCCC) was formed, mitigation of global greenhouse gas emissions has been the foremost framework to redress this energy imbalance. The initial shift of the Earth from negative to positive energy balance was an unintentional by-product of industrial civilisation. However, attempts to mitigate climate change by mediating *in* current energy policy to redirect future climate trajectories marks a shift from unintentional to intentional influence.

Global mitigation attempts by the UNFCCC through twenty-five consecutive annual UN Conferences of Parties have manifestly failed to decrease Earth's Energy Imbalance. Over these twenty-five years since the UNFCCC was formed the concentration of carbon dioxide (CO₂) in the atmosphere has gone from 352 Parts Per Million (PPM) to 408 PPM in 2017. Even at the time the UNFCCC was conceived, the CO₂ concentration was already above 350 PPM, the conservative notional maximum concentration that would not precipitate runaway climate change. In addition, the four-decade inertia of the climate system is such that the climate currently being experienced is due to emissions from around the time the Earth went into positive energy balance in 1971. Given the volume of emissions since then, a substantial increase in climate is already committed even if all releases ceased today (Meehl et. al., Zickfeld et. al.).

In light of how timeframes for averting runaway climate change are determined by the unyielding laws of physics and chemistry rather than the pace of global policy negotiation, the last decade has seen a substantial increase in scientific research and proposals for an altogether different response: intervention through climate engineering. Kathryn Yusoff points out that the “logic” of a superficial similarity between unintentional anthropogenic climate change and intentional climate engineering is “used to defend geoengineering to its critics” (2801). By this rationale, “there is little distinction between inadvertent geoengineering (anthropogenic climate change) and overt climate engineering, just one of intent” (2801). Maialen Galarraga and Bronislaw Szerszynski are similarly disdainful of the “logic” Yusoff inveighs against. They expand on the distinction outlined by Yusoff, regarding the distinction between influence and intervention:

The very definition of geoengineering means that it is intentional and planned; the full-scale implementation of Solar Radiation Management would thus result in a climate that was an artefact – a climate that has not just been disturbed by human intervention, but has been intentionally shaped by human intervention. (221)

Proposals to shape Earth's climate by intervening in its energy imbalance date back over 50 years. In 1962 Harry Wexler, Chief of Scientific Services at the United States Weather Bureau, put forth the first proposal that constitutes climate engineering, in *On the Possibilities of Climate Control*. Wexler built upon a much longer history in the United States of proposed interventions, albeit of the relatively regional and short duration of weather control versus the planetary scale and deep time durational effects of climate change and climate engineering. For instance, in 1840 James Pollard Esby,

the first United States. Government meteorologist, proposed a systematic network of fires to form “artificial volcanoes” in his *The Philosophy of Storms* (Fleming). Yet Espy’s proposed weather control did not quantitatively or qualitatively constitute climate engineering as the aim was to ephemerally control regional weather.

So, while Galarraga and Szerszynski also refer to a volcano-related intervention, Solar Radiation Management (SRM) is otherwise incomparable to Espy’s “artificial volcanoes” as SRM entails mimicking the cooling effect volcanoes induce on climate by reflecting incoming solar radiation back into outer space. The foremost climate engineering technique, Stratospheric Sulphur Particle Injection (SSPI), proposes to mediate in Earth’s Energy Imbalance via continuously injecting sulphur particles into the stratosphere. Unlike Espy’s system of “artificial volcanoes” this contemporary version of mimicking volcanoes would affect the entire functioning of the Global Earth System.

SSPI received an air of legitimacy when Paul Crutzen declared his provisional support for researching the efficacy of such an intervention in his 2006 article on “Albedo Enhancement by Stratospheric Sulphur Injections: A Contribution to Resolve a Policy Dilemma?” Posed with the poignant use of a question mark to end the title, Crutzen’s article has reverberated through the work of scientists, given his standing as a Nobel Prize laureate for co-discovering the Ozone hole and as the first to propose geologists formally rename the current epoch as “Anthropocene.” In response to such a polemic for what constitutes remedial action in the face of anthropogenic climate change, in the following I chart emerging practices that have shifted from meditating on the consequences of climate change, to mediating *in* the causes of climate change vis-à-vis Earth’s Energy Imbalance. Such an approach to the environmental arts may be attuned and responsive to the rapidity of changing environmental conditions by offering a portent of the Anthropocene as the re-making of the world-as-artefact. In discussing these practices, the central dilemma pertains to what may constitute “remedial action” for the environmental arts, in response to Crutzen’s 2006 policy polemic for energy, climate change and climate engineering.

