Sublime Melancholia

by

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Abstract

Sublimity in the twenty-first century is no longer manifest as the emotion of 'wonder and fear' at dynamic natural phenomena but rather as *sublime melancholia*, the 'wonder of loss' for the vanishing natural world. The Apollo Program missions of 1968 to 1972 represent both the apotheosis of the *Romantic Sublime* and the beginning of this shift in sublime emotion. The first images of the Earth in Space focus attention on the uniqueness and fragility of our planet while drawing awareness to the destructive human practices threatening the biosphere. This dissertation examines how *melancholia* and the fear of loss has come to influence sublime feeling. The advent of space tourism (to the Kármán line), adventure expeditions to scenes of destruction (Pripyat/Chernobyl), or tours chasing natural disaster (Whakaari/White Island; Tornado Alley), are emblematic of the need many feel for authentic sublime experience even if at risk to life. Consideration of deep time offers another lens to explore the shift in sublime emotion. Our chronophobia drives our efforts to control time which fail beside the human-caused geological acceleration of our planet that is underway. Unearthing deep time capsules (Siccar Point) hidden in our planet's geological record create new sublime landscapes to consider. The discovery and opening of time capsules in the historical human record–accidently or tragically occurring capsules (Pompeii; Ötzi the Iceman; shipwrecks *Erebus* and *Terror)* or deliberately created ones (messages in bottles; Anne Frank's diary; crypto capsules)–offer insights into the challenges we face in our changing world. We must consider how what we leave behind will constitute time capsules for our ancestors many generations hence (the Anthropocene midden; urban fossilization). We create time capsules today as a way forward out of the nihilism of the human age. We fill these capsules (Golden Record; Svalbard Global Seed Vault; Future Library) with our deep emotion for the living world; we embed both our wonder and fear of loss into these time travellers and send them forth as sublime arks to the future. Cultivating 'fresh seeing' and respect towards the natural world helps bridge sublimity and deep time, and gives agency to non-human life that we can harness to stem the melancholia of loss.

Keywords: sublimity; romanticism; deep time; time capsules; *solastalgia*; eco-anxiety

In memory of my brother

Dr. Geoffrey Richard John Lockwood

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Variation on Caspar David Friedrich's Man and Woman Contemplating the Moon
Pencil drawing: S. Lockwood, 2024

Part One

Reimagining Sublimity

Chapter 1.

Introduction

Figure 1. **Pyrocumulonimbus cloud.**
26 July 2021, Okanagan Range, Alberta.
Photo: S. Lockwood

To be aware of the wonders of the living planet is to take on an unbearable burden of grief.

~George Monbiot[1]

'Flying' has always been an uneasy experience for me. I am aware of time and space, of travelling in a pressurized metal tube at great speeds at a great height. Outside the cabin is an extreme environment: the jet's hypoxic cruising altitude on the upper reach of the troposphere. Despite the safety of modern aircraft, when a plane

[1] Monbiot, George. "The Unseen World." *Monbiot*, 28 Dec. 2012, https://www.monbiot.com/2017/12/28/the-unseen-world/ Accessed 6 May, 2024.

does crash it is always catastrophic. Aircraft are swallowed whole by oceans and break open on the backs of mountains.

Everyday living has risks, and, as I need to visit my family, I accept the conditions of air travel and choose an economy window seat as far to the front of the craft as I can get. My reward for tamping down my flying fears is an oval frame through which I can admire the sky. There is nothing quite like the feeling of rising from rainy Vancouver into brilliant sun-infused clouds. I watch the light saturating this cloud layer–light that left the surface of the sun 8.3 minutes ago to arrive here, travelling at 299,792 kilometers a second.

Like the Kármán line which astronauts use to demarcate the end of the Earth's atmosphere and the start of the nothingness of space, there is also a liminal demarcation in the sky for passengers travelling above the clouds. This line is the cloud layer and is not always present. When it is, it separates the overview zone of earthen landscapes–the mountain tops, winding rivers, highways, and urban sprawl–from the expanse of sky above.

The cloud layer is an in-between state, an abeyance that sometimes lasts for only seconds, suspending the aircraft in vapour. It is both a beautiful and a transforming place. It is also an alienation and an escape from the busy life on the earth below: the plane subsumed in cloud aether becomes invisible as does everything else. This concealment evokes intense feelings of nothingness. It can feel suspicious, even sinister, as if the cloud is hiding something in its thick vacuity of dust and ice.

Wisps of earth float underneath as the clouds close. The cloud layer shifts in colour and opacity. It can feel alive, muscular and strong, at odds with its gaseous composition. The aircraft rises in altitude through the cloud envelope until it leaves it far below; until the clouds becomes a pattered ocean beneath while the steel of the aircraft wing reflects the blue above.

I was flying from Toronto to Vancouver one day in July, 2021. I was seated over the wing. From Calgary onward the clear prairie sky filled with haze. The foothills of the Rockies stepped up into mountains and columns of smoke from wildfires came into view. As we passed over the Okanagan Range, a massive cloud formation came along side. At first it just looked like the soft domed peaks of a cumulous, but centered within was a

weird configuration: part cauliflower-shaped thunderhead, part ghostly bouquet. This cloud was a *pyrocumulonimbus,* a 'fire cloud,' also called a *cumulonimbus flammagentis*, 'a cloud created by fire.' Anchored to the blistering earth, flames loft a volume of super-heated air into the cooler atmosphere; it condenses into an electrical storm and generates a bespoke weather system. It is a self-perpetuating inferno where lightning ignition and the convection cycle downdraft propels the blaze towards new fuels.

I had never seen such a cloud before, and the aircraft gave it wide berth so it could be enjoyed from the safety of our seats. It was raw and powerful, and even as we appreciated this performance, we knew of the wildfire's sensational progress, and the consequent emergency on the ground as people and animals raced to escape the path of the burn unfurling across acre upon acre of living forest. But here, flying above, we could see none of that. No blackened trees, no ashes. We could not see the town of Lytton, that just one day after enduring the hottest day ever recorded in Canada, was swallowed whole in minutes. This fire-breathing cloud was a slayer, a bringer of pain and despair, but we could see none of that.

In November later that same year, I was on a Vancouver outbound flight. It was a mostly clear day, no liminal cloud layer to navigate. The aircraft circled over the Strait of Georgia before heading east inland. In just a few minutes we were passing over water again. I looked out to see the sun glinting off the flat silver pan of a brand new lake. Only, it was not a lake but a flood–the result of a formidable 'atmospheric river' that had poured down several months' worth of rain in just a few days, inundating the Fraser Valley. As I looked down on this pan of water, I wondered if it was the lost Sumas Lake–drained in the 1920s to make the farming community of Sumas Prairie–now resurrecting itself back into being.

From above, glints of sun and a few handfuls of cloud made reflected patterns on the silvery water. It looked peaceful, serene. I thought of the satellite photos of this atmospheric river–a thick white brushstroke over the west coast of North America. But by now it had moved on, leaving the painful consequences behind: the hurried evacuations that could not save hundreds of thousands of farm animals; the houses and barns swept under; the mountain mudslides entombing cars on highways; the bridges, dams and dikes torn apart and washed away. My mind travelled back to a news photograph, taken days earlier, of a terrified dairy cow being led to safety through neck-

deep water. But I could see none of this. I was protected from the aftermath of this terror by the vantage of an aircraft window, for the height at which we travelled rendered down any sad detail. Instead, I was free to let my mind roam over the curiousness of this newborn lake as I watched the shadow silhouette of the aircraft in which I travelled draw across its surface.

From an aircraft window seat, I was, unwittingly, witness to the two major climatic disasters that befell British Columbia in 2021.[2] These climactic emergencies were among the very worst: although British Columbia has an aggressive 'fire season,' it was never before augmented by a high pressure 'heat dome' and such extreme temperatures, and the atmospheric river that pounded the Fraser Valley creating flooding was unprecedented. This was the year, in my pocket of the world, when the climate crisis breeched all the hypothetical nonsense, all the projections, and became a lived reality.

Yet, from the safety of my window seat, the pyro cloud and the silver lake were expressions of the sublimity of nature. The awe and wonder I felt–amplified by the frisson of air turbulence against the skin of the plane–gave these dynamic manifestations of smoke and water more power to impress. Yet, any impression of exhilaration at such a strong display was undercut by an equally deep feeling of 'eco-anxiety.' The smoke and water were materializations of a changing planet, a planet in crisis. Unlike vertiginous mountains, or stormy seas, or roaring volcanoes that so thrilled my Romantic-era forebearers, this drama of smoke and water could not be enjoyed for its own sake. An experience of 'the sublime' is uplifting; this experience was disquieting.

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[2] During the Western North American Heat Dome of 25 June-7 July 2021, the highest temperature ever measured in Canada, that of 49.6ºC, occurred on 29 June in Lytton, B.C. The Lytton Creek Fire took place the next day, 30 June 2021.

The Pacific Northwest (Fraser Valley) Flood of 2021 occurred between 14 November-17 December. It caused anomalous phenomena such as a tornadic waterspout on 6 Nov. just off the coast of City of Vancouver. By 15 Nov., Highways 1, 3, and 99 were closed due to washout as was the CN Rail line north of Hope. Over 800 farms were evacuated in Sumas Prairie; 15,000 people were forced to flee; hundreds of thousands of animals were killed including an estimated 600,000 chickens, 400 dairy cattle,12,000 pigs, and 3 million bees in 110 hives.

Cecco, Leyland. "'Heartbreaking' clean-up of animal corpses as Canada floodwaters ebb." *The Guardian*. 3 Dec. 2021. https://www.theguardian.com/world/2021/dec/03/british-columbia-floods-animal-corpses-clean-up. Accessed 3 Dec. 2021.

Eco-anxiety is a very real and visceral emotional reaction to the climate crisis. The changes in the environment are having a psychological impact. ‘Eco-distrust’ is a component of this–the loss of reliability of seasons or ‘normal’ temperature ranges; weather patterns behaving in ways that are not predictable. “Living in climate truth is like living in a nightmare,” says Margaret Klein Salamon, a psychologist turned climate activist. “But the worst part is that everyone’s acting normal…”[3] We understand very well that climate truth is *not normal*, but the overwhelming crush of emotional helplessness renders us inert and creates, as Salamon describes, a “delusion of normalcy.”[4]

Zadie Smith takes this even further, highlighting how the phrase, *the new normal*, is “the most melancholy of all euphemisms.”[5] It describes this loss of relatability combined with inevitability. “We can’t even say the word “abnormal” to each other out loud… Better to forget what once was normal, the way season followed season, with a temperate charm only the poets appreciated.”[6]

It does not help that globalization has created an environment where we expect a kind of ‘abnormality’ in the consumer choices available to us. Songwriter Tamara Lindeman, who records as The Weather Station, laments how even in a Canadian winter, “We can still walk out on the street and buy/ champagne grapes/ Strawberries and lilies in the November rain/ It never occurred to us we would have to pay.”[7]

Feelings of eco-anxiety are especially prevalent among a cohort of young people born into the climate crisis who are absolutely aware that they will ‘have to pay.’ They feel a genuine sense of futility, that the world is already ‘too far gone;’ they are ‘striking’ from school, choosing not to have children, and expressing rage at their parents and grandparent’s generation for leaving them a ‘broken’ planet.

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[3] Milman, Oliver. “Suicides indicate wave of ‘doomerism’ over escalating climate crisis.” *The Guardian*, 19 May 2022, https://www.theguardian.com/environment/2022/may/19/climate-suicides-despair-global-heating. Accessed 23 Oct. 2023.

[4] Ibid.

[5] Smith, Zadie. “Elegy for a Country’s Seasons: Zadie Smith.” *The New York Review of Books*, 26 Apr. 2023, www.nybooks.com/articles/2014/04/03/elegy-countrys-seasons/. Accessed 5 Oct. 2023.

[6] Ibid.

[7] The Weather Station. “Endless Time.” *How Is It That I Should Look At The Stars*. Fat Possum. 2022.

The frequency and severity of destructive climactic events breaking our planet is inescapable. Moreover, these events are no longer accommodated by our current systems of measurement or description. The current '1 to 5' scale for hurricane classification is insufficient to describe the ferocity of mega-hurricanes. Scientists propose adding a 'Category 6,' for storms with once unimaginable wind speeds surpassing 192mph.[8] Australian meteorologists are pushing for a new colour–purple–to be added to colour-coded weather maps plotting heat on the continent.[9] Even coping with climate events in our daily lives has become confusing, and sometimes this 'coping' goes against intuitive measures we depend on to keep us safe. For example, the September 2020 Oregon wildfires poured so much smoke into the atmosphere that home smoke alarms reacted even in buildings nowhere near the actual fires. Erica Berry recounts how she would silence her alarms only to have they go off moments later, "I hated the noise, and yet, because I felt powerless against the fires and the climate denial that had seeded them, their bleating began to feel like an extension of my nervous self. *Things are not OK*, said the alarms. *Are you listening? Are you listening? Are you listening*?"[10]

"Language is crucial to how we perceive the natural world," states George Monbiot, and yet we have such poor vocabulary to help us make sense of the noisy alarms the natural world is screaming out.[11] "Words," he writes, "have a remarkable power to shape our perceptions." It is why the word "environment" leaves us cold as it is "an empty word that creates no pictures in the mind."[12] How disappointing this word is when we use it to mean the natural world. Such a word is so devoid of emotion, how can it possibly denote our sensuous, living world, an 'environment' that is bursting with feeling?

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[8] Milman, Oliver. "Hurricanes becoming so strong that new category needed, study says." *The Guardian*, 5 Feb. 2024. https://www.theguardian.com/world/2024/feb/05/hurricanes-becoming-so-strong-that-new-category-needed-study-says. Accessed 13 Mar. 2024.

[9] Ibid.

[10] Berry, Erica. "Here in fire-stricken Oregon, an old way of life is gone." *The Guardian*, 16 Sept. 2020. https://www.theguardian.com/commentisfree/2020/sep/16/oregon-wildfires-portland-smoke-way-of-life. Accessed 5 Feb, 2024.

[11] Monbiot, George. "Forget 'the environment': we need new words to convey life's wonders." *The Guardian*, 9 Aug. 2017, https://www.theguardian.com/commentisfree/2017/aug/09/forget-the-environment-new-words-lifes-wonders-language. Accessed 2 Dec. 2023.

[12] Ibid.

Dramatic bursts of feeling at natural majesty have long been a source of *sublimity*. Are the destructive bursts produced by our rapidly changing climate also a source? How do we integrate the severe fires, floods and other manifestations into our understanding of sublimity? Do these events not have the raw sensuousness, the elation and terror of the sublimity of nature, especially since we fully engage with them on an emotional level? Yet, to ascribe *sublimity* as the emotion experienced does not feel quite right. Zadie Smith laments the lack of emotional vocabulary to articulate the new climate truth: ""There is the scientific and ideological language for what is happening to the weather, but there are hardly any intimate words."[13]

Solastalgia is gaining traction as a new intimate word. With its overtones of *solace* and *nostalgia*, this neologism was coined by Australian environmental philosopher Glen Albrecht from his own personal experience of "environmentally induced distress" witnessing the degraded landscapes caused by open pit coal mining in New South Wales.[14] Environmental psychologist Thomas Doherty and climate emotions scholar Panu Pihkala add to *solastalgia*, collecting in their research on this very subject the emotions "*saudade… ikegai*, *dugnad*, *pura vida*, *weltschmertz*, hyper-object, hyper-empathy, *thumos*, *ubuntu*, awe, *riittämättömyyden, tunne*, *sisu*, [and even] hope…"[15] I propose adding another emotion/word to this taxonomy, one that embodies the feeling of wonder when imbued with loss and despair: *sublime melancholia*.

This phrase, *sublime melancholia*, my brother jokes, is a fitting title for a piece of Romantic era piano music describing the passage of a muddy European river in February. Perhaps *melancholia* is not a perfect fit. However, it is a most ancient malady; Hippocrates used melancholia back in the 4th century BCE to describe a depressive mental state, an inertia. The sufferer exhibits a profound inability to feel joy, and this joylessness is often compounded with feelings of guilt and despair.

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[13] Smith. "Elegy for a Country's Seasons."

[14] Albrecht G, Sartore GM, Connor L, Higginbotham N, Freeman S, Kelly B, Stain H, Tonna A, Pollard G. "Solastalgia: The Distress Caused by Environmental Change." *Australian Psychiatry*. February 2007. 15 Suppl 1:S95-8. DOI:10.1080/10398560701701288. PMID: 18027145. https://www.researchgate.net/publication/5820433_Solastalgia_The_Distress_Caused_by_Environmental_Change. Accessed 21 Feb. 2022.

[15] Doherty, Thomas and Panu Pihkala, hosts. "Climate Change and Happiness." *Climate Change and Happiness*, Season 1, Episode 1, 7 Jan. 2022, https://climatechangeandhappiness.com/about. Accessed 2 Feb. 2022.

Both guilt and despair are components of *sublime melancholia*. Human beings recognize that they are the architects behind the climate crisis, that the conditions that precipitate dramatic events are the cumulative result of a collection of human behaviours expressing itself on a planetary scale. Thus, we cannot enjoy the 'pyro cloud' and such without acknowledging our culpability behind its creation. We despair at the sheer scale of the climate emergency, and although a feeling of existential insignificance against the monumental forces of the natural world is a component of sublime feeling, here there is no respite. The safe vantage places–a requirement for the enjoyment of a sublime experience as opposed to suffering inside it–are transitory. It was not lost on me, that my two experiences of *sublime melancholia* took place during 'lulls' in the SARS-CoV-2 pandemic (when I reasoned it was acceptable to risk air travel), the first just after the peak of the 'Delta' wave, and the second just before 'Omicron' ramped up. We passengers, infected in our peculiar state of wariness of each other, self-cocooning in our seats, had a very different view of what constitutes natural and unnatural behaviour, living as we were in detached strangeness. Perhaps we were desensitized as our current reality was consumed with an invisible viral threat. As such, this 'pyro cloud' and the reborn lake were false sublimities, just other symptoms of a progressing condition sickening the living world. Despite my safe observational berth over the wing, the plane still had to land. We passengers exited the aircraft, masks tight, socially distanced, vaccination passports in hand, and headed back into survival.

In my lifetime, 'the sublime' in the natural world has come to manifest less as an expression of 'wonder and fear' and more as one of 'the wonder of loss.' There is a dysphoria that exists between human beings and nature. Although this can be tied to the big, unpredictable, and newsworthy weather events, like snow in the desert or tornados in the rainforest, much of it is felt on a more intimate level–a flower blooming out of season in the garden; a deep-water fish washed up on the beach; common birds that no longer visit the birdfeeders. Our awareness of both our place *in* and our effects *on* the (vanishing) natural world is changing and now seems perched on the cusp of a new understanding. Just as the Romanticism championed the natural world, enabling a shift in perception towards wildness, wilderness and nature, so too does the *sublime melancholia* of our age reveal a critical shift.

Our understanding of sublimity in nature has its origins in Romanticism, an aesthetic and philosophical movement, born in the late eighteenth-century Europe, that

ascribed value to the powers of the human imagination, intuition, emotional integrity, and individual expression.[16] The 'Romantic sublime' is very much a Western invention that locates in the once deemed hostile and forsaken landscapes a source of deep emotion (fear and awe, annihilation, transcendence and transformation). Romanticism promoted the drama, the 'dizzying raptures' and 'aching joys,' to use Wordsworth's description, of sublime experience.[17] The quest for such an experience contributed to the appreciation and understanding of the natural world even as it facilitated its commodification and exploitation.

Today, the deep emotion we feel towards the natural world is tempered with how damaged it feels. The aesthetic has completely changed: Take as example, the Mer de Glace in France, the sublime icescape where Mary Shelley set the pursuit of Dr. Frankenstein and his monster. This glacier is now a dirty grey retreat, and the tourism industry of Chamonix that once promoted this stunning tour de force is now dealing with infrastructure to abate rockslides and permafrost melt.[18] The tourists are still coming, but now they are coming to see what is *gone*.

In our appreciation and awareness of the living world we are just as likely to contend with a flock of oil-soaked geese in the gloom of a tailings pond than a soaring eagle.

How did this shift in our perception of sublimity happen? How is sublimity manifest today? These are two questions motivating this inquiry.

Part One, Reimagining Sublimity, examines this shift from the Romantic sublime to *sublime melancholia.* Chapter 2, Romantic Apollo, outlines how this transition gains momentum in the wake of the Apollo moon landings of the late sixties and early seventies. The first images of the Earth floating in the void of space are a turning point, perhaps a genuine paradigm shift, in both positioning us as a spacefaring civilization and

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[16] Honour, Hugh, *Romanticism*. Middlesex, Penguin Books, 1981. p. 21.

[17] Wordsworth, William. "Lines Composed a Few Miles above Tintern Abbey, On Revisiting the Banks of the Wye during a Tour." July 13, 1798." *Poetry Foundation*, https://www.poetryfoundation.org/poems/45527/lines-composed-a-few-miles-above-tintern-abbey-on-revisiting-the-banks-of-the-wye-during-a-tour-july-13-1798. Accessed Feb. 14, 2022.

[18] Vaughan, Adam. Special Report: How climate change is melting France's largest glacier." *New Scientist*, 18 Sept. 2019. https://www.newscientist.com/article/mg24332483-600-special-report-how-climate-change-is-melting-frances-largest-glacier/. Accessed 17 Feb. 2022.

drawing attention to the very miracle of our existence. This Apollo adventure, I contend, represents the apotheosis of the Romantic sublime. Although the astronauts themselves were the only ones to experience firsthand this “magnificent desolation” to use Buzz Aldrin’s famous phrase, the sublimity was such that it could be shared without losing any of its capacity to evoke wonder.[19] The iconic imagery generated during these lunar missions (*Earthrise*, *Spaceman*, *The Blue Marble*) has every bit the aesthetic dynamism and sublimity of the Romantic era imagery, except that here it is manifest from the vantage of a non-living world. These elemental lunar landscapes brought the biosphere of Earth into sharp focus as a fragile and exceptional rarity. The Apollo missions also delivered an intriguing dichotomy: although the sublime lunar imagery energized the environmental movement, the technological achievement initiated by the endeavor advanced many of the destructive practices that menace the well-being of the planet today.[20] Sublime feeling transitions with our spacefaring ambitions.

Post-Apollo, we became accustomed to images produced by technologies that enable us to look down on earth from space. We see the earth in abstraction. Hurricanes are pinwheels, forest fires are contrails. The swirling colours of desecrated landscapes, from the taffeta sheen of oil spills to terraced patterns of open pit mines, look like spectacular formations from high above. This technological remove augments our sensory powers, giving a God’s eye view, even as this vision is diminished and flattened to fit down into our screens. Earth is very small when it sits inside a device we hold in the palm of our hand.

How far we have pulled away from body earth! The sublime images from the Apollo era have become stale. How is it that our heart is no longer moved; how is it that a ‘space tourist’ can travel up past Earth’s atmospheric boundary and be more enraptured with weightlessness and throwing candy inside the spacecraft, than in the vision of home below.[21] Retired astronaut Roberta Bondar lamented the antics of the

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[19] Aldrin, Buzz. *Magnificent Desolation: The Long Journey Home from the Moon*. New York, Harmony Books, 2009.

[20] The first Earth Day is April 22, 1970, 7 months after the first lunar landing.

[21] Blue Origin, first crewed mission was abord the capsule, *New Shepard*, on 20 Jul. 2021. “Blue Origin Safely Launches Four Commercial Astronauts to Space and Back.” *Blue Origin*, 20 Jul. 2021. https://www.blueorigin.com/news/first-human-flight-updates. Accessed: 20 Jul. 2021.

“The crew brought ping-pong balls that they floated around the capsule, and at one point, Bezos

passengers aboard Blue Origin's inaugural voyage, "It is tough … to be able to watch somebody go up for 25 seconds and not look at the Earth but choose instead to play with some smarties."[22] Can a feeling of sublimity ever be brought back?

Chapter 3, Wonder and Sadness, examines our search for authentic sublime experience. Estranged as we are from natural processes by the artificiality of our built urban environments and the "manufactured landscapes," to use photographer Edward Burtynsky's evocative phrase, rendered in the process of mammoth-scale resource extraction, we seek out the thrills of natural disasters.[23]

Disaster landscapes–due to the climate crisis or ecological collapse–further supplant the Romantic sublimity of natural phenomena. Encounters of *sublime melancholia* are located in these forbidding geographies that now function as human-made 'Thin Places,' as extreme, life-risking environments. Every year storm chasers jump in their cars and trucks to hunt the twisters of Tornado Alley from South Dakota down to Texas; helicopters ferry tourists to smoking volcanoes–like that of Whakaari/White Island, New Zealand; and guides lead the curious though the radioactive outskirts of Chernobyl. Such is the allure of danger to feel intense emotion, the dopamine reward of getting so close to something so awful.

So many of our technologies impede how we process real phenomena; the medias of popular culture further remove us as they recreate and package a simile of sublime experience. We consume the vicarious thrills of disaster from the safety of a cinema seat. Thus, caught in the path of a genuine wildfire or a storm, we are surprised and horrified at how it actually *feels,* that we cannot walk out of the theatre or turn off the screen when we have had enough.

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could be heard yelling, 'Who wants a Skittle?' They then took turns trying to throw the candies into each other's mouths."
Davenport, Christian and Dalvin Brown. "Jeff Bezos, Mark Bezos, Wally Funk and Oliver Daemen reach space, return safely on Blue Origin's New Shepard rocket." *The Washington Post*, 20 July 2021. https://www.washingtonpost.com/technology/2021/07/20/bezos-space-flight-live-updates-video/. Accessed 20 July 2021.

[22] Roberta Bondar Interview on CBC news, on the 30th anniversary of her space shuttle mission. "Dr. Roberta Bondar Celebrates 30 Years since Her First Spaceflight." *CBC News*, CBC/Radio Canada, 21 Jan. 2021. www.cbc.ca/player/play/video/1.6324108. Accessed 30 Jan. 2021.

[23] Baichwal, Jennifer. *Manufactured Landscapes*. Foundry Films, Mercury Films, National Film Board of Canada. Sept. 2006. [Film based on photographs of Edward Burtynsky]

Part Two, Reimagining Time, examines another facet of this 'shift' in our perception towards the natural world through the lens of 'time.' Just as the language of 'climate change and happiness' requires new expressions, so too does the wholly abstract concept of time. Arguably, we are the most chronophobic and temporally dysfunctional cohort of humanity ever to grace Planet Earth. The climate crisis is maybe a case in point of this dysfunction. If we accept that a human-caused geological acceleration is underway, then how we measure, communicate and control time is knocked sideways.

Chapter 4, Deep Time Sublimity, examines how human beings develop metaphors, images, and symbols to express the passage and the volume of time (clocks, calendars, time zones, light speed). For those of us living in the West and in urban environments, we mollify the natural cycles of time to fit our lifestyles. Whether by a desire to eat summer foods in the dead of winter, or by jetting off to a warmer corner when we feel cold, we have myriad ways to avoid time's natural rhythms. Blame globalization or consumer culture or the instantaneity of information technologies: Our pursuit of efficiency, productivity and convenience tries to render time obsolete, and the metaphors and symbols become further abstracted and obscured. As geologist Marcia Bjorerud suggests, "nearly invisible forms of time denial are built into the very infrastructure of our society."[24] We may indeed feel we can engineer a world outside the laws of nature, but if anything the climate crisis has shown us is that natural forces have the controlling hand.

Our temporal sensibilities are tested by the mutable interlocking patterns of the global ecosystem. The jet stream is changing place. The ocean currents that cycle water are slowing down. The poles are melting; sea levels rising; shorelines and islands collapsing. The sun is too hot, the winds too strong. Everywhere animals, plants, and people are seeking out new places to live or risk extinction. These displacements and migrations are playing out on an accelerated geological timeline that cannot be stopped or even paused.

Taking stock of temporal dysfunction is vital as it is tied to how we treat the planet; it forces us to reconsider even the most trifling of our everyday behaviours–from

[24] Bjornerud, Marcia. *Timefulness*. Princeton University Press, 2018. p.11.

driving a gas-fueled car to using a plastic bag–because the impact of these behaviours will outlive us and may constitute all that remains of us. All this chafes at our biological limitations–our lives are finite. Planet Earth is finite too.

It is our deep cosmic insignificance that readily conjures sublime feeling. Seventeenth-century French polymath Blaise Pascal expressed it thus, “When I consider the short span of my life absorbed into the preceding and subsequent eternity, … the small space which I fill and even can see, swallowed up in the infinite immensity of spaces of which I know nothing and which knows nothing of me, I am terrified, and surprised…”[25]

Cosmic deep time is so truly unfathomable it resists any emotional resonance. Sometime four billion years from now the sun will turn supernova and the ashen molecules of Earth will dissipate, perhaps even regrouping into new stars. As crushingly mind-bending as this is, deep time consideration is inspiring some innovative long-term thinking.

Even accepting the eventual demise of Earth, we can still make plans for the next, hundred, thousand, million, even millions of years to come for the continuation of organic life on our planetary home. Our story is not ended yet.

Some of the most innovative ‘forward-thinking’ plans manifest as ‘time capsules.’ Chapters 5, Time Capsules, examines this practice while Chapter 6, Sublime Artifacts, argues such capsules are arks, designed and desired to be found by future beings who will respond with the awe and wonder of discovery. These arks can take many forms, from the seed repositories and bio-banks into which we pour life-saving technologies, to the spacecraft emissaries we send out on deep time voyages into the interstellar unknown. They take the form of the very personal notebooks and tins of special objects we tuck away in anticipation of even one day becoming archeological treasure. Three such arks, the Golden Records on the Voyager spacecraft, Svalbard Global Seed Band, and Future Library are considered in detail.

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[25] [Blaise Pascal, as quoted in] Marcelo Gleiser, “Meaning in a Silent Universe.” *The New Atlantis*. Number 47, Fall 2015, pp. 76–86. https://www.thenewatlantis.com/publications/meaning-in-a-silent-universe. Accessed 11 Jan, 2021.

Time capsules assuage our chronophobia–a fear founded less upon a dread of death than of *obsolescence*. We fear being forgotten, because if we are, what we do in life has little meaning, and how we treat the beautiful earth does not matter. Time capsule construction eases this fear of time with a concrete object–not a symbol or a metaphor but a small hopeful time traveller. And if this traveller is not incinerated in a lightning strike from a pyro cloud or washed away by floodplain alluvium, the sands of time might save it.

With the climate crisis so present in our daily life, much of what we choose to protect inside time capsules is indicative of our shift in perception towards the natural world. We look for ways to save and repair what we love on our planet even if this saving and repairing must be done by future beings. Creating a time capsule to send into the future is a cathartic practice with deeply melancholic overtones. In stashing parts of our best selves into such a vessel, it helps liberate us from all the paralysing end-of-world scenarios that doom-scroll through our waking hours. As such, time capsules are a balm for eco-anxiety.

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Sublime melancholia in the post-Apollo world is more than just the estrangement from authentic sensory experiences or the pursuit of disaster landscapes. It is also manifest in the intense sensation of loss we feel for the vanishing plant and animal world. We are obsessed with species in the process of becoming extinct and this extinction countdown (one northern rhino, ten vaquita porpoises …) is a source of deep melancholic emotion.

Adding to this well of emotion is our recognition that many species already lost and those in the process of disappearing have non-human sentience (trees communicate through the ‘wood-wide web,’ orcas grieve, elephants have long-term memory). In feeling a ‘melancholic empathy’ towards this sentience we seek to address it with eco-justice, with reciprocity. We no longer just consider how the natural world makes us feel but how we, in turn, treat it, because even seemingly inert rock or ocean swells are interconnected with all the biological processes of which we are a part. Herein is where that crucial shift in perception begins: our process of ‘fresh seeing,’ balanced on the cusp of our emotional engagement with the non-human world. We find it in our recognition of the agencies of animals and plants to survive and thrive with a real legal

right to life; of mountains and rivers to an existence without interference, independent of us. Such recognition made possible the granting of 'personhood' in 2021 to the Magpie River in Quebec.[26] It also led to a valiant attempt in 2022, to grant 'Happy,' the Bronx Zoo elephant, personhood.[27] Another gesture in this same vein of melancholic empathy can be found in the 'funeral' given to Okjökull, a glacier in Iceland, that at the end of the 19th century spanned 16 square kilometers. In 2014, 'Ok' had melted to "dead ice." [28] A memorial plaque acts as a tombstone. It reads:

> A letter to the future:
> Ok is the first Icelandic glacier to lose its status as a glacier. In the next 200 years, all our glaciers are expected to follow the same path. This monument is to acknowledge that we know what is happening and what needs to be done. *Only you know if we did it."*[29]

Perhaps such a gesture is only a symbolic one, but if it aids an experience of *sublime melancholia*, then it is most welcome.

To be alive today is to carry around the weight of an existential sadness. Our lives are still punctuated by moments of great joy and these moments must be cherished. There is still much grandeur and majesty in the natural world even if the tragedies feel unrelenting. We must find small joys, like a bee diving into a flower oblivious to the 'insect apocalypse', or an orca born to a pod on the verge of extinction, or the roots of shore bound tree that still grasp the soil together against the rising seas. In an awareness of the tenacity of the natural world to hold onto and heal itself even

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[26] "In 2021, the Innu Council of Ekuanitshit and the regional municipal council of Minganie passed sister resolutions, granting the Magpie River the landmark right of legal personhood."

Benner, Elizabeth. "This pristine Canadian river has legal personhood, a new approach to conserving nature." *CBC/Docs/The Nature of Things*, 1 Feb. 2024, https://www.cbc.ca/documentaries/the-nature-of-things/this-pristine-canadian-river-has-legal-personhood-a-new-approach-to-conserving-nature-1.7100728. Accessed 20 Mar. 2024.

[27] The Nonhuman Rights Project lost an appeal in New York's top court to give Happy the elephant in the Bronx Zoo legal personhood. The zoo successfully argued that such a win for Happy would lead to cascade of legal actions on behalf of all animals including not just those in zoos, but farm animals and even pets.

Associated Press. "Happy the Elephant is not a person, the court rules." *NPR*, 14 Jun. 2022, NPR.https://www.npr.org/2022/06/14/1105031075/bronx-zoo-elephant-not-person-court-rules. Accessed 20 Mar. 2024.

[28] Johnson, Lacy M. "How to mourn a glacier." *The New Yorker,* 20 Oct. 2019, https://www.newyorker.com/news/dispatch/how-to-mourn-a-glacier. Accessed 20 Mar. 2024. Italic mine.

[29] Ibid.

when we fail, we can cultivate a practice of sublime melancholia: wonder with sadness, but still wonderful.

Chapter 2.

Romantic Apollo

Figure 2. ***Earthrise.***
Photo: William Anders. 24 December 1968.
https://science.nasa.gov/resource/image-earthrise/. Courtesy of NASA.

2.1. Leaving Earth

On 24 December 1968, the three-man crew of Apollo 8 became the first men to leave earth orbit, the first to circumnavigate the moon. It was on their third pass, 68 miles above the moon just as they rounded the shadowed side that Comm. Frank Borman rolled the space craft slightly, shifting the frame of view for William Anders tasked with photographing the topography. Out of the corner of his eye, a shiny blue object appeared. It was tiny–swimming above the moon's grey horizon that filled most of the frame. "Oh my God!" Anders softly exclaimed as he hastened to put a colour roll of film

into his camera “Look at that picture over there! There’s the Earth coming up. Wow, isn’t that pretty.”[30]

Three days after splashdown, Anders’ photos were developed, and one image–that of the earth rising above the lunar horizon–fanned out across the globe. The impact of *Earthrise*, as this image came to be known, cannot be understated. [31] Here, for the first time, was a view of earth as a planet. Visible in the photo, just faintly, was a violet-blue halo along the earth’s shadowed edge–our biosphere.[32] *Earthrise* generated a rare instance of collective sublimity that shifted human consciousness, forcing us to confront our tenuous *livingness* in an unfathomable universe full of suns and worlds out of reach.

On July 20, 1969, six months after our first view of Earth, human beings walked on the moon generating another collective burst of sublimity. A sixth of the earth’s population of that time–watched Apollo 11’s grainy transmission: these emotionally charged “first steps” of Neil Armstrong and Buzz Aldrin, the first spacemen.[33] Through the reflective gold visors on their helmets, reflective to protect against cosmic rays and to hide their human faces, they saw both a new world and the one from which they came, and they saw each other, encased within their white survival suits against the cratered extremity below and the airless black above.

The moon watched its first terrestrial aliens, leaving footprints. And the world watched–with the gasp of wonder–as a nebulous beam, transferred across 240,000 miles of void, reached their TV screens; the feed was eroded and shadowy, but proof enough that human beings had left this world and flown among stars.

Just the *idea* of going to the moon is sublime. The *journey* is sublime; it is wondrous and fearful to contemplate the tale of three men climbing aboard a rocket, blasting off to the moon. The *risk*, the *scale* of the endeavour; the little pressurized ship

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[30] “Apollo 8 Onboard Voice Transcription. January, 1969.” *History Collection*, Johnson Space Center, NASA. Day 4, p. 113. historycollection.jsc.nasa.gov. Accessed 11 Oct. 2019.

[31] There are a trio of Apollo mission photos that are considered iconic and representative of a paradigm shift: *Earthrise*, *Spaceman* and *The Blue Marble*.

[32] Moran, Joe. “Earthrise: the story behind our planet’s most famous photo.” *The Guardian*, 22 Dec. 2018, https://www.theguardian.com/artanddesign/2018/dec/22/behold-blue-plant-photograph-earthrise. Accessed 3 Nov. 2019.

[33] One sixth of the Earth’s population in 1969 was 650,000 people; the Earth’s total population was 3.61 billion.

of aluminium alloy shielding living people, hurtling through hundreds of thousands of miles of space, is sublime. Considering the *fate* of the astronauts is sublime; as is imagining them peering out into the limitless universe, watching their home recede, the earth getting smaller and smaller until it could be obliterated behind a thumbnail.[34]

The dangers of the journey were palpable. An immeasurable number of things could go wrong and all prove fatal, from a tiny broken wire to a decompression pinprick in a space suit. Yet, everything worked. The astronauts were ingenious and resourceful: Aldrin fixed a chipped circuit breaker–that threatened to strand them on the moon–with a felt-tipped pen.[35] Millions on earth drank it all in–the technical minutiae, all the explanatory graphs, diagrams, animations, and even the description of their beef and vegetable dinner.[36]

The fiery lift-off of the Saturn V rocket was pure energy, as were the furious stages of rocket burn, the escape from earth's gravity, the docking manoeuvres between modules. Millions hung on to every radioed word between the control center in Houston, elevating the astronauts' mundane chatter into voices from the stars.

The very last minute before lunar touchdown had all the heart-pounding adrenalin of a Hollywood blockbuster: Armstrong, taking manual control of the craft after the LEM's computer had aimed it into a boulder field; all the while Aldrin counting down the remaining seconds left of fuel, alarms sounding inside the LEM, crash warning lights flashing in Mission Control. We hear Aldrin count to zero. And then Armstrong's quiet assurance, "Tranquility base here. The Eagle has landed." With that, the breathless 650

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[34] Jim Lovell remembers hiding the earth behind his thumb from the capsule window; Neil Armstrong recalls hiding our planet behind a gloved finger while on the surface of moon.

[35] Aldrin reattached a plastic circuit braker switch on the LEM using a felt tipped pen. Had this repair been unsuccessful, the men would been unable to ascend back to join the orbiting Command Module.

"One Hour that Changed the World: The Moon Landing." *The Passionate Eye*/*CBC/Radio Canada*, 2019. https://www.cbc.ca/player/play/1571660355723. Accessed 5 Mar 2020.

[36] Astronaut food: The tubes of applesauce given to John Glenn had evolved by the time of Apollo 11 to packaged beef and vegetables. And, Apollo 11 got to use spoons.

Bendix, Aria. "From applesauce in a tube to space noodles, here's how astronaut food has evolved from the 1960s to today." *The Business Insider,* 16 Jul. 2019, https://www.businessinsider.com/astronaut-food-in-space-timeline-2019-7. Accessed 11 Nov. 2019.

million viewers glued to their TV screens exhaled in relief as did capcom Charlie Duke, "You got a bunch of guys about to turn blue. We're breathing again."[37]

2.2. Apollo as the Apotheosis of the Romantic Sublime

This collective 'holding-of-breath,' this gasp of wonder, unveiled the lunar adventure with a moment that harnessed elemental bolts of pure feeling. Here on this lifeless rock, in this celestial realm, the lunar landing produced that singular and rarest of emotions: *sublimity*, a transcendent, intoxicating kind of terror that vaults beyond normal experience into something far more profound and exhilarating.

Our understanding of what constitutes 'sublime feeling' is anchored in late-eighteenth century Romanticism, an aesthetic and intellectual movement born in Europe which embraced raw and wild landscapes for their emotional power. But here it was not glacial vistas, vertiginous peaks, thundering cataracts or boiling storms at sea: it was the desolate lunar landscape and the sight of a distant Earth that produced deep emotion– fear and awe, fear of annihilation (in the void of space), transcendence (from Earth's boundaries) and transformation (into spacemen).