The Art of the Anthropocene

The Weather Project offers a cogent metaphor for weather control. However, in the context of contemporaneous Global Earth System science and climate engineering research, the seeming innocuousness of its artificial atmosphere was actually occurring amidst climatic upheaval implicit in Crutzen and Stefan’s announcement of Earth being in a “no-analogue state.” Analogously, the installation reifies the meditative modality so dominant in art, at a time when an emerging body of practice has moved from meditating on, to mediating in, Earth’s Energy Imbalance. Such artistic practice has shifted from meditating on the manifestations and consequences of climate change, exemplified by melting glaciers, to intentionally intervening in the causation of climate change, exemplified by art that evokes either of the two main fields of climate engineering: Carbon Dioxide Removal (CDR) and SRM.

Cooling Station: Worldwide Geoengineering and Local Weather Making was one of the first exhibitions in the world on climate engineering, staged in Austria in 2012. Yusoff described the artists and researchers in the exhibition as having “explored proposals for interventions in the climate” and in doing so, “opened up questions about the making of models and worlds” (2805).

As an emerging body of practice, this shift from meditating on to mediating in global climate has not yet been subject to sustained critical analysis. Kayla Anderson’s 2014 article on “Ethics, Ecology, and the Future: Art and Design Face the Anthropocene,” was one of the first survey articles to critique this shift in practice. Anderson is highly critical of this shift, arguing that “Anthropocene narratives coming from the art world seem to be most potentially destructive when they propose to do something, further reinforcing an attitude of human dominance over the planet” (338). While she does not define or provide an example of what “to do something” entails, the context indicates a normative definition. That is, a smaller part (“some”) of a bigger entity (“thing”), as distinct from “everything.” Even in this definition there is still a seismic gap between this “to do something” and an attitude of “human dominance over the planet.” The extant field of bioremediation art since the 1960s attests to how “doing something” does not necessarily entail “human dominance.” In this vein artists “do something” by seeking to redress deleterious biophysical ecosystems as art practice. However spatially or temporarily limited such practice is, whether to a section of river, a contaminated industrial site and the like, it is hardly “reinforcing an attitude of human dominance.”

Instead, Anderson advocates for dominant meditative practices whereby “paradoxically, art initiatives that stimulate critical thinking rather than simulate action have the potential to be most constructive” (342). Like her use of the term “something,” Anderson also does not define or offer an example of what constitutes “constructive.” As the consequences of inaction (mitigation as intentional influence) or action (climate engineering as intentional intervention) are of a planetary-scale, privileging “art initiatives that stimulate critical thinking” reinforces oblique engagement with Earth’s Energy Imbalance, exemplified by the meditative modality of *The Weather Project*. This is not to denigrate the role of a meditative modality toward Earth’s Energy Imbalance, but rather to forgo art practice and criticism that privileges mediating climate change over mediating in climate change. If there is to be a “potential to be most constructive” this would entail a shift in practice from meditating on to mediating in Earth’s Energy Imbalance: that is, from “simulate action” to “stimulate action” that remediates this energy imbalance. Such remedies include the relatively benign CDR technique of massive afforestation, as trees extract CO₂ from the atmosphere. Picture Joseph Beuys’s *7000 Oaks – City Forestation Instead of City Administration* scaled up a million fold as an enactment of such a proposed remedy. And yet, rather than increase afforestation rates, global deforestation rates have been increasing for decades. So, while this shift in practice should not necessarily entail a stance in favour of climate engineering, it remains something of a demonstrable failure that CDR could meaningfully redress Earth’s Energy Imbalance.

Notwithstanding the irony of using scholarly writing to critique the imbalance toward “thinking” over “doing,” I concur with Anderson that the act of meditating on the Anthropocene does yield preliminary insights that are otherwise unobtainable. For how else could the significance of mediating in Earth’s Energy Imbalance be made, if one did not already understand and appreciate the magnitude of the imbalance itself? Scholarly engagement about Earth’s Energy Imbalance fulfils a thinking-response to a dearth of “constructive” doing. Journalist Ian Welsh opens his 2015 blog post about “Surviving Climate Change” with the sentence: “The news is all bad. You may have seen this graphic already, but it’s worth meditating on,” followed by a Cartesian graph showing the shift from net negative to net positive energy balance over the 20th century, with the year 1971 again marking the pivotal turning point. In the same year as Welsh’s blog post, a team of International Relations scholars presented “Planet Politics: A Manifesto for the End of IR” at the Millennium Conference on *Failure and Denial in World Politics* with a “manifesto ... not about politics as usual” but rather about “meditating on the failures that have come before and making the urgent changes needed for future survival” (Burke et. al. 1). In an editorial from the first volume of the *Nature Energy* journal launched in January 2016, the editor, Nicky Dean, explicitly laid out the urgency of the required changes:

It’s clear that dealing with climate change calls for deep (and, likely, total) decarbonisation of our energy system, which entails a fundamental transformation of our infrastructure. It also demands immediate and rapid action, as our window for avoiding the disastrous consequences of carbon emissions is ever shrinking. (15026)

In art, there is generally a trade-off between oblique and direct engagement with Earth’s Energy Imbalance. To advocate a position akin to the “Planet Politics Manifesto” or Dean’s introduction to the *Nature Energy* journal is generally anathema for art. Once demoted to “activist” or “propaganda” art, direct engagement is generally relegated to the echo chamber conundrum, whereby a viewpoint reinforces already held viewpoints for those who have already agreed, while continuing to not inconvenience those who currently disagree (Lorien). The echo chamber conundrum raises the dilemma: if *The Weather Project* had made more than a “nod” (Cooke) to climate change and the 2003 European heatwave, would two million people have attended, spending hours basking under the glow of the artificial sun? In *Environmental Apocalypse in Science and Art* Sergio Fava asks:

Did the two million visitors ... get the hypercomplex causality chains represented in the scientific literature? There is no doubt they knew the “beach” was impossible, but they returned in masses to relax in its sunlight. Maybe it’s not just a matter of exploring clumsy solutions for messy problems, it’s also a matter of valuing ways to destabilize our stagnant assumptions. (184)

Fava’s rhetorical question echoed through the same Turbine Hall three years after *The Weather Project*, when David Attenborough used the same floor

space to project large scale Cartesian graphs of climate change in his documentary *The Truth about Climate Change*. Attenborough's staging gained widespread media attention, as it was the first time he had publically spoken about climate change being anthropogenic. The promotional billing dramatised his Damascus Road experience, describing how, having been "long unsure about the causes of the observed climate warming ... he sheds doubt and explains what convinced him" (Attenborough). Walking along the floor of the Turbine Hall, Attenborough explains his conversion by following the rise and rise of the graph while explaining to the camera, the "key thing that convinced me at any rate was a graph like this one that we marked out on the floor."

Fava's rhetorical question also echoed through the same floor four years after Attenborough, when Liberate Tate started their performative interventions about the relationship between art organisations and fossil fuel companies. Through six years of performative interventions in the Tate Modern, Liberate Tate were able to "destabilize our stagnant assumptions" (Fava 184), not only about the elephant in the room of oblique engagement in art on climate change, but also on the relationship between art organisations and their fossil fuel sponsors. After twenty-six years of patronage, BP announced in May 2016 that it would cease sponsoring the Tate. While Anderson argues in favour of "art initiatives that stimulate critical thinking rather than simulate action," Liberate Tate's mediating in the Tate Modern demonstrates a "potential to be most constructive" (Anderson 342).

Two of Liberate Tate's first interventions involved appropriating dominant tropes of climate change consequences – melting glaciers – and causes – oil – to illegally enact both tropes in the Turbine Hall. For their January 2010 performance *Floe Piece*, Liberate Tate dragged a piece of Arctic ice from the Occupy London camp, directly opposite Tate Modern, to leave it to melt on a sled in the middle of the Turbine Hall. The ice, donated from a climate scientist, was a paleoclimatological sample of the sort used to form the Global Circulation Models Crutzen and Steffan generate, which Attenborough describes as motivating his conversion from "sceptic" to "believer."

The use of melting glacial ice in *Floe Piece* as a proxy for climate change recalls Dean's analogy between the non-negotiable timeframes to remedy Earth's Energy Imbalance with his metaphor that the "window for avoiding the disastrous consequences of carbon emissions is ever shrinking" (15026). The glacier melts until it is gone. The window shrinks until it is closed. Melting and shrinking collectively form the dominant trope of engaging with energy by proxy, in the sense of Julie Doyle's *Mediating Climate Change* and M. Jackson's article on "Glaciers and Climate Change: Narratives of Ruined Futures." Jackson argues against the prevalence in news media and artworks that invoke melting, as the unidirectional path "normalizes and predetermines a glacier-free world not yet in existence while reducing the range of imaginable climate change-influenced futures" (485). To respond to Jackson's invitation to expand the range of imaginable futures, I turn to the conundrum of what the unidirectional path of melting entails if it is to be

meaningfully redirected away from a glacier-free world, where melting ice is a proxy for Earth's Energy Imbalance.