If the Romantic Sublime could have an 'apex' moment, one that eclipses all others in majesty of feeling, surely Apollo 11 is the one. Surely the lift-off of the Saturn V rocket is equal to the volcanic fireworks the eighteenth-century Romantics sought. Is not its radiant power, its deafening roar, its ascension is every bit as sublime if not more than that of Vesuvius? Do not the lunar landscapes in their stark and shadowed depths produce a greater transmutable wonder than the Alps and Apennines? Three men leaving their home planet to visit another at incomprehensible risk is an odyssey of mythological proportions that belongs in the canon of Classical Greece. Cannot this lunar voyage be seen as the extension of the pursuit of knowledge through adventure, beginning in the ancient world, blossoming in the eighteenth century, and now refined in mid-twentieth century spacefaring?

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[37] "Apollo 11 Transcripts." *NASA*, https://www.nasa.gov/history/alsj/a11/a11trans.html. Accessed 3 Mar. 2019.

A case can be made for the Apollo 11 lunar landing as the finest expression of 'the sublime,' a singular art form. Matthew Walther calls this mission, "the most unlikely piece of art ever created for the ennoblement of our species."[38] Apollo was the apotheosis of sublimity: all human encounters with dynamic natural phenomena led up to this very instance when human beings would stand on another world. It culminates a long trajectory of seeking of Thin Places (in the Polar regions, the Himalayas, the ocean depths), romantic yet liminal landscapes of evolving bleakness, danger and hostility to life that provoke an intense existential experience. Going to the moon conjured into reality the romance of a brand new sublime, elemental and otherworldly. "Apollo 11 was the culmination of the Romantic cult of the sublime prefigured in the speculations of Burke and Kant, an artistic juxtaposition of man against a brutal environment upon which he could project his fears, his sympathies, his feelings of transcendence."[39]

This brutal environment also offered a shocking new perspective: it was as if the Earth and the Moon had changed places. No longer was the moon our synchronously rotating satellite, its illuminated face changing as our planet passes in front of the sun; it was now the Earth up above in the black sky, appearing like a shiny new object for veneration.

This change in perspective upended the complex legacy of humanity's relationship to its natural satellite. The radiant moon that has shone down on the living world since it was punched out of a primordial earth now had two spacemen moving across its face. Apollo 11 presented a paradox: in that euphoric moment of discovery, the 'sacred' moon became profaned.

As a celestial body, an object of beauty, a timepiece, the moon is a foundational element in creation mythologies, spiritualities, and scientific archetypes from the very beginning of human curiosity. Indeed, contemplation of the moon is considered the starting point of intellectual thought, with pre-historic scratches of the moon's phases our first intellectual activity. But with the first lunar landing, millennia of human storytelling and pent-up longing dissipated into cosmic dust. The regolith hid no surprise civilization, no divine entity. It hid nothing at all. It was a brutal revelation from a brutal environment

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[38] Walther, Matthew. "The sublime Romanticism of the moon landing." *The Week*, 17 Jul. 2019, https://theweek.com/articles/852955/sublime-romanticism-moon-landing. Accessed 2 Jan. 2021.

[39] Ibid.

and one that reoriented human fascination–we now had to project ourselves (and our imaginations) further away, deeper into the vastness of the universe even as we looked back at our precious Earth.

Alighting on a world once mysterious and unattainable, the astronauts unwitting became protagonists in the moon's last great Romantic story.

2.3. A Short History of the Romantic Sublime

Figure 3. ***Wanderer above the Sea of Fog*.**
Painting: Caspar David Friedrich, 1818.
https://commons.wikimedia.org/wiki/File:Caspar_David_Friedrich_-_Wanderer_above_the_Sea_of_Fog.jpeg
Public domain, via Wikimedia Commons.

And I have felt
A presence that disturbs me with joy
Of elevated thoughts: a sense sublime
Of something far more deeply interfused…

~William Wordsworth[40]

To appreciate the lunar adventure as a great Romantic story, we return to the origins of Romanticism. Just as the lunar landings redefined humanity's relationship with the living earth, so too did Romanticism in its time facilitate a similar reorientation. The achievement of Romanticism is this *shift in perception*, an appreciation for natural environments that had hitherto been shunned.

This reorientation primarily affected Western culture, addressing the rift that had placed humankind above and outside the natural world.[41] Deep division between the human and non-human world were normalized and coloured by biblical truths and hierarchical ideas of stewardship. Theories, such the mind-body dualism advanced by René Descartes elevated the rational, 'soul-bearing' man above the rest of the mechanistic universe, thus denying any empathetic reading of the primordial *livingness* of the earth.[42] This disconnection between beings with a 'soul,' has been a powerful tool in dividing and isolating human beings from other living beings and enabling the practice of 'othering' that perpetuates these divisions and disconnection even to this day.

2.3.1. Burnet's imaginative theory

So ingrained was this disconnection between the human and non-human world, it could not easily be expunged. Take the early pre-Romantic example of the English theologian Thomas Burnet (1635-1715), on his way to Italy in 1672. Crossing the Simplon Pass in the Swiss Alps he is afforded a magnificent view of four-thousand metre

[40] Wordsworth. "Lines Composed a Few Miles above Tintern Abbey."

[41] Many non-Western cultures allow a holistic human integration with the natural world, human beings *not apart from* but *a part* of nature.

[42] René Descartes, French philosopher and scientist, 1596-1650. (I think, therefore, I am; *cogito ergo sum*)

high peaks, and something stirs in his soul.[43] These “wild, vast, indigested heaps of Stones and Earth,” as he described the mountains, made him feel something he had not felt before, “that inspires the mind with great thoughts and passion.”[44] Burnet is overwhelmed; the peaks “fill and overbear the mind with their Excess” and he feels “a pleasing kind of stupor and Imagination.”[45]

Burnet was feeling sublime emotion, even if he couldn’t recognize it as such. Inspired, he wrote a great work of the imagination, his geological cosmology, *The Sacred Theory of the Earth*, 1684, that came to have great traction in the late seventeenth century.[46] By then, Burnet in trying to qualify his sublime experience, theorized the “indigested heaps of Stones,” were actually ‘ruins,’ symbols of wickedness. God, he reasoned, had not created the seven-day world of the Old Testament, but rather a perfect, featureless oviform. This earth-egg possessed a fiery centre and vast chambers of water which cracked upon humanity’s expulsion from the Garden of Eden. Angered, God inflicted the great Deluge, and its “colossal hydraulics,” to use Robert Macfarlane’s evocative phrase, further rent the earth asunder. In corrupting the unblemished earth, an angry God created the first landscapes. The sublime feeling Burnet felt when crossing the Simplon Pass, troubled him now; perhaps all the “great thoughts and passion” generated an involuntary swell of guilt. It was a relief then, for him to be able explain away sublime feeling when the mountains were “gigantic souvenirs of humanity’s sinfulness.”[47]

2.3.2. Shaftsbury, father of Romanticism

Anthony Ashley Cooper, the Third Earl of Shaftsbury (1671– 1713), did not locate humanity’s sinfulness in high peaks. Both Shaftsbury’s *Inquiry into Virtue or Merit*, 1699, and *The Moralists*, 1709, mark a significant shift away from the prevailing Burnetian

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[43] Simplon Pass. Legendary mountain pass between the Pennine and the Lepontine Alps, in Switzerland. Highlight of the Grand Tour. Made famous by William Wordsworth in his poem “The Simplon Pass.”

[44] Macfarlane, Robert. *Mountains of the Mind: A History of Fascination*. London, Granta, 2003. p. 24.

[45] Ibid.

[46] *Telluris theoria sacra* (Latin, 1681), The Theory of the Earth (English, 1684)

[47] Macfarlane, p. 27.

conception of the landscape asymmetry–the mountainous “wens and blisters” of a god-forsaken wildness–towards one of natural goodness.[48]

Shaftsbury was not threatened by sublime feeling. He admired the beauty of wild environments. He reasoned, as Paul Guyer writes, that “our natural sense of beauty is evidence of our natural sense of moral goodness.”[49] This belief was shared by many of his contemporaries. Isaac Newton (1642-1747) found “God’s perfection” not only in maths and physics, but also “in the rest of God’s creation–the natural world.”[50] Jean-Jacques Rousseau (1712-1778) also deemed the natural world to be inherently good and he championed the moral, physical, and intellectual benefits of nature.[51]

Shaftesbury also directed his attention towards a new aesthetic of expression, an appreciation and respect for the organic freedom inherent in wild environments. He viewed the “human tampering” evident in the sculpted, geometric gardens such as the promenade of Versailles, with disgust.[52] It was untamed wildness that moved his soul.

Shaftesbury, asserts Christopher Thacker, is the “father of Romanticism;”[53] “He is also, more than any other person, the originator of the eighteenth-century cult of the sublime, the belief in the beauty of terror.”[54] For Shaftsbury an experience of the sublime was essential for a transcendent kind of creative vision: “through each inspiration, the poet is–if only temporarily–different than other people, and superior to them,” says Shaftsbury.[55] “Nature contains what is *terrible*,” he explains, “and yet this leads to *divine wisdom*.”[56]

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[48] Nicholson, Marjorie Hope. *Mountain Gloom and Mountain Glory*. Seattle, University of Washington Press,1997. p. 42.

[49] Guyer, Paul. Introduction. *A Philosophical Enquiry*, by Edmund Burke, Oxford, 2015. p. vii.

[50] Ibid, p.12.

[51] Duffy, Cian and Peter Howell. *Cultures of the Sublime.* New York, Palgrave Macmillan. 2011. p.16.

[52] Thacker, Christopher. *The Wildness Pleases*. New York, St. Martin’s Press, 1983. p.15.

[53] Ibid, p.12.

[54] Ibid, p.16.

[55] Ibid, p.15.

[56] Ibid, p.16.

2.3.3. Edmund Burke's taxonomy of sublime feeling

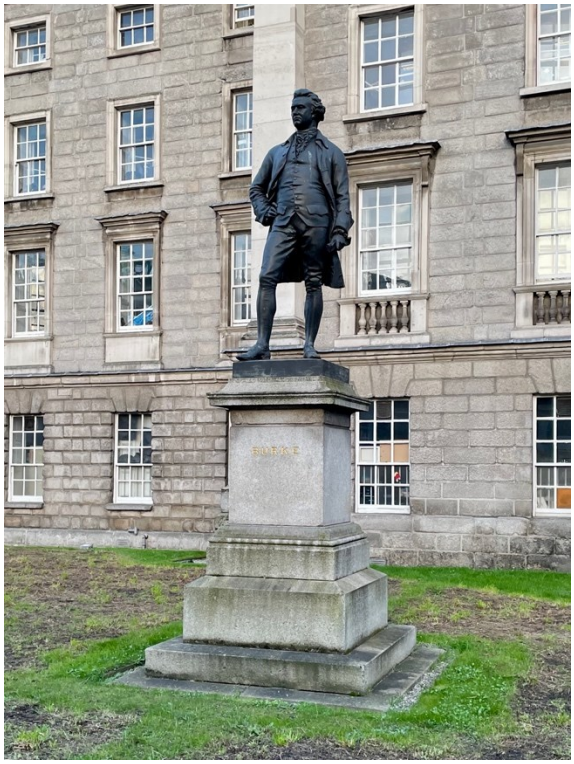

Figure 4. **Statue of Edmund Burke.**
Trinity College, Dublin.
Photo: S. Lockwood, 2024.

Like Shaftsbury, Edmund Burke (1729-1797) was also obsessed with the *terrible* in nature, reasoning *terror* to be the essential ingredient for sublime emotion. Burke's *Philosophical Enquiry into the Sublime and the Beautiful*, 1757, sought to illuminate and codify human feeling, sublimity being the "strongest emotion."[57]

Burke was a child of the Enlightenment and valued Newtonian empirical methods for anatomising aesthetic values. His work suffered in his belief that sensory organs operate according to fixed scientific principles. All humans, he reasoned, experience

[57] Burke, Edmund. *A Philosophical Enquiry into the Sublime and Beautiful*. Oxford, Oxford University Press, 2015. p. 33.

Burke was only 19 years old when he wrote his Enquiry. It was his only foray into philosophy. He lived through both the American War of Independence and French Revolution, events which influenced his subsequent writings and his politics. He sat in the British parliament as a member of the Whig Party.

emotion in the same way and these emotions are quantifiable. Burke was not alone in believing this kind of *sensationalist* philosophy as James Boulton expounds, "the dependence of the mind, for its ideas, on the senses was fundamental to the work of Locke, Berkeley, and Hume."[58] Nonetheless, Burke's coup was in his articulation of sublime emotion: "the empirical exposition of aesthetic judgments" as Kant describes his theory–and for this, his *Enquiry* is considered a foundational document of the Romantic Sublime.[59]

Evidence suggests Burke, as a student at Trinity College, Dublin, was inspired by an earlier document, the ancient text, *Peri Hypsous* (Latin: *De sublimitate*; English: *On Heigh*t, or *On the Sublime*). [60] This document was a treatise on persuasion by Longinus (213-273 BCE), a Greek philosopher living in Rome. [61] Longinus was the first to formulate the concept of 'the sublime,' and he situates it in 'lofty argument.' The sublime "does not convince the reason of the reader but *takes him out of himself."*[62] Longinus introduces the idea of intellectual transcendence: "Even the whole world is not wide enough for the soaring range of human thought, but man's mind often overleaps the very bounds of space."[63]

For Burke, transcendence hinges on *astonishment*, being that "state of the soul in which all its motions are suspended with some degree of horror." [64] He also situates it in *terror*:

> Whatever is fitted in any sort to excite the ideas of pain, and danger, that is to say, whatever is in any sort terrible, or is conversant about terrible

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[58] Boulton, James T. Editor's Introduction. *A Philosophical Enquiry into the Sublime and the Beautiful*, by Edmund Burke. London, Routledge, 2008. p. xxxiii.

[59] Ibid. p. cxxvii.

[60] *Peri Hypsous* lay dormant for centuries finally coming to light in a 1554 Latin translation *De Sublimitate*, "On the Sublime." The Latin *sub limen* means literally up to or under the lintel; the lintel being the place where the earth's atmosphere reaches to meet heaven.

Burke entered Trinity College, Dublin in 1744; *Peri Hypsous* was likely required reading during his four years at the college.

[61] *Peri Hypsous* is attributed to Cassius Longinus, (*pseudo*-Longinus).

[62] Longinus. *On the Sublime*. Translated by H.L. Havell. London, Macmillan & Co., 1890. Released online at Gutenberg.org. 10 Mar. 2006. https://www.gutenberg.org/files/17957/17957-h/17957-h.htm. Accessed Jan-Oct. 2017. Section I, p.3.

[63] Ibid. Introduction p. xxxv.

[64] Burke, *A Philosophical Enquiry,* p. 47.

> objects, or operates in a manner analogous to terror, is a source of the *sublime*; that is, it is productive of the strongest emotion which the mind is capable of feeling.[65]

Burke believed sublime emotion to be a desirable, even healthy intellectual condition. For Burke, an experience of sublimity was, as Kari Lokke makes note, "necessary as a kind of exercise for 'finer and more delicate' mental organs in order to preserve mental health and prevent lethargy, melancholy, and despair."[66]

However, a 'healthy,' 'delightful' experience of sublime emotion comes with a caveat: "When danger or pain press too nearly," argues Burke, "they are incapable of giving any delight and are simple terrible; but at certain distances, and with certain modifications, they may be, and they are delightful…."[67] Thus, the 'modification' of a safe distance from the source of terror was necessary to benefit from sublime experience.

Edmund Burke compiled a list of requisite attributes for generating sublime emotion. Although *terror* (encompassing the fear of pain and death) was at the top of his list, he also detailed such factors as *obscurity*, *power*, *privation*, *vastness*, *infinity*, *light*, *colour*, *noise*–all factors that engage the human senses–as instrumental in producing sublimity. It was these factors, alone or in combinations with *terror* that produced the desired emotional impact.

2.3.4. Kant's dynamic and mathematical sublime

If Burke locates sublime feeling in the engagement of the senses, for Kant it is in the mind. Immanuel Kant (1724-1804) is responsible for another foundational text of the Romantic sublime. Kant's *Critique of Judgement*, 1790, is a study of the human mind, defining the relationship between sensory experience, perception and the development of knowledge. Unlike Burke, Kant's does not rest his theory of the sublime on "aesthetic

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[65] Ibid. pp. 33-34.

[66] Lokke, Kari Elise. "The Role of Sublimity in the Development of Modernist Aesthetics." *The Journal of Aesthetics and Art Criticism*, vol. 40, no. 4, 1982, pp. 421–29. *JSTOR*, doi.org/10.2307/429973. Accessed 8 Apr. 2019. p. 421.

[67] Burke. p. 34.

judgments," of physical objects or objects of the imagination, but rather "modes of consciousness." [68]

Kant splits the sublime into two types: the *dynamic* and the *mathematical*. Powerful natural forces or formations, "threatening rocks, thunder clouds… volcanoes in all their violence of destruction, hurricanes leaving desolation in their track, the boundless ocean rising…" bring about the dynamic sublime. [69] These phenomena "must be represented as a source of fear" and make "our power of resistance" seem "trifling."[70] Like Burke, Kant argues a degree of separation is necessary: "We must see ourselves safe," he writes, "in order to feel this soul-stirring delight."[71] These threatening rocks, thunderclouds "we readily call sublime," he explains, "because they raise the forces of the soul… and discover within us a power of resistance which gives us the courage to be able to measure ourselves against the seeming omnipotence of nature."[72]

This ability to 'measure ourselves' against this 'natural omnipotence' allows us to transcend our fears. In Boulton's explanation, "we feel helpless in the face of fearsome natural objects, but because we are independent of nature, the mind is conscious of its own essential power."[73] Kant maintains that "sublimity does not reside in any of the things of nature, but only on our mind."[74] Thus our 'rational faculty,' our brainpower, has a "pre-eminence over nature even in its immeasurability."[75] Nature, for all its dynamism, cannot compete. Elizabeth Kessler calls Kant's dynamic sublime a "discovery." She writes, "This *recognition* of a power to resist [the fearful natural object] follows the initial gasp of awe… Kant's dynamic sublime possesses an affirming quality that tempers the terror."[76]

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[68] Shaw, Philip. *The Sublime*. London, Routledge, 2017. p. 8.

[69] Ibid. p. 218.

[70] Kant, Immanuel. *Philosophical Writings*. New York, Continuum, 1986. p. 217.

[71] Ibid. p. 219.

[72] Ibid. p. 218. Heroic courage

[73] Boulton. p. cxxvii

[74] Ibid. p. 221.

[75] Ibid. p. 221.

[76] Kessler, Elizabeth A. *Picturing the Cosmos*. Minnesota, University of Minnesota Press, 2012. p. 47. Italics mine.

Kant also expounds a category of sublime feeling he calls the *mathematical sublime* which is grounded in his astronomical fascinations. Kessler draws attention to Kant's early essay on the heavens, in which he writes:

> If the grandeur of a planetary world in which the earth, as a grain of sand, is scarcely perceived, fills the understanding with wonder; with what astonishment are we transported when we behold the infinite multitude of worlds and systems which fill the extension of the Milky Way![77]

"The common denominator in all discussions of the sublime," Lokke writes, "is the preoccupation with infinity, more precisely within the human mind's attempts to come to terms with infinity."[78] In this early essay, Kant wrestles with "these immense orders of star-worlds," for they "form one of a number whose termination we do not know…." Kant looks up at the stars aghast, "There is no end but an abyss of real immensity in the presence of which all the capability of human perception sinks exhausted…."[79]

However, human perception is lifted out of exhaustion by the virtue that we can *consider* a concept like infinity at all. This, posits Kant, is proof of our *supersensible* abilities. The imagination needs the senses to understand; reason does not. The power of human reason is greater than anything in the sensual world. The mathematical sublime becomes a supersensible pleasure that "exceeds bodily senses."[80] Darren Jorgensen expresses how:

> The sight of outer space brings about elation for Kant because it implies an infinitude that lies not only in nature but also in one's own mind. Gazing at the stars, Kant knows that they are far away, and yet in being able to think this distance, to hold this greatness in his mind, grasps the dimensions of the universe.[81]

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[77] Ibid. p. 47.

[78] Lokke. p. 422.

[79] Kessler. p. 48., from "Kant's Cosmology as in His Essay on the Retardation of the Rotation pf the Earth." Chapter II, First Part. James MacLehose & Co. Glasgow: 1900. pp. 64-65.

[80] Ibid.

[81] Jorgensen, Darren. "Middle America, the Moon, the Sublime and the Uncanny." *The Sociological Review*. Wiley-Blackwell Publishing. Oxford, 2009. (Kant, 1790: 95) Sage Journals, vol. 57, issue 1 suppl.,178-189. Published online 1 May 2009. https://doi.org/10.1111/j.1467-954X.2009.01824.x. Accessed. 8 Apr. 2019. pp. 178-179.