2CE or not 2CE

Eliasson has most prominently used the metaphor of ice melting in a series of works staged inside galleries and in outdoor public squares for UN and IPCC conferences. The first version of the outdoor installation, *Ice Watch*, was staged in Copenhagen “to mark the publication of” the IPCC’s Fifth Assessment Report on Climate Change in 2014 (Eliasson, *Ice Watch*), and the second version was staged in Paris for COP21 in 2015. In both iterations, the installation comprised 100 tonnes of ice in twelve blocks from 15,000 year old icebergs “harvested” (Bottrill) from Nuup Kangerlua fjord outside Nuuk, Greenland then transported by boat and refrigerated truck to their terminal destination. There, the twelve semi-spherical icebergs were arranged in a clock face/sundial configuration, with each iceberg positioned at the hours on an analogue clock face.

The gallery equivalent, *Your Waste of Time*, used six tonnes of 1,200-year-old ice from the largest glacier in Iceland. For both exhibitions, at the Neugerriemschneider Gallery, Berlin in 2006, and MOMA PS1, New York in 2013, the ice was arranged in a haphazard layout within a section of the gallery refrigerated to just above freezing point. For both exhibitions, Eliasson listed the materials as “Vatnajökull ice, cooling system, Styrofoam, wood” (*Your Waste of Time*) but did not include “energy” – that is, the combustion of fossil fuels to power the buildings’ refrigeration to keep the ice from melting. While *Ice Watch* melted away over the course of four days in Copenhagen and ten days in Paris, the two sets of ice used in *Your Waste of Time* were kept from melting for one month and three months respectively. The different rate of ice melt in Eliasson’s external versus internal ice works recalls the effect of enacting planetary scale climate engineering on the rate of glacial ice melt. Sufficiently cooling down global warming would slow glacial ice melt. Yet, rather than being *Your Waste of Time*, arguments for such staging an intervention are that it would “buy us time.” In this rationale to justify climate engineering a planetary sunshade through SSPI could stop climate change going past the putative tipping point, while countries use this “bought time” to take the required action to decarbonise their economies.

In Jackson’s glacier-driven narrative of ruined futures or Eliasson’s ice melt works, “all that is solid melts into air” (Marx and Engels). Such melting can be delayed in the short term by fossil-fuelled cooling systems whose emitted greenhouse gasses add to the eventual rate of melting in the long term. In his efforts to “distinguish the bourgeois epoch from all earlier ones” Marx follows this narrative of melted futures to its end point, where “man is at last compelled to face with sober senses his real conditions of life, and his relations with his kind” (Marx). Three months after the Berlin installation of *Your Waste of Time* closed and this Icelandic glacial ice then melted, artist Tavares Strachan opened his installation of Arctic ice transported to the Bahamas, where it was exhibited for a month over the peak of Bahaman summer, from July 27–August 27, 2006.

In *The Distance Between What We Have and What We Want (Arctic Ice Project)* the appropriated 4.5 tonne segment of glacial ice was housed inside a cubic container of transparent glass, kept at freezing point by a system powered by solar panels. Described in the press release as “a battle against the effects of entropy” (Ronald Feldman), *The Distance* presents a notion of environmental arts as remedial action, where Strachan deliberately drew on the relative solar intensity of the Bahaman summer to draw more electric current from the solar panels, to power the freezer enough to keep the temperature within glass below freezing point. Following the month long installation, the Arctic ice was transported to Brooklyn, via Miami, where it was exhibited by his two commercial gallerists.

The following year, artist Jane McMahan exhibited her *Arapaho Glacier: What Goes Around Comes Around* outside the Boulder Public Library in Colorado. To “harvest” the glacier, McMahan extracted a segment of the city’s frozen water supply and displayed it during the United States summer using a similar cooling system to Strachan, with the exception that the *Arapaho Glacier* solar panels were mounted directly on the roof of the glass cube, to provide additional shading for the ice inside. In contrast, *The Distance* was exhibited in the shade of the awning at the entrance to Strachan’s primary school, with the solar panels placed nearby in the direct sun.