Or, as Kessler puts it, “Kant zooms the reader out beyond the Milky Way.”[82] The concept of a limitless universe, of uncountable numbers, may not have the fearful physicality of the dynamic sublime but it has instead a fearful *profundity*. This feeds into the sublime feeling generated by the first lunar landing. “Such is the pleasure of thinking about Apollo 11,” Jorgensen says, “which brings about a supersensible pleasure because it demonstrates that the human mind has mastered the infinite. The mind appears all-powerful in its ability to configure a spacecraft that will travel from Earth to the moon and back again.”[83]

2.4. The Romantic Shift

As the concept of ‘the sublime,’ so elucidated by Burke and Kant, began to coalesce in the eighteenth-century it fed into an age of great scientific discovery and geographic exploration. “The notion of an infinite, mysterious Nature wanting to be discovered,” Richard Holmes contends, and “seduced into revealing all her secrets,” was motivation for scientific pursuits and simultaneously, for creative imagination.[84]

With an emphasis on an individual, ‘show your feelings’ kind of expression for life, the creative arts flourished. Achievements in the literary arts (Mary Shelley, Percy Bysshe Shelley, Friedrich Schiller, Lord Byron, Samuel Taylor Coleridge, John Keats, William Wordsworth, Victor Hugo, Alexandre Dumas, Johann von Goethe, Jean-Jacques Rousseau, Robert Burns and others); the visual arts (William Blake, Caspar David Friedrich, J.M.W. Turner, Francisco Goya, Eugène Delacroix–being just a few); and in music performance and composition (including such artists as Hector Berlioz, Ludwig van Beethoven, Johannes Brahms, Frédéric Chopin, Franz Liszt, Gioachino Rossini) are emblematic of Romantic emotion and continue to be influential and celebrated in Western culture.

Romanticism introduced new thoughts into religion: God came to exist through natural reasoning, a deist truth. William Herschel (1738-1822) aimed his telescope

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[82] Kessler. p. 48.

[83] Jorgensen. p. 179.

[84] Holmes, Richard. *The Age of Wonder*. New York, Harper Collins, 2008. p. xviii.

heaven-ward and declared the universe not God's "fixed creation" but "an enormous living organism."[85] The natural theologist William Paley (1743-1805) saw in the movements of stars evidence for God as a great watchmaker tinkering with planetary orbits.

The Romantics weighed the starry skies and wild world and found them rich in emotion. The wild world became of value. It was still a time when low population numbers and lack of industrialization left much of the natural world intact and pristine wilderness still undiscovered. This fascination for an experience of wild phenomena (and especially the *priority* of such an experience) laid the ground work for many journeys of discovery, scientific exploration, and what we call 'adventure tourism' today.

Herein this fascination is where the *shift* is made concrete.

2.5. From the Romantic Legacy to *Novel Sublimity*

Back in the late-eighteenth century, for many of the well-to-do, adventure tourism manifested as the Grand Tour, a right-of-passage journey through France, crossing the Alps to Switzerland, and down into Italy. Key attractions along the way, immortalized in Romantic verse, included Mont Blanc–the highest peak in Europe, the Mer-de Glace glacier, and the Simplon Pass.

The "travelogue narrative" became a new literary genre, a requisite component of the Grand Tour. This narrative included careful notation of itinerary, weather conditions, picturesque vistas, and, importantly, the emotional state of the traveller. A "phraseology and vocabulary" of "romantic voyaging" develops, that Scaramellini Guglielmo says is "more evocative than descriptive, more suggestive than qualifying, more in tune with the observer's sensations than with the intrinsic attributes of the object observed."[86] Thus in these travelogues, "the landscape becomes the 'mirror of the interior world.'"[87]

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[85] Holmes. p.113.

[86] Guglielmo, Scaramellini. "The picturesque and the sublime in nature and the landscape: Writing and iconography in the romantic voyaging in the Alps." *GeoJournal.* Vol. 38, No. 1, Geography and Literature (January 1996), p. 51.

[87] Ibid. p. 51.

The legacy of Romantic travelogues remains in the pursuit of new conquests and explorations of the unknown, to which spacefaring is an integral part. The Apollo "Voyages to the Moon" are, arguably, a kind of Grand Tour; the moon being the 'first stop.' The astronauts become the intellectually curious Romantic traveller. The mission transcripts become a new genre of travelogue, one with its own phraseology, flavoured with technical minutiae; a set of conversations carried between human beings across outer space.

The lunar adventures were a manifestly *novel* version of the Romantic sublime. The landscape, bleak and pristine, was missing the sensuous, organic power of living landscapes that the Romantics found so desirable. Everything about the moon messed with the astronauts' senses. Encased within their life-support suits, they were denied the full range of sensation. Instead, an experience of space bestowed an array of new wonders beyond those Burke catalogued in his *Enquiry*.

The sensation of weightlessness inside the space capsule was unnerving and exhilarating. Lightness and agility on the surface of the moon–despite the cumbersome spacesuits–felt impossibly joyful. Apollo 12's Alan Bean recalls his attempts to run, "I remember being spaceborne so long that my calf muscles could relax and recover."[88] In the moon's weak gravitational force (one-sixth that of Earth) he bounded across in leaps.

The astronauts' spatial sense was transformed. When moving through the landscape, direction and distance were hard to measure. The lack of familiar objects (trees, building, clouds) and the lack of atmospheric abstraction meant that objects that could be seen (rocks, craters) had no perspective. The astronauts could not instinctively locate themselves *within* the landscape. During the last three missions (Apollo 15, 16, and 17), the astronauts driving the lunar rovers could not tell how far they had travelled. Moreover, the shape of the horizon–the curvature–felt unusual; the moon, being one-quarter the size of earth, is noticeably spherical at ground level. Aldrin recalls being intensely aware of this, "That sensation was clear as distinctly different than on earth."[89]

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[88] Chaikin, Andrew. "The Farthest Place." Essay in *Full Moon* by Michael Light. New York, Alfred A. Knopf, 1999. n.p.

[89] Ibid. n.p.

The lack of atmosphere–just a scant trace of gas and solar wind–proved disorienting; on the lunar surface the astronauts felt the incongruity of blinding sunlight and black sky existing side by side. As Apollo 15's Dave Scott relates, the lunar black sky of daytime "is a whole new thing for the mind to handle."[90]

There is no wind on the moon. In the stillness only the astronauts' shadows ruffled the surface.

Lighting effects jarred colour perception: moon rocks seemed to "glitter" under unfiltered sun and then change–from snow white to tan to dark gray–depending on which direction the astronaut faced. This created, as Andrew Chaikin describes, "a local universe of colour."[91]

The visual *clarity* was profound and unexpected. Michael Light, tasked with assembling and digitizing the Apollo photographic archive, remarks on this unusual phenomenon, "Truthfully, humans were physically never meant to see so clearly and penetratingly, without an atmosphere to soften the edges of the physical world."[92]

With no atmosphere and no liquid water to sculpt the surface, the lunar landscape changes only through erosion, from 4.6 billion years of meteoroid bombardment. The sun heats the surface up to 127ºC every day but there is nothing to burn. During the lunar night and the absence of sun, the temperature falls to -173ºC. It is a lifeless world of inorganic dust and astral fragments. The absence of life means there are no sounds of life. Encased within spacesuits, their spaceman senses registered the muffled crunch of their own boots on a silent, soundless world.

Back in lunar module, released from their suits, the astronauts' human senses came back. They could hear each other's voices not just as radio signals in their helmets. Removing their space gloves, they could feel through their fingertips. The moon dust felt sharp; unpolished, jagged edges of particles embedded into their suits and could not be brushed off. The dust stuck to their skin. And it had a strange smell. The

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[90] Ibid. n.p.

[91] Ibid. n.p.

[92] Light, Michael. "The Skin of the Moon." Essay in *Full Moon* by Michael Light. New York, Alfred A. Knopf, 1999. n.p.

moon, Neil Armstrong recalled, had “the scent of wet ashes.” For Buzz Aldrin, it was “the smell in the air after a firecracker has gone off.”[93]

It was not just the astronauts themselves that experienced a new range of unexpected sensations. Darren Jorgensen draws attention how the TV audience experienced the “mass” of the moon: it was no longer just an orb in the night sky, instead the “secure space” of the living room was “exposed to [its] fearful immensity.”[94] Now “closer than ever before,” he writes, “the moon asserted its alien magnitude.”[95]

This *novel sublimity* was met with abstruse reactions from the astronauts themselves. Even before they set out on their adventure, they mentally surmounted Kant’s dynamic sublime, their ‘rational faculties’ resisting any expression of fear or wonder. This deliberate, cultivated, and professional objectivity was meant to save their lives. It was not always possible to know what the astronauts were *feeling*. A proximity to danger or pain is considered ‘heroic courage;’ the astronauts were courageous heroes, but did they ever feel *in danger*?

The essential ingredient for fomenting sublime feeling is *terror*. As Burke says, “the *idea* of suffering must always be present. And indeed, the idea of pain. And above all of death…”[96] Riding a ballistic missile out of the earth’s orbit is truly a frightful experience, so how was the terror was kept at bay? Of all the risks the astronauts faced, loss of life was ever present. Should the life support fail, should they crash, or explode, or burn, they would have mere seconds of useful consciousness before death and no recourse for rescue.

The Apollo lunar missions were full of terrors. Tapping into a pioneering fear of the unknown is a strong catalyst for risk, and the astronauts were risk takers all. They had trained for every conceivable terror and were professional problem solvers–as seen with Apollo 13 when the men carefully worked though the terror of an explosion that vented oxygen into space. The missions were the culmination of many, many hours of

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[93] Fishman, Charles. “What you didn’t know about the Apollo 11 Mission.” *Smithsonian Magazine,* June 2019, https://www.smithsonianmag.com/science-nature/what-you-didnt-know-about-apollo-11-mission-fifty-years-ago-180972165/. Accessed 14 Jul. 2019.

[94] Jorgensen. p. 180 (channeling Norman Mailer, 103).

[95] Jorgensen. p. 181.

[96] Burke. *Enquiry.* p. 33.

rehearsal and simulation. They had performed all the detailed, technical sequences by rote. The mechanics of spaceflight were often automatic, mathematic, and sustained: the endless checklists, the to-dos, the careful ordering of tasks, all the switches and locks and gauges continually needing attention. The process permitted little inclination toward aesthetic reflection and even less toward the release of sublime emotion. As Michael Collins, in a post-Apollo 11 interview quipped, “The best crew for the Apollo mission would be a philosopher, a priest, and a poet. Unfortunately they would kill themselves trying to fly the spacecraft.”[97]

Nonetheless, the astronauts did *feel* even if they did not readily express it. Collins, who piloted the Command Module while his Armstrong and Aldrin explored below, was intensely awareness of his state of being. As he rounded the far side of the moon, he was the most ‘alone’ human being in the universe. In the far side radio blackout he had no one to talk to, no other voice to hear. The moon was a shadowed mass below, no sun, no planet Earth. Looking out the window he had a banquet of stars. With the exception of seven other Apollo command module pilots, no one can relate to the vacuity, darkness, solitude, and silence that Collins felt in that state of isolation:

> I am alone now, truly alone, and absolutely isolated from any known life. I am it. If a count were taken, the score would be three billion plus two over on the other side of the moon and one plus God knows what on this side.”[98]

Adding to his isolation was the real existential dilemma of returning to earth alone should his colleagues perish. Collins kept himself busy with onboard operations. “Behind the

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[97] White, Frank. *The Overview Effect: Space Exploration and Human Evolution*. Denver, Multihouse Publishing, 2021.

White, Frank. “Michael Collins and the Overview Effect.” *Frank White Author*, 3 May 2021, https://frankwhiteauthor.com/article/2021/05/michaelcollinsoverviewеffect. Accessed 18 Mar.2024.

[98] 3.2 billion people was the human population of the Earth in 1969.

Collins, Michael. “Statement from Apollo 11 Astronaut Michael Collins.” *NASA*, Release: 09-164. 15 Jul. 2009, https://www.nasa.gov/topics/moonmars/moon_pressreleases_archive_13.html. Accessed 3 Jul. 2019. Note: This link has been taken down but is quoted here:

Goldstein, Richard. “Michael Collins, ‘Third Man’ of the Moon Landing, Dies at 90.” *New York Times*, 28 Apr. 2021, https://www.nytimes.com/2021/04/28/science/michael-collins-third-man-of-the-moon-landing-dies-at-90.html. Accessed 18 Mar. 2024.

moon," he later mused, "it was very peaceful."[99]

2.6. The *Romantic* Apollo Photographic Archive

Only the Apollo astronauts have enjoyed the novel experience of partial gravity, or the moon's 'firecracker smell,' or the 'very peaceful' isolation of the lunar far side. The novel sublimity of space and moon is unattainable for most of us and perhaps this is a contributing reason why, as Matthew Walther laments, that the Apollo missions did not fuel, as the early Antarctic expeditions had done, "a literary mania for feelings of remoteness, hugeness, and brooding oceanic emptiness."[100] He explains, "What a shame that we have been able to produce no great lunar literature to succeed the writings by Byron, the Shelleys, Tennyson, and Melville that both immortalized and inspired the great hypothermic pioneers,"[101] especially as Armstrong, Aldrin, and Collins were, like Coleridge's ancient mariner, "'alone, alone, all, all alone' on a sea of stars."[102]

In place of a literary archive Apollo has a photographic one, and it fits firmly within the aesthetic tradition of the Romantic sublime, even if this was unintended. Over ten Apollo missions, six being on the lunar surface, the astronauts took over 17,000 images from hand-held Hasselblad cameras, producing an archive of unparalleled, dreamlike beauty. An array of cameras mounted on the spacecraft and rocket add to this archive. The images are from every part of the journey and unspool the adventure from lift-off to splashdown; from the fiery instance of ignition (caught on the camera mounted underneath the Saturn V rocket) to the trio of red and white drogue parachutes easing the spacecraft's homecoming.

Many of the images of the astronauts exploring the lunar terrain ascribe to a conquest narrative. We see the space-heroes as they plant the flag. They photograph their footprints. In the last three missions, we see them steering space-rovers over larger

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[99] Gohd, Chelsea. "Alone on the Moon: What was Michael Collins Thinking During the Apollo 11 Lunar Landing?" *Space*, 20 Jul. 2019, https://www.space.com/michael-collins-remembers-apollo-11-moon-landing. Accessed 3 Jul. 2021.

[100] Walther. "The sublime romanticism…"

[101] Ibid.

[102] Ibid.

swaths of lunar domain. The rover tracks lay down roads. Such photos were proof of a kind of 'Lunar Destiny,' laid out before all the nations of Earth (and such alien nations as might exist). "For America," writes Michael Light, "Apollo was a chance to take its old driving myths of Manifest Destiny and an endless frontier and symbolically reignite them on a scale as vast as the cosmos."[103]

We also see the photographic story of the astronauts as scientists; carefully setting up and operating scientific experiments, data gathering, poking and scraping up new knowledge of deep time origins. We see spacemen digging, leaping, playing in the forbidding dust, the cavernous depressions, and massive boulders. We see them alongside the spiny lunar module, their lifeboat yet a wholly unearthly machine, its gold legs adding an incongruous sparkle to the tonal monotony.

Michael Light, upon examining the original negatives, remarks, "The pictures are so sharp and clear they verge on surreal."[104] For him, the photos taken on the surface of the moon are "… a kind of pure, elemental dialogue between minerals and radiation, an epiphany of rock and light."[105] These lunarscapes, he says, "are charged tracings of a world perceptually and biologically beyond the pale… To view them, even from the safety of Earth, is to feel both ecstatic and imperiled."[106]

This 'ecstasy and imperilment' is unique to the lunar sublime. The moonscape photographs–especially the desolation vistas of rock and shadow–expose such a literal 'otherworldly' terrain to the human viewer, they manifest danger. It is only when the eye has something recognizable to alight on is this foreboding eased and a feeling of delight allowed to creep into the landscape. Thus, a boot tread, a human-shaped shadow, a tool become moments that both reveal the wonder of human presence on the moon and also a longing for humanity. The photos in the archive that focus on 'the human condition'– from Charlie Duke's cellophaned portrait of his family lying a top the lunar dust, or the glazy look on Eugene Cernan's face, post moonwalk, exhausted and streaked with dust, or even the beads of condensation generated by the astronauts' breath on Apollo 12's

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[103] Light, Michael. "In the Skin of the Moon." n.p.

[104] Ibid.

[105] Ibid.

[106] Ibid.

command module hatch window–possess an intimate and profound kind of sublimity to which we relate.

Photos in Apollo lunar archive are coveted images, instantly recognizable, and among the most widely disseminated in the world. The three images discussed below, are emblematic of the Apollo missions' contribution to the canon of Romantic imagery:

2.6.1. Spaceman

Figure 5. ***Spaceman.***
"Buzz Aldrin on the Moon."
Photo: Neil Armstrong, 20 July 1969.
https://www.nasa.gov/image-article/buzz-aldrin-moon/. Courtesy of NASA.

Spaceman or *Moonman* is Buzz Aldrin's story. In this full-length portrait, he stands his feet apart in a small depression, the knees of his brilliant white spacesuit covered in moondust. His shadow stretches out in from of him into the dust marked with the treads of his boots. His mirrored, domed visor is a huge screen in his helmet into which his head has disappeared. The life support system is a mounted hulk on his back. "Aldrin looks like an alien," reasons Jonathon Jones, "His body hangs loose, moving with

almost drugged steps on the grey desert that stretches to nothingness–to true black nothingness. In this unearthly place he has become unearthly."[107]

Reflected in Aldrin's visor is Armstrong, the photographer. The horizon behind Armstrong is also reflected, lining up with the actual horizon behind Aldrin as one continuous line, an effect that makes Aldrin's helmet feel transparent.

Aldrin, so disguised, loses his identity. He becomes an "everyman–and everywoman," in Jones' standpoint, "Anyone could be in that suit."[108] Concealed within the spacesuit, the spaceman belies, "the gulf between the intimately human on the one hand and the incomprehensible void on the other."[109]

Hidden in the visor reflection is a whole other world: Armstrong holding the camera as he stands beside the gold-limbed lunar module. In this refection, Aldrin appears as shadow, a black silhouette in the rocky ground softened and bent by the visor's curvature and gold-tint. A speck-sized Earth is reflected in the visor just below where it attaches to the helmet.

The *Spaceman* portrait "captures humanity evolving before our eyes," writes Jones.[110] We see a faceless, awe-struck being suspended in time and space on an alien world, unsure of how to move and where to move to. Aldrin becomes a cryptic, humanoid portent.

The Apollo portraits, Jones posits, "show us the stupendous fact of human consciousness in an otherwise mindless universe. One human photographing another in space is as perfect an image of the mystery of ourselves as you can get."[111]

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[107] Jones, Jonathan. "The greatest photos ever? Why the moon landing shots are artistic masterpieces." *The Guardian*, 17 Jul. 2019. https://www.theguardian.com/artanddesign/2019/jul/17/greatest-photos-ever-moon-landing-shots-artistic-masterpieces. Accessed 17 Jul. 2019.

[108] Ibid.

[109] Light. *Full Moon*.

[110] Jones. "The greatest photo ever…"

[111] Ibid.

Spaceman echoes Casper David Friedrich's Romantic portrait, *Wanderer above the Sea of Fog*.[112] In this painting, the wanderer stands on a black outcrop, surveying a deep valley, mist billowing among the rocks. "The wanderer," writes Julian Haladyn, "overlooking this sea of fog, quite dramatically confronts the ends of the human power of judgment."[113] He is "the intervening medium," explains Haladyn, for the *fear of the empty*: "This is an active confrontation with, and even acknowledgment of, the *horror vacui* of existing within a world that is beyond definition. It is a fear of the void encapsulated in the concept of the sublime."[114]

In *Spaceman*, both Aldrin and micro-reflected Armstrong stare past each other into absolute *nothingness*. But for each other, they confront the *horror vacui* where the earth floats in *emptiness.*

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[112] See illustration by Thanapol Sinsrang as used in Walther, "The sublime Romanticism…" Sinsrang replaces Friedrich's "wanderer" with a spaceman in full suit. (1971yes/iStock, Wikimedia Commons). Also see Friedrich's painting *Two men contemplating the moon.*

[113] Haladyn, Julian Jason. "Friedrich's 'Wanderer': Paradox of the Modern Subject." *RACAR: Revue d'art Canadienne / Canadian Art Review*, vol. 41, no. 1, 2016, pp. 47–61. JSTOR, http://www.jstor.org/stable/43855855. Accessed 19 Mar. 2024.

[114] Ibid.

2.6.2. The Blue Marble

Figure 6. ***The Blue Marble.***
"View of the Earth seen by the Apollo 17 crew traveling toward the moon." Photo: The crew of Apollo 17. 7 December 1972. NASA ID: AS17-148-22727. https://images.nasa.gov/details/as17-148-22727. Courtesy of NASA.

The Blue Marble is a portrait of Earth taken by the crew of Apollo 17 on the way to the moon. It shows the Earth as a whole, complete sphere, fully illuminated by the sun. The atmosphere swirls above the blue ocean like threads of melting glass. The Antarctic icecap glows, tilted towards the sun as the winter solstice approaches the southern hemisphere. The continent of Africa is visible as is Arabian Peninsula, and even the 1972 Tamil Nadu cyclone. The black around this "perfect colourful circle" of earth is, as Al Reinhard describes, "so dense it defines infinity."[115]

[115] Reinert, Al. "The Blue Marble Shot: Our First Complete Photograph of Earth," *The Atlantic,* 12 Apr. 2011, https://www.theatlantic.com/technology/archive/2011/04/the-blue-marble-shot-our-first-complete-photograph-of-earth/237167/. Accessed 1 Jun. 2019.

Blue Marble is conjoined beauty and terror. Everyone who has ever seen it has studied it and searched it for home. It is the most widely produced photographic image in history; it is a rare image that–despite such ubiquity–retains sublime feeling. [116]

Apollo 17's Eugene Cernan reflects on the moment the image was taken:

> You have to literally just pinch yourself and ask yourself the question, silently: Do you know where you are at this point in time and space, and in reality, and in existence? … You can see from pole to pole and across oceans and continents and you can watch it turn and there's no strings holding it up, and it's moving in a blackness that is almost beyond conception.[117]

Cernan's silent pinch of a "Do you know where you are…?" question was on everyone's mind as images of earth in space were realized.

2.6.3. Earthrise

Jim Lovell thinks of *Earthrise* as "the fourth astronaut; it was there and it did the job. One frame and it showed exactly our existence."[118] *Earthrise* is the Christmas eve 1968 photo taken by Apollo 8's William Anders. It has a loveliness of composition: above the lunar horizon floats the top third of the earth, a dynamic and beautiful blue and white orb partially hidden in shadow. It was a revelation.

"We were all on the earth so we knew about the earth," Lovell recalls noting that NASA had zero interest in images of earth from space, the sight of Earth as a planet was so unexpected.[119] "It didn't take long for the moon to become boring. It was like dirty beach sand," said Anders in an interview. "Then we suddenly saw this object called Earth. It was the only colour in the universe."[120] Borman recalls, "… how could this little ball exist in the vast universe of nothing?"[121]

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[116] Ibid.

[117] Ibid.

[118] Vaughan-Lee, Emmanuel. *Earthrise*. Global Oneness Project. 2018. Film.

[119] Ibid.

[120] Sample, Ian. "Earthrise: how the iconic image changed the world." *The Guardian*, 24 Dec. 2018, https://www.theguardian.com/science/2018/dec/24/earthrise-how-the-iconic-image-changed-the-world. Accessed 24 Dec. 2018.

[121] Vaughan-Lee. *Earthrise*.

Earthrise came to take on a role of its own, to represent the unity of human experience, the fragility of earth and its place in the universe. “We did something that ended up showing the earth and its people exactly how we exist, where we are,” says Lovell, “that we were really here on earth–a spacecraft–that we were all astronauts…”[122]

“The most enduring legacy of the Apollo missions,” writes Kelly Oliver, “remains the images of Earth from space.”[123] The emotion of seeing our home planet suspended in black oblivion completely changed our conception of Earth. “Spaceship Earth” (Lovell), and “Christmas-tree ornament Earth” (Anders) are metaphors that continue to resonate. Considering the earth as a delicate and breakable glass ball, as an object that could shatter if not handled with care, inspired much empathetic introspection. Earth becomes “Living Earth,” or *Gaia,* as named in 1972 by James Lovelock, then working for NASA, as the Apollo program takes its last flight.

The environmental movement is founded on the images of earth in space. The first “Earth Day” was in 1970, a year after the first lunar landing. Today a multitude of peoples worldwide advocate for the protection of many aspects of earth, from the oceans to the plight of individual species. The urgency to ‘save’ Earth against the critical threat of climate change is now the world’s most serious challenge; it affects absolutely everyone. “There is no ‘Planet B’” reads a climate protest placard. And we know this to be true, from the Apollo archive, from those resplendent images of ‘Planet A.’

2.7. Melancholic Apollo

The Apollo photographic archive was successful in promulgating a story of great bravery in a romantic, liminal environment just as it was passing into myth. Viewing the archive is poignant; it seems long ago and the missions have passed into popular culture to such an extent that ‘Apollo spacemen’ are action dolls and cartoon shapes that

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The Apollo 8 crew reflect on the experience of seeing the earth from space in Vaughan-Lee’s documentary commemorating the 50th anniversary of the Earthrise photo. Interviews with Anders, Lovell and Borman.

[122] Ibid.

[123] Oliver, Kelly. *Earth & World*. New York, Columbia University Press, 2015. p. 12.

populate childhoods. With the Artemis Program due to return humans to the moon in the near future, the Apollo missions will pass into a memory of a nascent lunar age.

This 'First Lunar Age' (1968-72) was an unparalleled human milestone, not just as a technological and engineering feat but as a highly symbolic endeavor. Although the Apollo missions revealed the fragility of planet Earth in void of space, the ecological fragility of Earth was not the immediate 'fragility' that came to mind. Even before the mission was realized, it was solemnized with a fragile hope for 'peace on earth.' Seventy-three world leaders wrote messages to be left on the lunar surface. They were etched onto a small silicon disc that Aldrin kept tucked in a small shoulder pocket on his suit. [124] He nearly forgot to leave it behind. With few exceptions, every message asked for peace.[125]

The celebratory aftermath of the lunar landing engendered a rare instance of collective jubilation and wishful thinking. This wishful global goodwill offered solace, albeit short-lived, from disparate conflicts and aggressions plaguing many different nations. In the States, Apollo 11 was escapism from the heartaches of the civil right struggles and the Vietnam war. Even the G.I.s on patrol in Vietnam carried transistor radios turned in to the moon landing as a most welcomed diversion.[126]

It is incredulous now to think of the Apollo missions as 'peacekeeping.' If they fell short on this 'hope' one has only to look back to the conditions under which the moonshot was conceived. The Apollo program was born from the ashes of World War II, the invention of the ballistic missile, the hydrogen bomb, and dangerous Cold War rivalry

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[124] "From Planet Earth, July 1969"–wording on disc case.

"Apollo 11 Memorial Items." *Apollo 11 Lunar Surface Journal/NASA*, n.d. https://www.nasa.gov/history/alsj/a11/a11memorials.html. Accessed 20 Mar. 2024.

Note: this page is derived from Press Release. No: 69-83F, "Apollo 11 Goodwill Messages." 13 Jul. 1969, which is no longer a searchable page on NASA site.

[125] Hanlon, Michele. "Apollo 11 brought a message of peace…" *The Conversation*, 26 Mar. 2019, https://theconversation.com/apollo-11-brought-a-message-of-peace-to-the-moon-but-neil-and-buzz-almost-forgot-to-leave-it-behind-112851. Accessed 15 Apr. 2019.

[126] Bruce McCandless, Mission Control, Cap Comm., Return journey, radioed to Apollo 11 crew: "Apollo 11, this is Houston. If you're not busy now, I can read you up the morning news.… Things have been relatively quiet recently in Vietnam. G.I.s on patrol were observed carrying transistor radios tuned to your flight."
Fishman. "What you didn't know about the Apollo 11 mission."

to which the ‘Space Race’ was a part. Nuclear apocalypse is the backdrop to spacefaring.

This apocalyptic spectre is the melancholy we hold in the back of our minds at the very moment both the ‘end’ of the earth and the earth in space come into view. This is a most melancholic realization, that the *destruction* of earth and the *discovery* of earth are linked: the spectral ‘mushroom cloud’ being a *compliment* to *The Blue Marble*.[127] This is the point that Oliver makes, also noting how themes of obliteration have since multiplied, “After the Apollo photographs of ‘whole’ earth, the mushroom cloud and fear of nuclear destruction was joined in our cultural imaginary by images of other types of annihilation of the entire planet through our own pollution and climate change or at the ‘hands’ of aliens…”[128]

These annihilation scenarios have become a necessary component of the Earth-advocacy movements and remain vivid in current realities. “It was as if we could think the whole earth only by imagining its destruction,” continues Oliver, “that all attempts to ‘save’ the planet require first imagining destroying it.”[129]

This ‘destruction-salvation’ loop feeds back into the hope that such a scenario can be harnessed to promote peace, that national and tribal affiliations can be subsumed in the greater expression of a citizenry of planet Earth. This has not happened.

The post-Apollo cohort has benefited from the technological innovations initiated by the Apollo program. Although the Apollo spacecraft had limited computer technology (the Apollo Guidance Computer was pre-silicon chip and weighed 70 pounds), the space program is the foundation for ‘the Digital Age.’[130] Today, vast amount of information are

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[127] Oliver. pp.11-12.

[128] Oliver. pp.10-11.

[129] Oliver. p. 11.

[130] “The Apollo Guidance Computer had RAM of 4KB, a 32KB hard disk.”
Fisher, Len. “What tech would the Apollo 11 missions have today?” *BBC Science Focus Magazine*, https://www.sciencefocus.com/space/what-tech-would-the-apollo-11-mission-have-today/. Accessed 16 Jul. 2019.

Madrigal, Alexis C. “Your Smart Toaster Can’t Hold a Candle to the Apollo Computer.” *The Atlantic*, 16 Jul. 2019, https://www.theatlantic.com/science/archive/2019/07/underappreciated-power-apollo-computer/594121/. Accessed 2 Mar. 2021.

available to anyone with access to a computer. This brings people together, but not always peacefully. The new medias and the instantaneity of communication and reaction has also intensified hostilities between people. Expressions of protest and division are often emboldened by a morass of digitally broadcast disinformation.

Apollo presented a beautiful vision of our oasis in space. At the time, Apollo brought into focus many of the threats facing our planet–although 'disinformation' was not yet one. Now, threats are not just from conflict and disaster hot zones, but also from techno-pollution that fights for our attention with the numbing parade of eco-alarms that fill our screens with a news feed of ever more distressing images of an imperiled earth.

Imperiled and lonely, blue-marble Earth is both wonder and melancholia. Apollo is the reagent for much of the 'eco-anxiety' that exists today.

2.8. Apollo and Eco-Anxiety

The images of Earth from space are deeply melancholic; the fear of degrading the earth to the point that it can no longer sustain life, and the magnitude of such a *degradation* engenders feeling of *sublime melancholia*. Planetary consciousness is the birth of eco-anxiety.

This is not a new thought. Rachael Carson expressed anxiety for the consequences of new technologies just as human spacefaring got under way. She was acutely aware of the delicacy of the interconnections between the living systems that enable the biosphere. As an early advocate for environmental moral responsibility, she was concerned with the unintended chain reactions in the natural world from human activities–nuclear, chemical and otherwise.

Carson was deeply troubled by the launch of Sputnik in 1957. Jill Lepore recounts how she "observed the foraging of this 'space-age universe' with dismay."[131] Carson biographer Linda Lear reflects that the "Cold War and the imposition of humans

[131] Lepore, Jill. "Fifty Years Ago We Landed on the Moon. Why Should We Care Now." *New York Times*, 14 June 2019, https://www.nytimes.com/2019/06/14/books/review/moon-landing-anniversary.html. Accessed 14 Jun. 2019.

into space, a place Carson once regarded as sacrosanct, upset her."[132] She could not see how it would do any good.

Rachel Carson did not live to see the Apollo missions and the images of earth from space. Yet, she had the prescience to envision how earth might suffer if human beings try to occupy a pristine territory such as outer space. Certainly, the development of the technologies needed to land a man on the moon has benefitted numerous industries, facilitated globalization, and shaped our culture. However, post-Apollo technologies have a dark side: to maintain the material quality of civilization, citizens of industrially advanced countries consume vast amounts of energy, poison the air, water and soil with wholly unnatural toxins and 'forever' chemicals. Since Apollo, human beings have created an earth-choking amount of plastic waste.

Despite global awareness, ecosystem damage and biodiversity loss brought about by human activity continues. Slowing this progression of harms is a struggle made worse by the climate crisis and the digital medias that isolate human beings from the natural world.

2.9. The Risk of becoming *Non-Human*

The post-Apollo cohort remade the world as a digital, virtual environment and steered it away from all natural cadence into the artificial constructs that grip our daily lives. "To the extent that the space program involved a repudiation of humanity itself," writes Jill Lepore, "the legacy of Apollo is *Alexa* [tech company Amazon's virtual assistant], and it haunts us all."[133]

Hannah Arendt was among the twentieth-century thinkers, like Rachel Carson, who expressed concern for the 'Space Age.' She may not have envisioned a virtual *Alexa*, but she was troubled by 'earthmen' becoming 'spacemen' and that spacefaring to seek out new worlds would entail a change in our *humanness*. The earth is "the very

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[132] Lear, Linda. "Timeline, 1957." *The Life and Legacy of Rachel Carson,* n.d., https://www.rachelcarson.org/interactive-timeline. Accessed 1 Sept. 2019.

[133] Lepore. "Fifty Years Ago…".

quintessence of the human condition," she wrote, "earthly nature, for all we know, being unique in the universe."[134]

Arendt wrote *The Human Condition*, shortly after the launch of Sputnik.[135] She felt incredulous, that for many the little satellite inspired "relief," for it represented "the step towards escape from men's imprisonment on the earth." [136] Arendt added, "Nobody in the history of mankind has ever conceived of the Earth as a prison for men's bodies or show such an eagerness to go literally from here to the moon."[137]

We risk becoming *non-human* due in part to technologies that augment human abilities far beyond what our natural senses are capable of sensing, our physical bodies capable of reaching, or our mental capacities of understanding. Nuclear fission, a 'reaction that happens in the sun' being a case in point:

> "We have come to our present capacity to "conquer space" through our new ability to handle nature from a point in the universe outside the earth. For this is what we actually do when we release energy processes that ordinarily go on only in the sun, or attempt to initiate in a test tube the processes of cosmic evolution, or build machines for the production and control of energies unknown in the household of earthly nature.[138]

Our new abilities to 'handle nature' are a perennial dilemma in science–even more so now than in Arendt's time–with advances in bio-technologies that allow gene-editing/engineering or even the reconstitution of *proto-humans* to challenge essential questions of what it means to be human.

In answer to the question, 'Has man's conquest of space increased or diminished his stature?' Arendt argued man's stature risked "being destroyed."[139] Despite an anthropocentric view of our importance in the wider universe, when we project ourselves

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[134] Arendt, Hannah. *The Human Condition.* University of Chicago Press, Second ed., 1998. p. 2.

[135] Sputnik launch Oct 4, 1957. The little satellite orbiting the earth proved the catalyst for the space age and the space race; this Soviet achievement was greeted with such alarm in the United States it instigated a rivalry that culminated with the American moon landing.

[136] Arendt. *The Human Condition.* Prologue, p. 1.

[137] Lepore. "Fifty Years Ago …"

[138] Arendt. p. 10.

[139] Arendt, Hannah. "Hannah Arendt on the conquest of space". *Encyclopedia Britannica*, 17 Dec. 2014, https://www.britannica.com/topic/Hannah-Arendt-on-the-conquest-of-space-2003648. Accessed 15 May 2022.

beyond earth, we risk losing our earth-bound nature so essential to our identity. Arendt warns, “we have found a way to act on the earth as though we disposed of terrestrial nature from outside.” This way of acting impacts the creation of new knowledge and acts of discovery. [140] She continues:

> It was precisely by abstracting from these terrestrial conditions, by appealing to a power of imagination and abstraction that would, as it were, lift the human mind out of the gravitational field of the earth and look down upon it from some point in the universe, that modern science reached its most glorious and, at the same time, most baffling achievements.[141]

Becoming ‘space-beings’ is a glorious and baffling achievement. From spacecraft windows, the cupola in the International Space Station, orbiting telescopes and weather satellites, we all have become space-beings accustomed to looking down on earth and looking at our own bodies through our interactions with technologies. Arendt suggests the example of how our bodies appear subsumed into the vehicles in which we travel; when seen from a great height, the ‘car’ to us becomes as a shell to a snail, “an inescapable part.”[142] To this end, she continues, “All our pride in what we can do will disappear into some kind of mutation of the human race; the whole of technology, seen from this point, in fact no longer appears ‘as the result of a conscious human effort to extend man’s material powers, but rather as a large-scale biological process.’”[143]

Future humanity may well become a ‘prideful mutation.’ Yet, we are also intent on preserving a record of ourselves at this stage in our biological process, to solidify in the historical and even deep-time record exactly what it means to be a human being. Why else then such an endeavor as the Golden Record affixed to both Voyager spacecraft? Sailing through interstellar space, this time capsule is more than just a relic of humankind.

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[140] Ibid.

[141] Ibid.

[142] Ibid.

[143] Ibid.

2.10. Apollo Thin Places

Many human-made relics already exist in space. Most are just space junk like the husks of dead satellites. But other objects inspire reverence. The smashed remnants of spacecraft are as mysterious and sacred as shipwrecks on the sea floor.

In the intervening years, the Apollo lunar landing sites have taken on the aspects of Thin Place environments: The Sea of Tranquility, the Ocean of Storms, the Descartes Highlands, the Taurus-Littrow Valley carry the marks of human contact and are as untouched as the day the astronauts left. The Apollo ephemera, the tracks and tools, the gold-foil legs of lunar module landing gear engender the same reverence of feeling as the splintered wooden beams of the Antarctic's *Endurance* at the bottom of the Weddell Sea.

Through a *reverence of place*, the Apollo sites are consecrated ground. Space lawyer Michelle Hanlon heads For All Moonkind, an NGO devoted to the preservation and protection of these sites, the expectation being that these places of first human contact will one day become lunar tourist destinations. [144] These sites are "part of the common human heritage," worthy of preservation as 'lunar national parks' or UNESCO Lunar Heritage sites.

These Apollo Thin Places may even be at risk of a remote kind of vandalism: Steve Mirmina posits that in the near future, teenagers lounging on their beds, with just a cellphone could zoom around robotic cars on the moon like the remote-controlled train sets of childhood. "If you're a couple of college students and you have a rover and an iPhone," says Mirmina, "of course you're going to go to the Apollo landing sites… Just use some joysticks on the ground and drive over them."[145] One day, will an e-commerce company like Amazon sell lunar robots and drones for personal amusement?

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[144] For All Moonkind Mission Statement: "Ensure the six Apollo Lunar Landing and similar sites in outer space are recognized for their outstanding value to humanity and consequently preserved and protected for posterity as part of the common human heritage."

"Mission Statement." *For All Moonkind*, https://www.forallmoonkind.org/moonkind-mission/mission-statement/. Accessed 24 Oct. 2023.

[145] Drake, Nadia. "Should Neil Armstrong's Bootprints be on the Moon Forever?" *New York Times*, 11 Jul. 2019, https://www.nytimes.com/2019/07/11/science/moon-apollo-11-archaeology-preservation.html. Accessed 11 Jul. 2019.

Lunar conservationists also fear private lunar exploration and tourism. Take the Space IL team vying to claim the 'Moonshot' award to land a craft on the moon.[146] Peter Diamandis, founder of XPrize, explains the motivation behind the "democratization" of space travel, "We are optimistic about seeing this first domino fall setting off a chain reaction of increasingly affordable and repeatable commercial missions to the moon."[147] Will the moon become the playground for a class of tech billionaire with too much time and money? Will rockets turn the moon into a theme park as devoid of sublimity as Niagara Falls with its adjacent tourist circus, or with a garbage problem like Mt Everest?

There are many concerns for the fate of the moon. The Orion rocket that will carry Artemis 1 is already on the launchpad for testing. The chosen landing site for Artemis 1 is the lunar south pole near the discovery of frozen water.[148] This site will become 'base camp' and the frozen water will be mined to manufacture potable water, hydrogen fuel, and oxygen to breathe. This base, as explained in NASA promotional material for the Artemis Program, is the first step in establishing a "lunar economy," and building "a community on and around the moon capable of proving how to live on other worlds."[149]

Thus, the moon's future is already set in motion starting with a moon base and mining operation. As settlements grow and the moon revels its treasures, the earth-

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[146] In April 2019, SpaceIL's robotic lander, Beresheet, experienced engine failure and failed to soft land, but it successfully entered lunar orbit. It was a "first" for a privately-funded adventure to the moon, and also Israel's first lunar mission. Israel's SpaceIL was awarded the 'Moonshot' prize.

"XPRIZE Foundation Awards $1 Million 'Moonshot Award' to SPACEIL." *XPRIZE*, 11 Apr. 2019, https://www.xprize.org/articles/xprize-awards-1m-moonshot-award-to-spaceil. Accessed 6 May 2024.

"The New Space Race." *XPRIZE*, https://www.xprize.org/prizes/google-lunar. Accessed 5 Apr. 2019.