Both installations evoke the premise of mediating *in*, rather than meditating *on*, Earth’s Energy Imbalance. They do so by creating an artificially regulated microcosm of planetary scale climate change, wherein they invoke SRM techniques of climate engineering. Glacial ice becomes enclosed in a thermostatically controlled ecological system, differing from *The Weather Project* in scale, yet sharing the same principles of heat-energy exchange between the respective cube or building interior versus exterior. Yet *The Distance* and *Arapaho Glacier* “simulate action” in Anderson’s usage as they propose an act of doing “something” about Earth’s Energy Imbalance, even though their artificial life support system for preventing glacial melt is demonstrably not efficacious. The “something” they invoke is the proposed SRM technique of intervening in Earth’s albedo by reflecting incoming solar radiation back into space. Reflecting this heat-energy from the interior to the exterior of Earth’s atmosphere would in turn slow the rate of ice melt. However, the solar panel acts as a surrogate for the high albedo of ice, being white, relative to the low albedo and thus higher absorption of heat in the darker waters surrounding glaciers. The non-linear system dynamics of the albedo relationship between ice and water means that the more ice melts, the more water there is, which absorbs more heat, which increases the ice melt, and so on, in a terminal tailspin that recalls Jackson’s “Narratives of Ruined Futures” as enacted by Eliasson’s *Ice Watch*.

The spectral use in *The Distance* and *Arapaho Glacier* of a glacier kept on a life support system by converting incoming solar radiant energy to electricity by photovoltaic panels encapsulates the stark choice between mediating in Earth’s Energy Imbalance through grandiose technofixes, or meditating on the unidirectional flow of ice to water that dominates the narrative of climate change, as admonished by Jackson. To scale up this intervention would take

the internal system dynamics of the phase transition between air and water in Hans Haake's hermetically sealed *Condensation Cube*, and apply the same principle to regulate the energy balance within Earth enclosed in a thermostatically controlled cube. Fittingly, the climate engineering term for this intervention – Solar Radiation Management – has been subject to sustained criticism on the basis of how such a non-linear dynamic system could be “managed” (Corner and Pidgeon, 2010; and Gardiner, 2011).

The heat-energy intervention's that Strachan and McMahan invoke also refer to the existing technique of delaying snowmelt through albedo modification. One area this is conducted in is the Rhône Glacier in Switzerland, where hundreds of sheets of white reflective blankets are deployed each summer to slow the glacial melting rate. The Rhône intervention inspired the artist duo of Mats Bigert and Lars Bergström to collaborate on *Rescue Blanket for Kebnekaise*, the highest peak in their native country of Sweden. The work formed part of their 2016 project *The Freeze*, which they describe as “a geo-engineering performance on top of *Kebnekaise*” (Bigert and Bergström). On the 2015 summer solstice they installed a temporary 22 x 22 metre “golden climate shade cloth” on the summit. Increasing the albedo for the area under the cloth delayed the melting of the top 30 cm of the peak. Like Strachan and McMahan, Bigert and Bergström offer a reconceptualisation of the notion of the environmental arts as remedial action, where they describe their “golden rescue blanket for *Kebnekaise*” as “a futile symbolic gesture” (Bigert and Bergström). Yet it is a gesture informed by their extensive scientific and technical knowledge of climate engineering, and their attempts to manifest works that mediate in the material effects of Earth's Energy Imbalance.

Rescue Blanket also recalls proposals to mitigate coral bleaching by marine cloud brightening, effectively forming sunshades over particular coral reefs (Latham et. al.). By this intervention, targeted areas would be “conserved” and others would cease to exist, turning areas such as the Great Barrier Reef into a mosaic of ecosystems kept alive on artificial life support systems. Cloud Reflectivity Modification (CRM), a closely related form of marine cloud brightening, has been approached through cloud seeding devices that replicate *Rescue Blanket*, yet at 33 kilometres above the surface of the Earth. Karolina Sobecka, whose work enacts CRM, describes her *Cloud Machine* with language more akin to describing a scientific experiment than an artwork:

Cloud Machine [is] a personal device for the modification of the atmosphere. It consists of cloud-making gear sent up in a weather-balloon payload. As it reaches specific altitudes it disperses Cloud Condensation Nuclei and water vapour to create small, temporary clouds. This method is inspired by a geo-engineering technique proposed to create brighter, more reflective clouds which shield earth from sun's radiation, and thus partly counteract the climate change. (Sobecka)

The work has thus far only been launched once, in San Jose as part of the *ZERO1 Garage* festival in August 2013. In the manner of an experiment, it did not manage to seed a cloud due to a technical malfunction at an altitude of fifteen km. Two months later, UK design collective StudioPSK launched

their cloud seeding prototype, *I Wish To Be Rain*, in Texas. The work used similar principles, materials and techniques, save for a major difference in the chemical catalyst for precipitating clouds. Whereas *Cloud Machine* used Cloud Condensation Nuclei, *I Wish To Be Rain* used cremated ashes. When the weather balloon burst from reaching the low-pressure of the troposphere, the helium canister dispersed the ashes, which attracted water-vapour around the ashes, to combine into rain cloud that rained the ashes back to the surface of the Earth.