[147] "XPRIZE Introduces $1million 'Moonshot Award." *XPRIZE*, 28 Mar. 2018, https://www.xprize.org/articles/xprize-introduces-1m-moonshot-award. Accessed 20 Mar. 2024.

[148] Geddes, Linda. "Water exists on the moon, scientists confirm." *The Guardian*, 26 Oct. 2020, https://www.theguardian.com/science/2020/oct/26/water-exists-on-the-moon-scientists-confirm. Accessed 20 Oct. 2020.

[149] "Artemis." *NASA*, Page updated: 24 Apr. 2024, https://www.nasa.gov/specials/artemis/. First accessed 20 Mar. 2024.

aliens may decide to fight over it in a way that no treaty or set of lunar laws will pacify. In speculative forms of popular culture, the moon is already imagined as a battleground.

2.11. Apollo Hierophanies

Columbia, the command module that returned the Apollo 11 astronauts to earth, now hangs inside a plexiglass box in the Smithsonian Museum in Washington D.C. The spacecraft is distinguished, as Rebecca Maksel describes, by "its strangely beautiful charred orange exterior."[150] Columbia is now a sacred object; it cannot be touched. So in 2016, a 3-D digitization process 'opened' the precious capsule. The most revealing elements inside the capsule are the places that bear witness to the men who rode inside. The small human gestures– like the scribbled figures on the instrument panels– are strangely poignant. Duct-taped to the capsule wall is a hand-drawn paper calendar for July, all the mission days crossed off except for the last which was 'splashdown.' This calendar was "a very human thing" to do says Space History curator Alan Needell; there is no experience of night and day once off earth, and yet the calendar was a small way of connecting to loved-ones on earth who were marking the passage of the mission.[151] The digitization also revealed a message Michael Collins left behind on an equipment bay panel, "Spacecraft 107, alias Apollo, alias Columbia. The Best Ship to Come Down the Line. God Bless Her."[152]

The Apollo artifacts still on the moon have acquired a hierophantic energy as privileged objects that manifest a kind of 'sacredness' in the place where they are found. The photo of Aldrin's boot is instantly recognizable as a 'space footprint,' and is as crisp as the day it was made. The five lunar roving vehicles used on the later Apollo missions are still parked where the astronauts left them. Unlike an earthen archeological site, the sands of time have hidden nothing. With no erosion, the story can still be read in its

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[150] Maksel, Rebecca. "A New Look Inside the Apollo 11 Spacecraft Reveals A Few Surprises." *Smithsonian Magazine*, 12 Feb. 2016, https://www.smithsonianmag.com/air-space-magazine/smithsonians-3d-project-uncovers-new-detail-national-air-and-space-museums-apollo-11-command-module-180958124/. Accessed 20 Oct. 2020.

[151] Ibid.

[152] Ibid.

entirety: “Where the objects are, how they’re sitting there” says Michelle Hanlon, “that tells the actual real story and history of humans on the moon.”[153]

We are obsessed with our earthen evolution and these extraterrestrial, left-behind objects and markings are precious to us. Starting with Lunik 2 in 1959, the moon has been hit with sixty years of crashes and hard landings.[154] Recent crashes include Israel’s Beresheet lander (April 11. 2019) near the *Mare Serenitatis*, and India’s “Vikram” Chandrayaan-2’s near the lunar south pole. Some of the locations of crashed ‘remains,’ like those of Surveyor 4, are unknown. These ‘remains’ add up to a potential 110 human heritage sites.[155]

In the bid to preserve and perhaps one day clean up, NASA maintains a Catalogue of Manmade Material on the Moon, that includes plaques, flags, garbage bags, family photos, a Bible, and even graffiti.[156]

Why sanctify these remains? The moon was still unmarked territory just fifty years ago; this should give us pause for thought. Yet, Michael Light argues we cannot help leaving it the way it was before we found it:

> Tools and footprints and tracks, matched with a self-absorption unparalleled in the animal kingdom, are much of what humans are made of. Exploration of places we’ve not been to before etches the story sharper than normal, and sometimes the tale is one of sad destruction as much as thrilling enlightenment and shattering re-evaluations of our place in the universe.[157]

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[153] Michelle Hanlon interview in Nadia Drake, “Should Neil Armstrong’s Bootprints …”

[154] Corum, Jonathan. “Racing to Land, or Crash on the Moon.” *New York Times*, 19 Jan. 2024, https://www.nytimes.com/interactive/2023/08/22/science/moon-landing-crashes.html. Accessed 20 Mar. 2024.

[155] “For All Moonkind.” *For All Moonkind*. https://www.forallmoonkind.org. Accessed 5 Mar 2022.

[156] “Final Catalogue of Manmade Material on the Moon: NASA History Program Office, 7-05-12.” *Internet Archive*, https://archive.org/details/finalcatalogueofmanmadematerialonthemoon. Accessed 20 Mar. 2024.

Graffiti: Cernan wrote his daughter’s initial in the lunar dust.

[157] Light. “The Skin of the Moon.” *Full Moon*.

2.12. Apollo as the genesis of sublime melancholia

The Apollo lunar missions can be considered as the apotheosis of the Romantic sublime; nothing can compare to the intense feeling of physical vulnerability, proximity to death and euphoria of discovery. The Apollo missions are also the genesis of 'sublime melancholia,' as revealed by the images of Earth in space. Despite living with the knowledge of our planetary vulnerability humanity still struggles to cherish our living world.

This vulnerability is even exposed at a cherished Apollo Thin Place: Fifty years on from the first mission, the splendid beachfront of Cape Canaveral's Pad 39A–the Apollo 11 launch site–is being eaten alive. This is a much sought-after spot; for it is here where the rocket that breached the veil between worlds was launched.[158] But now the waves of climate change are bigger, stronger, and come in at a different angle.[159] In 2017, Hurricane Sandy, damaged a 1.2 mile stretch of shoreline near the row of historic launchpads designed for the Apollo Saturn 5 rockets.[160] Despite sand reinforcements, the rising Atlantic and annual hurricanes allow the dull nag of waves to reclaim the sandspit, and these hierophantic pieces of beach, touchstones of human spacefaring, will soon be no more.[161]

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[158] Blue Origin's Jeff Bezos and SpaceX's Elon Musk have launched rockets from Pad 39A.

[159] Interview with Peter Adams, Univ. of Florida geologist.
"Climate change threatens vital NASA Launch Pads." *CBS News*, 6 Dec. 2014, https://www.cbsnews.com/news/climate-change-threatens-vital-nasa-launch-pads/. Accessed 12 May 2019.

[160] Granath, Bob. "Restoration Planned for Shoreline Protecting Kennedy Infrastructure." *NASA*, 25 Feb. 2013, https://www.nasa.gov/centers-and-facilities/kennedy/restoration-planned-for-shoreline-protecting-kennedy-infrastructure/. Accessed 12 May 2019.

[161] "Climate change threatens vital NASA Launch Pads." *CBS News*.

Chapter 3.

Wonder and Sadness

3.1. Space Tourism and Sublime Melancholia

On 13 October 2022, the spaceflight company Blue Origin's *RSS First Step*, a New Shepard space capsule, lifted off from the shored-up bank of Cape Canaveral's venerated launch Pad 39A.[162] This was the second crewed flight of the *RSS First Step*, and it carried three paying tourists and a special guest, William Shatner, an actor but, arguably, "the most famous astronaut in the world."[163] Since the mid-sixties, Shatner played the role of a heroic spaceship captain, one thoroughly embedded in Western popular culture. His exhortation, championing the adventures of spaceflight, "to boldly go where no one has gone before" is as famous a line as Neil Armstrong's "one giant leap for mankind…."[164] Shatner's foray into space was a short one lasting a mere ten minutes and 17 seconds but in that time the crew journeyed to the Kármán line, they experienced a few minutes of weightlessness, and had the chance to see the biosphere melt into space.

The advent of space tourism engenders mixed emotion: it is a commercial endeavour that uses massive energy-consuming machines with huge carbon footprints to take a few human beings to the fine edge of their hurting planet–all for the fun of it. When Shatner crossed this fine edge, he was prepared, and expected himself to feel the optimism and fellowship with worlds beyond earth that he had so perfected in his fictional role. He expected "a feeling of deep connection with the immensity around us, a

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[162] RSS: Reusable Space Ship. RRS *First Step*, a "New Shepard" space capsule, so named after Neil Armstrong's "First Step" on the moon and Alan Shepard, the first American in space.

[163] Rivera, Enrique. "William Shatner experienced profound grief in space." *NPR*, 23 Oct. 2022, https://www.npr.org/2022/10/23/1130482740/william-shatner-jeff-bezos-space-travel-overview-effect. Accessed 25 Oct. 2022.

[164] Star Trek, introductory monologue: "Space… the final frontier. These are the voyages of the Starship Enterprise, its five-year mission… to explore strange new words… to seek out new life and new civilizations… to boldly go where no man has gone before."

Swanson, Glen E. "Space, the final frontier: Star Trek and the national space rhetoric of Eisenhower, Kennedy, and NASA." *The Space Review*, 20 Apr. 2020, https://www.thespacereview.com/article/3923/1. Accessed 2 Nov. 2022.

deep call for endless exploration." "I was absolutely wrong," he recalls. Instead, he found himself overcome with "the deepest grief:"[165]

> "I felt this overwhelming sadness for the Earth. I didn't realize it until I got down. When I stepped out of the spacecraft, I started crying. I didn't know why. It took me hours to understand why I was weeping. I realized I was in grief for the Earth."[166]

Shatner's experience maintains what many astronauts have long felt–the "overview effect." As conceived by space philosopher Frank White, this is an unmistakable *shift in perception* that occurs when seeing the earth from space, "an emotional or mental reaction strong enough to disrupt that person's previous assumptions about humanity, Earth, and/or the cosmos."[167] It is a realization of our singularity in the universe, of earth's beauty and fragility. This is a special feeling of sublimity, one that few will ever have, but it has never before been this *sad*.

"Overview" sublimity also harkens back to those first photos of "earth in space" shared by the Apollo missions. In the intervening years, these images have lost their power. Satellites and space telescopes distribute remarkable images so readily, and these images are readily consumed and absorbed into popular culture. We are distracted and forgetful, and generations born post-Apollo have only known a time when images of hurricanes crossing oceans or continent-wide sandstorms are transmitted from above. Thus, we all think we know what the earth is like from space, and, like an actor, we all imagine how we would *feel*. So, Shatner's experience of fresh seeing was shocking. People were genuinely moved by his awareness:

> I understood, in the clearest possible way, that we were living on a tiny oasis of life, surrounded by an immensity of death.…This was an immensely powerful awakening for me. It filled me with sadness. I realized that we had spent decades, if not centuries, being obsessed with looking away, with looking outside. I did my share in popularizing the idea that space was the final frontier. But I had to get to space to understand that

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[165] Shatner, William. "My trip to space made me realize we have only one Earth – it must live long and prosper." *The Guardian*, 7 Dec. 2022, https://www.theguardian.com/environment/2022/dec/07/william-shatner-earth-must-live-long-and-prosper-aoe. Accessed 7 Dec. 2022.

[166] Wattles, Jackie. "William Shatner on traveling to space: 'All I saw was death.'" *CNN*, 10 Oct. 2022, https://www.cnn.com/2022/10/10/business/william-shatner-new-book-boldly-go-scn/index.html. Accessed 3 Nov.2022.

[167] Rivera. "William Shatner experienced …"

> Earth is and will stay our only home. And that we have been ravaging it, relentlessly, making it uninhabitable. [168]

Thus, the euphoria of the going to space for a man who had spent so much of his life pretending to do just that, is tempered by the reality of an earth in crisis. The wonder of earth in space is traumatized by the sadness of its damaged state. Shatner's startling admission is pure *sublime melancholia*.

3.2. *Awe*ful Disasters

On November 25, 2022 Artemis I launched from the shored-up sand bank of Cape Canaveral's Pad 39A. By November 28, the Orion spacecraft had begun a distant retrograde orbit of the moon, becoming the most distant spacecraft built to carry humans.[169] This was an unmanned test flight; soon, Artemis, *moon goddess, twin of Apollo*, will return astronauts to a chosen place near the lunar South Pole where they will create a human outpost, "a sustainable presence," readying for "the next giant leap"– landing a human being on Mars.[170]

It is still a distant future away before even the most ardent space tourist will have a lunar or Martian holiday. So other-worldly landscapes, worthy of the moon, of Mars, must be found here on earth. The moon is, after all, a remnant of Earth, calved off by a Mars-sized asteroid. For many of the lunar early years, it was an incendiary sphere of magma lakes and jet fountains. The grey and white "marbling" on the moon's surface is

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[168] Shatner, William. "My trip to space made me realize we have only one Earth …"

[169] Distant Retrograde orbit (DRO) Distant=high altitude; Retrograde=opposite direction. The Orion spacecraft travels around the Moon in the opposite direction that the Moon travels around Earth.

Mars, Kelli. "Orion Will Go the Distance in Retrograde Orbit During Artemis I." *NASA*. 18 Apr. 2022. https://www.nasa.gov/feature/orion-will-go-the-distance-in-retrograde-orbit-during-artemis-i. Accessed 3 Dec. 2022.

[170] In Greek mythology, Artemis in the twin sister of Apollo.
"What is Artemis?" *NASA,* 25 Jul. 2019, https://www.nasa.gov/what-is-artemis. Accessed 3 Dec. 2022.
"Artemis Program." *NASA*, Updated: 1 Jul. 2021, https://www.nasa.gov/artemisprogram. Accessed 3 Dec. 2022.

result of volcanic activity; the lunar *maria*, the dark 'seas,' were once vast pools of lava.[171] Ancient Moon boiled with volcanoes.

Tourists seeking the moon on earth go to volcanoes. Moonscapes exist in many volcanically active regions–in Indonesia, Hawaii, Iceland, New Zealand, to name a few. Remove the sky, replace it with the black of space, and the volcano tourist has an audience with the cosmos, an experience of sublimity in the explosion of 4.5 billion-year-old liquid rock. The volcano seeker risks, in Kant's words, "their all-destroying violence," for this sublime, alien communion.[172]

3.2.1. The Volcanic Sublime

An active volcano is a manifestation of the natural sublime. It is an expression of bowel-deep Earth; of a seismic, wild, living planet, of its cosmic origin and deep-time fascination. Through volcanoes, we feel humility, that wondrous state of *creature-feeling,* of being infinitesimally small against something all-encompassing. A volcano is numinous energy; in the mystical explosion of rock and steam, as Kant writes, it "elevates the strength of our soul." [173]

Volcanic numinosity is infused with deep time. Out of all the dangerous natural performances–tsunamis, avalanches, tornadoes, fires, lightning storms–none tap into deep time quite the way a live volcano does when magma from the core of the earth's creation bubbles up into new time layers.

William Hamilton, in his *Transactions* and *Observations,* written after his study of Vesuvius in 1770, remarked on the rarity of seeing a natural event *as it was happening*, for "Nature acts slowly. It is difficult to catch her in the act."[174] A volcano is not a slow actor; it is mountain-making before our eyes. Unlike a tornado's shattered aftermath, a

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[171] Nasrullah, Qamariya. "Moon volcanoes may hold future water supply for astronauts." *Cosmos Magazine*, 22 May 2022, https://cosmosmagazine.com/space/moon-volcanoes-supply-water/. Accessed 2 Dec. 2022.

[172] Kant (5:261).
"Kant on the Sublime, Part 1." *Philosophy Live Journal*, https://philosophy.livejournal.com/2021705.html. Accessed 19 Feb. 2024.

[173] Ibid

[174] Duffy, Cian. *Landscapes of the Sublime, 1700-1890*. Palgrave Macmillan, 2013. p. 75.

volcano's lays down its destruction as solid time. Lava is a deep time liquid arisen from great depths. Mountains gather snow, form glaciers, because they are inert, eroding, time decaying. Volcanoes are new land. Time *building*.

A volcano has "temporal depth" explains Cian Duffy, but "spatial depth too.[175] In his study comparing the sublimity of alpine and volcanic landscapes, Duffy observes how, for the Romantic era voyager, "Alpine ascents tended to be motivated primarily by the desire to see the view from the summit… [volcanic ascents] were much more likely to be motivated by the desire to look *into* the crater."[176] This is still true today. We climb the highest peaks for their astounding panoramas, to look out and down on the land below. We climb volcanoes to look *inside* the cauldron, to see the soup of raw earth, the liquid time. Both this spatial and temporal depth informs the volcanic sublime.

As natural philosophies of the mid-eighteenth century branched out into new fields, *volcanic sublimity* was foundational in the creation of the discipline of geology.[177] "The visible sublimity of the volcanic landscape," explains Duffy, "came to signify for the Romantic period what John Playfair, a populariser of Hutton's theories [James Hutton, 'father of modern geology'], would later describe… as the sublime 'abyss of time' involved in the geological history of earth."[178]

3.2.2. *Whakaari*/White Island

"Mother nature does what she wants to do.
But there is also human nature."

~rescuer, *Whakaari*/White Island[179]

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[175] Ibid. p. 70.

[176] Ibid. p. 69.

[177] Ibid. p. 70. "The volcanic sublime and the idea of *depth* is generated in the mid-eighteenth century by those enquiries in natural philosophy which would pave the way for the emergence of the modern, scientific discipline of geology."

[178] Ibid. p. 70.

[179] Bailey, Mark and Dallas Brennan, writers. Rory Kennedy, director. *The Volcano: Rescue from Whakaari*. Netflix. Film. 1:32:10. (Based on the Outside Magazine article "The True Story of the White Island Eruption" written by Alex Perry).

"I was excited because I had never been near a volcano in my life," retells Stephanie Browitt.[180] The cruise ship *Ovation of the Seas* offered guided excursions to Whakaari/ White Island.[181] It dropped Stephanie, along with her sister, father, and fellow tourists on the neck of the volcano. Whakaari's skirts descend 1,000 feet [304 meters] into the seabed, for it is a submarine volcano fomenting a boiling, acidic cauldron. It is a hydrothermal conduit into molten Earth.

"We started seeing black smoke coming out of the crater and the first thing we did was take a picture." Browitt, then 24, took pictures with her family standing in front of the amphitheatre-shaped lip. The family wear gas masks against the sulfuric fumarole that billows behind them. "A few seconds later," she recounts, "we heard the tour guide scream 'run!'"[182]

At 2:11 pm on Monday, December 9, 2019, Whakaari erupted killing 22 people and severely maiming the lungs and skin of 25 more. The temperature of the steam that day was 1,000ºC. The ash plume ascended four kilometers. No one on the volcano that day escaped unscathed. Stephanie Browitt is one of the survivors; her sister and father are not. Although now, a sequence of errors of inaction and recrimination occupy the aftermath of the tragedy, no one doubts the fact that people should never have been sightseeing on an active volcano, one that had been showing "signs of unrest" for weeks.[183]

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[180] "Survivors of White Island Disaster say they felt abandoned after eruption." YouTube, uploaded by *60 Minutes,* Australian Broadcasting Company, 1 Nov. 2021, Duration: 34:11. https://www.youtube.com/watch?v=5nGnXthjVgc. Accessed 3 Nov. 2022.

Ocean of the Seas is operated by the Royal Caribbean Line of cruise ships. It sails around coastal New Zealand.
Whakaari/White Island is an island with a dual name. *Whakaari* is Maori for "to make visible." The explorer James Cook named the island "White Island" due to the white steam cloud that engulphed it.
"New Zealand Gazetteer." *Toitu Te Whenua / Land Information New Zealand,* https://gazetteer.linz.govt.nz/place/6961. Accessed 3 Nov. 2022.

[182] Ibid.

[183] "No party or individual has accepted responsibility or the injuries and lives lost." *The Volcano: Rescue from Whakaari*, film postscript.
Rescue attempts were delayed due to the ferocity and opacity of the steam cloud. A no-fly zone was put in place as authorities deemed it too risky to operate an aircraft. Two private helicopters and the tour boat Phoenix provided the only means of evacuation.

Yellowstone Volcano Observatory. "The December 2019 hydrothermal explosion at White Island (Whakaari), New Zealand, and its lessons for Yellowstone." *USGS*, 27 Jan. 2020,

Whakaari's unrest, the intensifying smoke, made for an even more compelling adventure. An eyewitness aboard the tour boat *Phoenix*, that had just left the island, recounts the explosion:

> I'm watching it go up and its beautiful…the white [smoke] is pure white and the black is dark. It kind of is just an awesome moment…within seconds what was beautiful went eerily sinister."[184]

Another eyewitness remembers how the smoke took out the sky, "It was the darkest thing I have ever seen in my life, darker than anything I've ever experienced, just pitch black."[185] And yet, it was intoxicating, "[Whakaari] had an aura about it of beauty," recalls another survivor, "as it was different than anything I had seen before."[186] That aura, "that allure of adventure–natural beauty with a dash of risk," as journalists Jamie Tarabey and Damien Cave describe the tragedy, is what "framed the excursion for visitors on Monday [Dec. 9]."[187]

3.2.3. Pliny the Elder and Mt. Vesuvius, AD 79

The allure of getting up close to a smoking volcano, is a uniquely human compulsion, one not shared by any other living creature. This is not a new compulsion; the almighty spectacle of a flaming, roaring mountain was just as captivating for our ancestors. Consider the Early Roman volcanist, naturalist, and fleet commander, Pliny the Elder who was drawn to explore the flanks of Mt. Vesuvius during its historic eruption. In October, AD 79,[188] the Pliny family were staying at Misenum (Miseno) when they witnessed "a cloud of very unusual size and appearance" hovering over the

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https://www.usgs.gov/news/december-2019-hydrothermal-explosion-white-island-whakaari-new-zealand-and-its-lessons. Accessed 3 Nov. 2022.

[184] Geoff Hopkins, New Zealand Tourist, eyewitness, interview in *The Volcano: Rescue from Whakaari*. (30:28–30:42).

[185] Ibid. Brian, eyewitness, (32:34).

[186] "Survivors of White Island Disaster …" 60 Minutes, Australia, (34:11)

[187] Tarabay, Jamie and Damien Cave. "Why Were Tourists Allowed to Visit an Active New Zealand Volcano?" *New York Times*, 10 Dec. 2019, Updated 30 Nov. 2020, https://www.nytimes.com/2019/12/10/world/asia/new-zealand-volcano.html. Accessed Nov. 10, 2022.

[188] Pliny the Younger, in his letter to Tacitus gave Aug 24th as the date of the explosion. Recent archeological discoveries now date it to Oct 24, 79 AD.
"Pompeii: Vesuvius eruption may have been later than thought." *BBC.com*, 16 Oct. 2018, https://www.bbc.com/news/world-europe-45874858. Accessed 15 Nov. 2022.

mountain's dome.[189] Seventeen-year-old Pliny the Younger, the nephew of the Elder, documented the volcano's performance. Misenum is safely across the Bay of Naples, but Pliny the Elder needed a closer look. The nephew, in a letter to the historian Tacitus, explains, "This phenomenon seemed to a man of such learning and research as my uncle extraordinary and worth further looking into."[190] The uncle took several quadriremes–oar-powered warships–and tried to cross the Bay.[191] His nephew recounts:

> Hastening then to the place from whence others fled with the utmost terror, he steered his course direct to the point of danger, and with so much calmness and presence of mind as to be able to make and dictate his observations upon the motion and all the phenomena of that dreadful scene. He was now so close to the mountain that the cinders, which grew thicker and hotter the nearer he approached, fell into the ships, together with pumice-stones, and black pieces of burning rock…[192]

Pliny was unable to land on Vesuvius–then in a state of in active eruption:

> … they were in danger too not only of being aground by the sudden retreat of the sea, but also from the vast fragments which rolled down from the mountain, and obstructed all the shore…[193]

Consequently, the quadriremes made for Stabia, nine miles south, to the home of his friend Pomponianus, where Pliny went ashore, asked for a bath, and "sat down to supper with great cheerfulness," as he tried to calm his terrified companions.[194] Morning found him dead in the sand by the shore, having succumbed, the nephew deduces, to "some gross and noxious vapour."[195]

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[189] "The Two Letters Written by Pliny the Younger about the Eruption of Vesuvius in 79 A.D." *Pompeii.org.uk,* http://www.pompeii.org.uk/s.php/tour-the-two-letters-written-by-pliny-the-elder-about-the-eruption-of-vesuvius-in-79-a-d-history-of-pompeii-en-238-s.htm. Accessed 16 Nov. 2022.

[190] Ibid.

[191] Acocella, Joan. "The Terror and the Fascination of Pompeii." *The New Yorker*, 10 Feb. 2020, https://www.newyorker.com/magazine/2020/02/17/the-terror-and-the-fascination-of-pompeii Accessed 19 Oct. 2022.

[192] Pliny. "The Project Gutenberg EBook of Letters of Pliny: LXV to Tacitus." Trans. William Melmonth, *Gutenberg*. Release date Sept. 2001; last update 13 May, 2016, https://www.gutenberg.org/files/2811/2811-h/2811-h.htm#link2H_4_0007. Accessed 6 May, 2024.

[193] Ibid.

[194] Ibid.

[195] Ibid.

Pliny the Younger himself does not escape unscathed. In his second letter to Tacitus he recounts his own flight and state of being as the cinders descended on Misenum:

> I might boast that, during all this scene of horror, not a sigh, or expression of fear, escaped me, had not my support been grounded in that miserable, though mighty, consolation, that all mankind were involved in the same calamity, and that I was perishing with the world itself.[196]

Nephew Pliny is unafraid as the noise and panic of the volcano's killing fields surround him. Mentally, he rises above, to survey the end of his world, now engulphed in that "cloud of very unusual size and appearance" he had first seen hovering above Vesuvius. Pliny's boast is *apocalyptic* and also *sublime*.

Pliny the Younger's letters to Tacitus recounting the 79 AD eruption of Vesuvius are among the most compelling texts from the Early Roman Empire. The tragedies of the ancient cities and settlements around the Bay of Naples have come down through the centuries, preserved in ash, embedded in our historical narrative and in the geological record, as great wonders of natural disaster. They are touchstones for disaster sublimity, undeniable proof of the wholly destructive power of a living planet. These disasters are preserved in humanity's collective imagination; we recognize the *awe* and the *awful*ness of these events and the human suffering that went alongside. In the archeological sites of Pompeii and Herculaneum, living beings of the ancient world are flash-frozen right at the point of their greatest pain and terror. They are caught up in geologic creation as molten rock pours itself into the sea. Pliny the Elder is an eyewitness to this creation, a man astonished, passing through stages of the sublime, on the way to his death.

There is, of course, a *point of no return* in disaster chasing, when the sublimity of the experience surrenders to a terror beyond escape. Past this point, there is no sublime feeling, for as Friedrich Schiller clarifies, "Genuine suffering permits no aesthetic judgment, because it nullifies the freedom of the spirit."[197] Still, our spirit desires the freedom to chance this point of no return. This risk is irrepressible, for this point is

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[196] "The Two Letters Written by Pliny … Vesuvius in 79 A.D." *Pompeii.org.uk*

[197] Schiller, Friedrich. "Of the Sublime –Toward the Further Elaboration of Some Kantian Ideas." *The Schiller Institute*, 1986, First published 1793, Translation by Daniel Platt. https://archive.schillerinstitute.com/transl/trans_of_sublime.html. Accessed. 5 May 2022.

another Thin Place veil demarking a living world from a dark numinosity, a deep-time world, a world of certain death.

3.2.4. Irrepressible Risk

Figure 7. **The lava skirts of Mt. Fagradalsfjall.**
Photo: S. Lockwood, Iceland, April 2022.

A volcano is fantastically dangerous invitation to "dance with danger."[198] Risk has come to be an acceptable, even gratifying component of enjoying a volcano. Here is how *Ovation of the Seas*' online promo brochure for the Whakaari markets the excursion:

> "Get close to the drama. Gas masks help you get near roaring steam vents, bubbling pits of mud, hot volcanic streams and the amazing lake of steaming acid. And vivid hues of yellow and orange on the island make for remarkable photos, so have your camera ready."[199]

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[198] Tourism New Zealand advertises Whakaari and many other locations as a 'dance with danger.'
Tarabay. "Why Were Tourists Allowed … Volcano?"

[199] Ibid.

Michael Light, in his examination of the Apollo photographic archive, describes the moonscapes as “a pure elemental dialogue between minerals and radiation, an epiphany of rock and light.”[200] A volcano is, arguably, far more elemental, and a far greater natural epiphany, for unlike the desolate stillness of the moon, a volcano *is alive*. It is the natural world in a monstrous form, dangerous, otherworldly, even grotesque. Beholding Whakaari then, to apply Light’s revelation, “is to feel both ecstatic and imperiled.”[201]

We are willing to risk a violent performance like Whakaari, to see it first hand, because it punctuates the timescale of our puny lives as a milestone event. Into the otherworldly landscape we photograph ourselves, preserving our place, as a witness to history, to sublimity. In essence, we are recreating a personal archive of those iconic Apollo images that saturate our collective imagination. Is not the volcano tourist, standing against the black volcanic moonscape, a cipher for Buzz Aldrin in his *Spaceman* portrait? Surely, this “disaster selfie” has a direct lineage to the Apollo archive. Before commercial spaceflight has fully evolved to enable the space tourists to realise their astronaut dreams, volcanoes offer a key. Despite the gasmasks, the Whakaari astronauts on that fateful December day, clothed in just a shorts and T-shirt, could not withstand the ghastly extremes that once unleashed dealt instantaneous trauma to the body.

Sublimity is a tough craving to satisfy. The most dangerous quests on Earth have already been undertaken; nearly every corner of Earth has been documented, mapped, photographed. We have been everywhere and seen everything and each year technology evolves so we can see more and more, and there is less and less for our own eyes to see fresh. Computers can out-create natural sublimity, and, as Thomas De Zengotita observes, “After a lifetime’s experience with digitized wonders depicted so fabulously…the human imagination begins to feel like a vestigial organ.” [202] The allure of exploration and discovery, that Thin Place *awe*, is harder to find in the natural world because De Zengotita explains “There isn’t much [nature] left”:

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[200] Light. “In the Skin of the Moon.” n.p.

[201] Ibid.

[202] De Zengotita, Thomas. *Mediated: How the Media Shapes Your World and the Way You Live in it*. New York, Bloomsbury, 2005. p. 210.

> … the earth and the oceans were finite after all, and now it's over. There are still a few unlabeled species around, a few acres of untouched jungle or tundra, a Pacific trench or two off the Philippines, but, basically, psycho-culturally, recalling the epochal sweep of events on a planet that was once unbounded, –it's over.[203]

However, a *performance* by the natural world is gloriously unbounded. The planet is writing its own natural history. It is a novel event. In Earth's vast creative catalogue, it is the natural power stories, the dangerous ones existing beyond the scope of human imagination, that are so compelling, so utterly attractive.

> De Zengotita has this theory of our attraction to essential risk:
>
> "We want to be with something that wasn't put there by us, something indifferent to us, something vast, something we can't penetrate, can't get to the end of, something incomprehensible–something as big and powerful as God used to be. We long for the beyond. We want to be in *awe*."[204]

Hardships that arise or are imposed on us by the natural events, often generate as De Zengotita describes, an "elemental injustice of pain," and it is this elemental injustice that gives pain its profundity and validation. "Edges of hardship in encounters with nature," he says, work "in superslow motion, they make nature more real, and after a while, you feel more real yourself."[205] The deadly energy of a volcano notwithstanding, human beings push themselves to taste this elemental hardship, this painful injustice, towards an attainment of *transcendence*, and, to repeat De Zengotita, because "we want to be in *awe.*"

Arguably, it is not *awe* that finds 600,000 people living today within the danger envelope of Vesuvius, but economics and fertile volcanic soil.[206] Although, *monetizing awe* (volcano tourism) was, until the eruption, what fueled the economy of Whakatane, the New Zealand mainland town closest to Whakaari.[207]

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[203] Ibid. p. 211.

[204] Ibid. p. 211. Italics mine.

[205] Ibid. p. 214.

[206] "What If Mount Vesuvius Erupted Today?" *The Nature of Things*/*CBC Docs*, https://www.cbc.ca/natureofthings/features/what-if-mount-vesuvius-erupted-today. Accessed 21 Sept. 2022.

[207] "Tourism now contributes over $100 million to the district's economy, and 10% of the workforce is employed in tourism and associated businesses. Tourism is the fastest-growing local

Volcanoes feel tame when we live close by; we weigh the odds of something rare but catastrophic ever happening to us, and if the odds feel good, we build up our threshold to withstand a greater level of risk. Sometimes, the unknown is just unfathomable. Pliny, no doubt, thought he was safe standing on the beach at Stabia. He had no way of knowing what we do today–that the blast from Vesuvius was 100,000 times the thermal energy of the atomic bomb that fell on Hiroshima.[208] And although current technologies were actively collecting and reading the seismic and gaseous signs emanating from Whakaari, volcanoes operate on their own time. Pliny accepted the risk as did Stephanie Browitt, although she had been grossly misinformed.

People take risks every time a volcano explodes. “We know we can’t say, ‘Stay away.’” explains Hjordis Gudmundsdottir, spokesperson for Iceland’s civil protection agency, “We are not locking the place.”[209] She is referring to Mt. Fagradalsfjall on Iceland's Reykjanes peninsula and the airlift of tourists injured trying to cross the fragile lava beds to get close to the active volcano. Fagradalsfjall, after 815 years of dormancy, erupted in two consecutive years, in March, 2021, and in August, 2022.[210] Both events were livestreamed around the world.[211] In our age, an actively erupting volcano is an opportunity; it is exciting, liberating, even celebratory. As Icelandic artist Björk exclaimed in her social media: “YESSS !! , eruption !! we in iceland are sooo excited !!! we still got it !!! sense of relief when nature expresses herself !!! [sic]”[212]

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industry.”
“Tourism.” *Whakatane.com*. https://www.whakatane.com/live-and-work/work-here/tourism, Accessed Nov. 10, 2022.

[208] “Eruption of Mount Vesuvius in 79 AD.” *Wikipedia*. https://en.wikipedia.org/wiki/Eruption_of_Mount_Vesuvius_in_79_AD#:~:text=In%20autumn%20of%2079%20AD,bombings%20of%20Hiroshima%20and%20Nagasaki. Accessed 20 Mar. 2024.

[209] Levenson, Michael. “Three Tourists Are Injured Near Volcanic Eruption in Iceland.” *New York Times*, 4 Aug. 2022. https://www.nytimes.com/2022/08/04/world/europe/fagradalsfjall-iceland-volcano-tourists.html. Accessed Dec. 2, 2022.

[210] Fagradalsfjall continues to erupt, necessitating the evacuation of the town of Grindavik in November, 2023.

[211] “Eldgosið í Geldingadölum í beinni útsendingu.” *Live from the Fagradalsfjall eruption,* 18 Mar. 2021, https://www.ruv.is/frett/2021/03/18/eldgosid-i-geldingadolum-i-beinni-utsendingu. (This link is no longer live).

[212] Ives, Mike and Evan Peltier. “A Volcano Erupted in Iceland. Björk Was ‘Sooo Excited.’” *New York Times*, 20 Mar. 2021, https://www.nytimes.com/2021/03/20/world/europe/iceland-volcano-eruption.html?action=click&module=RelatedLinks&pgtype=Article. Accessed 2 Dec. 2022.

Thousands of people trekked into the Geldingadalur valley to marvel at the coral-coloured lava pouring from Fagradalsfjall's crater. "It was mesmerizing," says photographer Chris Burkhard. "I never thought something as simple as molten rock would get me this excited."[213]

In November, 2022, Mauna Loa exploded on Hawaii's Big Island.[214] It last erupted a long thirty-eight pre-internet years ago. It became an instant sensation. Within a few days of the eruption Ken Hon of the Hawaiian Volcano Observatory watched in alarm as lava crossed the Mauna Loa Observatory access road and cut off power to the facility.[215] In a short week, capillaries of liquid rock were coursing over the surface of the volcano towards the main highway linking the Big Island's east and west together. As the state transportation department was working out contingencies for the highway's closure, "awestruck viewers" took to the highway impeding all passage as they jostled to take the perfect "disaster selfie."[216] Shift nurse Anne Anderson was one of the awestruck: "It's Mother Nature showing us her face. It's pretty exciting."[217] Vacationer Gordon Brown marvelled, "… it is so bright, it just blows my mind."[218] Unsatisfied with the highway, Las Vegas visitor Abel Brown planning a helicopter tour over Mauna Loa's fiery mouth: "The closer you get …the more scary it is. [sic]"[219] That lava could create a lethal impasse or that toxic gases and harmful particulate could create serious injury did nothing to dissuade the volcano tourists. Risk overrides fear, especially when risk is so bright it *blow one's mind*.

Björk [@bjork] "YESSS !! , eruption !! we in iceland are sooo excited !!! we still got it !!! sense of relief when nature expresses herself !!! enjoy , warmthness , björk." *Instagram*, March 2021, https://www.instagram.com/p/CMnpyJ6sree/. Accessed 2 Dec. 2022.

[213] Ng, Rachel. "Volcano tourism is booming, but is it too risky?" *National Geographic*, 2 Apr. 2021, https://www.nationalgeographic.com/travel/article/is-volcano-tourism-safe. Accessed 19 Nov. 2022.

[214] Eruption started on Nov 23, 2022.

[215] Associated Press. "Thousands flock to Mauna Loa for selfies during dramatic eruption," *The Guardian*, 30 Nov. 2022, https://www.theguardian.com/us-news/2022/nov/30/mauna-loa-hawaii-eruption-selfies. Accessed 30 Nov. 2022.

[216] Ibid.

[217] Ibid.

[218] Ibid.

[219] Ibid.

3.2.5. What Volcanoes can teach us about the climactic sublime

Figure 8. ***Winter Landscape with Skaters and Bird Trap*.**
Painting: Pieter Bruegel the Elder, 1565.
Collection Royal Museums of Fine Arts of Belgium.
https://artsandculture.google.com/asset/winter-landscape-with-skaters-and-birds-trap-pieter-bruegel-the-elder/DAFq10uBnWXIng. Public Domain.

The blackening effect of volcanic aerosols, the veiling of sunlight, can result in a decrease in atmospheric temperature. Even if only by a small fraction of one degree, a volcanic eruption can initiate a chain reaction of ill-consequence from crop failures to the collapse of animal populations.

In 1815, Mt. Tambora's erupted, bringing about the 1816 "The Year without a Summer," all due to just a 0.4–0.7 °C drop in temperature.[220] Ash from Tambora, effectively dispersed on the jet stream, blanketed much of the Northern Hemisphere,

[220] Mt Tambora, island of Sumbawa, Indonesia. Southern Hemisphere, just a few degrees south of the equator. Active stratovolcano. Last eruption: 1967.

creating a "great cosmic umbrella."[221] A vicar, writing in 1816, described his English summer thus:

> During the entire season the sun rose each morning as though in a cloud of smoke, red and rayless, shedding little light or warmth and setting at night behind a thick cloud of vapor, leaving hardly a trace of its having passed over the face of the earth.[222]

This change in atmospheric light is considered a contributing factor to 18th century Romanticism, supporting the development of the Romantic Sublime. Kathryn Schlesinger draws attention to J. M. W. Turner's "volcanic sunset paintings;" she reflects on how the gloomy landscape and electrical storms as experienced by Lord Byron at the Villa Diodati by Lake Geneva, may have inspired his guest Mary Shelley to compose *Frankenstein* that year.[223]

The climate anomalies from the Mt. Tambora explosion of 1815 pale in comparison to the Mt. Samalas eruption in 1257. This, the most powerful eruption of the last millennium, was a truly cataclysmic event, facilitated a 500-year-long volcanic winter across the North Atlantic.[224] Just a drop of 0.6°C was all it took to create village and farm-swallowing glacial expansion across Switzerland and France.[225] The rapid increase in sea ice so isolated Greenland and Iceland that the Norse colonies collapsed due to starvation.

The bitter cold of this "Little Ice Age" also engendered a creative response: it is immortalized in the artwork of Flemish master Pieter Brueghel, in such paintings as

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[221] The Editors. "The Year Without a Summer: Mount Tambora Volcanic Eruption." *Almanac*, 16 Jan. 2022, https://www.almanac.com/year-without-summer-mount-tambora-volcanic-eruption. Accessed 15 Dec. 2022.

[222] Schlesinger, Kathryn. "The 'Romantic' Year Without a Summer." *Forbes and Fifth*, University of Pittsburgh. Volume 3, Spring 2013, http://www.forbes5.pitt.edu/article/romantic-year-without-summer. Accessed 7 Jan. 2023

[223] Ibid.

[224] Mt. Samalas, Lombok Island, Indonesia erupted in 1257; this was the most powerful eruption of last millennium.
Vidal, C., Métrich, N., Komorowski, JC. et al. "The 1257 Samalas eruption (Lombok, Indonesia): the single greatest stratospheric gas release of the Common Era." Scientific Reports 6, Article 34868 (2016). https://doi.org/10.1038/srep34868. *Nature*. 10 Oct. 2016. https://www.nature.com/articles/srep34868. Accessed 8 Jan. 2023.

[225] Jackson, Stephen T. and John P. Rafferty, "Little Ice Age." *Encyclopedia Britannica*, 28 Feb. 2024, https://www.britannica.com/science/Little-Ice-Age. Accessed 21 March 2024.