Higher up in space, in Low Earth Orbit, Australian artist Ioannis Michaloudis proposes to install a series of silica aerogel sculptures in the orbital path of space junk circling the Earth. The silica gel would act as an aggregate like the cremated ashes in *I Wish To Be Rain*, by binding disparate pieces of metal satellites, rockets and other debris together into a single object. For the proposed work, Michaloudis describes his intention as to “create a nice parasol” that “provides shade and protection for our overheated planet.” His proposal recalls astronomer and optical scientist Roger Angel’s proposal to dim incoming solar radiant energy by mounting trillions of sixty centimetre, transparent lenses 1.5 million km above Earth, at the L1 Lagrangian point between the sun and the Earth. From the scale of a planet-shielding sculpture in Low Earth Orbit down to the cloud-seeding cremated ashes of a person, such artistic approaches to mediate in Earth’s Energy Imbalance problematise notions of intention and intervention around both inaction and remedial action.

In response to such proposals, Bronislaw Szerszynski asks, “What would be the best word to capture the climates” of “an intended world, one in which once-natural processes and systems become deeply shaped by human action.” The terms he suggests – “‘Engineered’, or ‘managed’? ‘Synthetic’, ‘made’, or ‘fabricated’? ‘Assembled’, ‘composed’, or ‘designed’” (82) – do not include “artwork.” Yet this is the one term that McKenzie Wark uses to describe the end result of such interventions when he asks, “Is not the totality of all our endeavours, all our social relations, tending towards the making over of the planet as a total work of art?” (39).

While Szerszynski is speaking earnestly in an article that ruminates on the profound ethical and existential dilemmas of “an intended world” (85), the planet-as-artwork that Wark proffers is sardonic. The only example that Wark provides for the planet-as-artwork is from lizvlx and Hans Bernhard, the collaborative duo who work together as *ubermorgen*. In response to the 2010 Deepwater oil spill, *ubermorgen* provocatively framed the spill as a breakthrough for art:

Finally oil painting has evolved into generative bio-art, a dynamic process the world audience can watch live via mass media. Never before has this art form been as relevant and visible as today - only 9-11 was nearly as perfect, but in the genre of performance art. An oil painting on a 80,000 square miles ocean canvas with 32 million litres of oil – a unique piece of art. (lizvlx and Bernhard)

This polemic is part of their artist statement for their work 2010 *Deepwater*, where they used NASA satellite imagery of the oil spill to generate digitally modified photographs that rendered the oil spill as an abstract melange of colours and shapes. Unlike the proposals to do “something” in the artworks mediating in Earth’s Energy Imbalance, *ubermorgen* offer a critique of the industrial capitalism at the heart of Marx’s “bourgeois epoch” rather than attempt to “simulate action” (Anderson) about mitigating the deleterious biophysical effects of *homo economicus*.

On a planet where an oil spill is rendered as aesthetic spectacle, the distinction between art and life will become progressively narrowed. It remains to be seen whether art about the Anthropocene will “destabilize our stagnant assumptions” (Fava 284) from meditating on climate change, to realising that, we are already mediating in current weather and future climates. For Szerszynski, “geoengineering would involve us in a deeper complicity in processes of anthropogenic climate change in the guise of promising to halt it, and thereby engender a new kind of relation between humans and the weather” (85).

It remains to be seen whether this new kind of relation is one between the millions basking under the surrogate sun in the Turbine Hall, gazing at their images reflected back onto themselves in the ceiling, or whether it is one of standing up to go behind the scenes to hack the energy infrastructure, light, and water vapour in the atmosphere. The simulacra of *The Weather Project’s* “internal weather system” (May 15) cogently recalls Thom Yorke’s stated dilemma on whether, how, and whom would have any such “right to interfere.” Extrapolating from this simulacra to the global experiment already being conducted through anthropogenic climate change, the question has become what on Earth would constitute remedial action on “the planet as a total work of art”? (Wark 39). Concepts for remediation will sink or swim into this ethical quagmire, in a manner akin to Crutzen’s policy formulation challenge for climate change and engineering.

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