Hunters in the Snow and *Winter Landscape with Skaters and Bird Trap*. These paintings inform the historical record; we visit galleries to marvel at these splendid winter scenes. However, they are not our experience. They are scenes of adaptation, even enjoyment of a climate-cooled world; they do not express the deep feelings of despair that accompany our current state of rapid climate warming.

Volcanism that resulted in the lost summer of 1816 and the centuries-long *Little Ice Age* were not global events.[226] They occurred in the Southern Hemisphere just below the equator and primarily effected the Northern Hemisphere. Today, climate change *is* global. And while the Global North, producer of most of greenhouse gases, can probably adapt to a two or a two-and-a-half degree Celsius of warming; it will be catastrophic for the Global South. The climate crisis may be global but it is also one of the *inequities of loss*.[227]

Even if all greenhouse gas emissions ceased today, self-regulating, self-healing Earth, would not be able "right" herself on a time scale of benefit to current human populations. Thus, the devastating floods that covered a third of Pakistan in 2022 or the wildfires that same year that consumed a staggering 100,000 hectares of natural forest in Portugal alone, are not unique events but rather ongoing phenomena.[228] A one or two degree Celsius rise in global atmospheric temperature may seem a small increment of change, but it is planet-altering.

In 1972, Edward Lorenz posed the question, "Does the flap of a butterfly's wings in Brazil set off a tornado in Texas?"[229] Lorenz, both a mathematician and a

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[226] Barbuzano, Javier. "The Little Ice Age Wasn't Global, but Current Climate Change Is." *Eos*, 24 Jul. 2019, https://eos.org/articles/the-little-ice-age-wasnt-global-but-current-climate-change-is. Accessed 2 Feb. 2023.

[227] Wallace-Wells, David. "Greta Thunberg: 'The World Is Getting More Grim by the Day.' Why the world's most prominent climate activist remains disappointed with people in power." *New York Times*, 8 Feb. 2023, https://www.nytimes.com/2023/02/08/opinion/greta-thunberg-climate-change.html?searchResultPosition=1. Accessed 8 Feb. 2023.

[228] "Flooding in Pakistan: The latest news." *British Red Cross*, https://www.redcross.org.uk/stories/disasters-and-emergencies/world/climate-change-and-pakistan-flooding-affecting-millions. Accessed 12 Feb. 2023.

Binley, Alex. "Portugal wildfires: State of alert begins amid third heatwave." *BBC*, 21 Aug. 2022, https://www.bbc.com/news/world-europe-62623333. Accessed 12 Feb. 2022.

[229] Vernon, Jamie L. "Understanding the Butterfly Effect." *American Scientist,* https://www.americanscientist.org/article/understanding-the-butterfly-effect. Accessed 21 Feb. 2023.

meteorologist, is behind the development of “chaos theory” and the “parallel meteorological simulations” in use today in weather forecasting.[230] His question, known as “The Butterfly Effect,” considers that in complex dynamical systems–such as global ocean currents or the jet stream–a minute variance in speed or temperature can trigger a momentous and unexpected outcome.[231] We know that just a fraction of a degree of warming is sufficient to affect the erosion process of Thwaites Glacier in the Antarctic, the so-called “Doomsday Glacier,” the harbinger to catastrophic sea-level rise. Yet, it is not so much a single beat of a butterfly wing that is responsible for the climate crisis, but rather a thunderous, acceleration of wing beats replacing chaotic unpredictability with inevitability.

This inevitability feeds into the melancholia endemic to our age. We feel helpless before an exploding volcano–but this is a rare occurrence. We feel helpless in our day to day lives amid weather systems that no longer act as expected. Certainly, ‘the weather’ is not a precise phenomenon, but the educated analysis that goes into forecasting a sunny tomorrow or a storm next week now contends with rogue meteorological actors.

The natural world is changing behaviour, but human nature is not. Of all the beating wings we could subdue, we choose to stand back. Human beings are not complicit in the creation of a volcanic ash cloud, but we own the climate crisis. Our emerging climate is its own volcanic force, and, like the ash clouds of prehistoric *supervolcanos* tagged to extinction events, the oppressive burden of greenhouse gases is modelled to produce a similar, terrifying conclusion.[232]

The inevitability of loss mixes with our lack of control; the despondency is self-inflicted. We smell melancholia in the air. The air *is* acting differently. We feel this *different air* in the winds that usher in the irregular seasons, in the hot gusts of

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[230] Ibid.

[231] Ibid.
Lorenz intended his question “to illustrate the idea that some complex dynamical systems exhibit unpredictable behaviors such that small variances in the initial conditions could have profound and widely divergent effects on the system’s outcomes.”

[232] Supervolcano–Volcanic Explosivity Index of 8. The Oruanui eruption, New Zealand, Late Pleistocene, 26,500 years ago, is most recent supervolcano. In just 2 weeks, the ash cloud covered the whole of the Southern Hemisphere.

pyrocumulonimbus and supercells; we feel it in the increasing turbulence on aircraft travelling through the jet stream.

Bad storms are coming–but can they ever be considered as *sublime*? How can the vagaries and volatilities of the climate crisis balance the requisite components of awe and terror, before becoming simply terrifying?

3.3. Storm Chasing

"We are here to make your storm chasing dreams come true…"

~Extreme Tornado Tours[233]

There is beauty in a vortex, in its muscularity, in its wild animal roar and lethal churn across the land below. Few human beings actively seek out tornadoes because there are just too dangerous, but for a subset of adventurers nothing encapsulated the visceral awe and terror of the sublime like an encounter with such a creature.

From May through to August each year, hundreds of storm chasers dive into heavily shielded "chase rigs" to speed towards the monster storms that descend over "Tornado Alley."[234] This "alley" is a swath of land in the middle of the North American continent, stretching from the mid-Texas up into the Canadian Prairies. It reliably receives over 1,200 tornados a year–the highest concentration of twisters in the world. In this tornado prone corridor, the perfect confluence of high wind speeds and air currents–a cold layer over top a warm moist ground layer–foment a rotating updraft into massive supercell thunderstorms.

Storm chasing is a new blood sport, a kind of big game hunting but with an invincible quarry. The challenge is survival, to stand down the storm, get tauntingly

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[233] *Extreme Tornado Tours*. http://extremetornadotours.com. Accessed 30 Dec. 2022.

[234] Vorticity Storm Tours describe their storm chase rig:
"… a 2006 Hummer H3…fully coated Reflex Bedliner protecting it from damage from large hail and flying debris … protective laminate film on all glass surfaces to protect them from being shattered … equipped with a Davis Vantage Vue weather station to give us raw live weather data during our chases, as well as 360° LED lighting for those times when we are travelling through disaster stricken areas in the dark, or performing nocturnal Search and Rescue…"
Vorcity Storm Tours. https://www.vorticitystormtours.com. Accessed 19 Feb. 2023.

close, to bask in *creature feeling*. Companies like Manitoba-based Vorticity Storm Tours specialize in “tornado intercepts,” and advertise to would-be clients the chance to “hunt down the strongest weather on the planet together.”[235] Oklahoma-based Extreme Tornado Tours (ETT), boasts “The ultimate weather experience… will you be there?”[236] ETT offers a success rate of eighty percent to their clients in gunning down a twister.[237] The highlights of their 2019 season include “a close-range intercept of an EF3 [Enhanced Fujita Scale level 3, windspeeds of 218-266 kph] monster tornado in the Texas Panhandle,” and “a pancake stacked mothership supercell of the ages in western Kansas.”[238]

The chase is exhilarating: “When you are out there you can see many things that will absolutely take your breath away,” ETT enthuses, “from a beautiful, calm, elephant trunk tornado slowly snaking its way through a field, to a mammatus filled sunset exploding with color.” [239] Uploaded on ETT website are tour group selfies in front of some spectacular storms. “We constantly hear from our guests that it was just as they dreamed…” says the company, adding that the adventure “bring[s] our guests happiness and sometimes tears of joy…”[240] The camaraderie of the shared sublimity is highlighted: “…most importantly you’ll be experiencing it together with a group of amazing people from all over that have the same unique love for severe weather that you do!”[241]

It is one thing to bond over a shared love of severe weather and pose for a selfie in front of a tornado, but quite another to live through its destruction. The location of “Classic Tornado Alley,” as identified in the early 1950s, passes through sparsely

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[235] Ibid.

[236] *Extreme Tornado Tours*. https://extremetornadotours.com/

[237] Ibid.

[238] The Fujita scale takes into account the damage left by the tornado. EF3: Enhanced Fujita Scale 3=windspeeds of 218 and 266 kph.
“Enhanced Fujita Scale.” *National Weather Service,* https://www.weather.gov/tae/ef_scale. Accessed 19 Feb. 2023.

Drieschman, Nick. “The 2019 Storm Chasing Season.” *Extreme Tornado Tours*, 18 Oct. 2019, https://extremetornadotours.com/2019/10/18/the-2019-storm-chasing-season/. Accessed 19 Feb. 2023.

[239]“What is it like to experience these storms in person?” Q & A section on the home page. https://extremetornadotours.com/.

[240] Ibid.

[241] Ibid.

inhabited grasslands and flat open landscape.[242] Climate change is shifting this corridor east out of the Plains into the Southeast, towards areas of much denser population, areas ill-equipped to cope with such violent phenomena.[243] It is now much harder to define a "tornado prone region," and every year a settlement, a farming community, or a town where people once felt a security of place, an understanding of the landscape, is reduced to ruin.[244] The debris field from an aggressive tornado is no different than any other disaster zone in the totality of destruction, loss of life, livelihood, and property.

With climate change, storm chasing is becoming a more dangerous sport. Warmer water–especially in the Gulf of Mexico–is a major factor in the formation of rampaging tornadoes.[245] Storm chasers are well aware of the threat of a "killer storm." Chimera Comstock, a 20-year storm chasing veteran no longer "chases" such a system. In a 2022 interview, she recounts how now, she "get[s] into position ahead of the storm and hope[s] the storm passes her location," even though this "potentially put[s] her or other chasers in immediate danger."[246]

It's a conundrum for the storm chaser–that any enjoyment from the chase now exists in tandem with the real possibility of death. It's a moral quandary too–can the chaser truly take delight in the pursuit of such a phenomenon that, in its passage, results in loss of life. There again is that *point of no return*, where sublime adventure crosses the line that separates the euphoria of a dramatic natural act from its wounded

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[242] Classic Tornado Alley reaches from the South Dakota in the north, down through Nebraska, Kansas, and Oklahoma into mid Texas, touching the eastern edges of Colorado and New Mexico. The term Tornado Alley was coined by two U.S. Air Force meteorologists–Major Ernest J. Fawbush and Captain Robert C. Miller in 1952.

Finch, Allison. "Is 'Tornado Alley' shifting east?" *AccuWeather*, 25 Apr. 2022, https://www.accuweather.com/en/severe-weather/is-tornado-alley-shifting-east/1162839. Accessed 2 Feb. 2023.

[243] Ibid.
Dr. Harold Brooks, the senior research scientist at the National Oceanic and Atmospheric Administration (NOAA) notes that these people are "vulnerable to tornadoes because there is a higher level of poverty and more people that live in manufactured homes."

[244] Ibid.

[245] Navarro, Adriana. "Tornado activity in March surged into record territory across the US." *AccuWeather*, 4 Apr. 2022, https://www.accuweather.com/en/severe-weather/tornado-activity-in-march-surged-to-record-territory-across-the-us/1166846. Accessed 3 Nov. 2022.

[246] Finch, Allison. "Is 'Tornado Alley'… "

aftermath. For every disaster selfie in front of a supercell cloud there are the images of disaster survivors, whose splintered, broken lives are broadcast on the news.

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To live along the fine edge of our hurting planet is tenuous. The longer we journey into our emerging climate, the more we recognize ourselves as survivors on a fragile planet. We are all becoming, in our own way, Stephanie Browitt peering into Whakaari's cauldron or Pliny on the beach at Stabia, caught up in something manifestly huge, fascinating, yet inescapable. As the impacts of climate crisis impinge on our daily lives, the compulsion to seek out sublimity in disaster landscapes lessens as it intrudes into our own personal landscapes. To live on a forested mountainside is to fear fire; to live in the far North, is to contend with melting ice roads and spongy permafrost; to live in swaths of the Global South is to watch the land that once fed you turn into desert; to live on a flat river plain is to navigate floods; to live in the lowland deltas and estuaries is to watch the sea steal away your land, your city, with each wave. The 'safe vantage' from which to enjoy dynamic phenomena is shrinking. Why chase storms when storms are bearing down on all you cherish?

The climate crisis supplants the Romantic sublimity of dynamic natural phenomena. Sublime encounters are located in climactic disaster landscapes, but these encounters require negotiating risk and uncertainty with cycles of natural violence. The melancholies of a changing climate are not exhilarating or transcending. We must find the safe vantage to negotiate a new sublime, lest, as Schiller says, a "nullification of the freedom of the spirit" becomes our new state of being, hostages as we are now, to emerging disasters.[247]

[247] Schiller. "Of the Sublime… Kantian Ideas."

Part Two

Reimagining Time

Chapter 4.

Deep Time Sublimity

4.1. Speaking of Time

On time. In time. Out of time.
It takes time. Just take your time.
As time goes by.

Time flies. *Tempus fugit*. Time is fleeting.
On the winds of time, the wings of time.
Time crawls. Time stands still.

We kill time, lose time, race against time, run out of time.
We punish, by ‘doing time.’

We spend time, squander time, count on time.
Time is money.
Small timer. Old timer. Big time player.
The Big Time.

Everybody wants a good time.

Only time can heal a broken heart.

Primordial time. Time immemorial
“That was before my time.”
Time, after time.

Nighttime. Summertime. Harvest time, Daylight Saving Time. Supper time.
Lifetime, Timeline, timespan, timescale, timespace

Time travel
Godspeed

Father Time carries both an hourglass and a scythe.

The language of everyday time is profane, devoid of sublimity, subjugated with all manner of cliché. In our patterns of brief social interactions, time is casual, synonymous with vapid, small talk. “What time do you have?” we ask, as if it were material. “Quel temps fait-il?” ask the French, where temps means both time and weather. Time, elusive and pervasive as a cloudy day. Tom Waits sings: “And all over the world/Strangers talk only about the weather/All over the world/It’s the same/It’s the same.”[248]

4.2. Speaking of Time in Metaphors

Deep time abhors casual conversation. It needs the tool of metaphor to shape meaning. Unlike drained everyday time, deep time is lean and rich. While everyday time is tamed and mechanized; deep time finds *wildness*. Although everyday time is founded in diurnal rhythms, light and season, orbits and phases, human hands mold it into paper calendars and clocks. And so we’ve lost the skill to see time as it dissipates from fossils. We forget the smell, that exhale of trapped gas, cast inside ancient ice cores–the breath of dinosaurs.

Despite our efforts to manage deep time (eons, periods, epochs, eras, astral units), we must acknowledge a time beyond measurement, a time beyond the power of our rational mind. An unknowable deep time like the passage of starlight. This is deep time sublimity, both wondrous and troubling.

4.2.1. Nests

In our mental conflict with amorphous time we take comfort in the construction of time nests. These are the time shapes encased one within others, not unlike the configuration of a group of Russian dolls.[249] Consider the most basic Russian doll

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[248] Waits, Tom. “Strange Weather.” *Big Time*. Island Records.1988.

[249] Russian dolls, also called *Matryoshka* dolls. Traditionally, the outer doll is the matriarch. The top and bottom sections of the hollow doll, when pulled apart, reveal another doll, also hollow and containing the same. Thus a ‘family’ of dolls of diminishing size, the smallest being the ‘baby.’

creation time nest: our embryonic nine-month gestation, nested within our mother's life, the lives of parents, ancestors, even the future nest of the still-to-be-born child.

"Our dwelling consists of a collection of nested time-spaces of relevance in which we typically live, move and have our being," explains David Wood, "All of these are built upon the metabolic rhythms of eating, sleeping, themselves attuned to the circadian cycles, to the moon, to the seasons." [250] Thus, the 'year,' 'month,' 'day,' 'hour' dolls inside dolls on down to the smallest time-doll we can carve.

Here, in the West, we meticulously refine the organization of our lives into segments of 'measurable' time. These become the individualized time nests that anchor the activities of our daily lives e.g. a work day, a commute, a lunch hour, a soccer practice. If free from the destabilizing forces like natural disaster or war, the human community generates the constructs of civilization inside the structures of time nests (take, as example, the four-year Olympic Games nest or a five-year term of elected office nest). In destabilized times, the building of time nests provides coping structures, a semblance of normalcy.

We assign some nests set durations, rules to improve functionality; life is rewarded, enabled (and sometimes not). Nests provide a way of grouping time, making it relatable, keeping it translucent as onion skin. However, in peeling back the layers of our manufactured nests, we often lose sight of the organic nesting inherent in the natural world. "Lift a rock in a field," demonstrates Wood, "and you will typically find a small bunch of creatures living together. Under the next rock, a different grouping, with species overlap."[251] These nests, these "time-shelters," as Wood also refers to them have "porosity" and interlapping "circles of relevance."[252] Although independent, the small bunches of under-the-rock-creatures can interact with each other through seasonal rhythms, and, have a "long-term dependency on the time-shelter we call the earth's movement around the sun."[253]

Although the family is the most common theme, political leaders, sports figures and cosmonauts have been turned into nesting dolls.

[250] Wood, David. *Deep Time, Dark Times*, New York, Fordham University Press, 2018. p. 11-12.

[251] Ibid. p. 11.

[252] Ibid.

[253] Ibid.

We must constantly retune ourselves with the rhythms of other (non-human) lives and how they occupy time just as we must acquaint ourselves with the deep time nests of the expanding universe, those cosmic, concentric nests rippling out from the Big Bang. “Nestedness is meant to capture the idea that one time-shelter can be set within the another,” writes Wood.[254] This is true of our place in the universe even if we cannot feel the sheltering embrace of deep time.

It may be comforting to feel we are the smallest most precious doll embraced withing the mother body of time. This is a human-centric, mindset of our place in the universe. If the metaphor of nest evokes sublimity it is found in the infinity pool of nests, multiplying and spreading out like never ending rings of concentric circles, that form when a rock is thrown into the water.

4.2.2. Time Horizons

A horizon is a ‘just-over-there’ point, a place we can see but never reach like the line where the sky meets the sea. A horizon has two planes of light, an above and a below. Something reaching across these planes appears in silhouette. A mountain or a high-rise, fixed and stolid against the theatre of above and below.

A time horizon is aspirational, visionary. It offers a mechanism for the mental projection of time *to be*. The horizon of an individual lifespan is a graph for time *left* and time *not yet achieved* and therefore still malleable, goals available.

Time horizons provide a method for evaluating our sentient sliver against the timeless universe. As such, a time horizon becomes a metaphor for accountability for our particular anthropocentric attribute of selfishness. “In our current era, where capitalist modes of thinking emphasize short-term rewards over long-term consequences and the prospect of climate catastrophe makes the future of human life on Earth appear uncertain,” writes Gemma Sack, “the need for this reckoning is increasingly pressing.”[255] The existence of human life is a scant 300,000 years set against the 4.5 billion-year age of the Earth. Our reckoning must attend to our disproportionate effect on the integrity of

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[254] Ibid. p. 11.

[255] Sack, Gemma. “Rendering Deep Time,” *College Hill Independent*, 4 Apr. 2019, www.theindy.org/1716. Accessed 12 Apr. 2021.

our planet, despite occupying such small historical bar of time-space. The geologist John McPhee contributes a much-treasured metaphor of our temporal insignificance:

> Consider the earth's history as the old measure of the English yard, the distance from the king's nose to the tip of his outstretched hand. One stroke of a nail file on his middle finger erases human history.[256]

This "nail dust" is our cosmic triviality. It is why we keep our time horizons short and inconsiderate of planetary well-being "It is a challenge to re-imagine the temporal horizon of our action," writes philosopher Melissa Lane, "from the short-term rewards and responsibilities to the pressing concern of what we will leave behind."[257] This challenge requires stepping over the horizon into the future then looking back, taking ownership and accountability of our legacy. As the climate traumas and extinction events, unmoored from their once faraway horizons, dissemble our present age aspirations, Lane observes, "Too many of the roles and requirements of modern society dictate time horizons which are ridiculously short when compared to the magnitude of the challenges facing us."[258]

Consider also that time *well spent* has value; it contributes to our sense of *well-being*; it is *good time*. Surely this good time demands an ambitious time horizon, and, if we aspire to live a *good life,* we include the impact of our legacy. The Haudenosaunee Confederacy of Mohawk, Oneida, Onondaga, Cayuga, and Seneca nations practice a stewardship legacy that stretches for seven generations.[259] This 'Seventh Generation' philosophy presents a time horizon based on the principle that all action and decision

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[256] McPhee, John. Basin and Range. New York, Farrar, Straus and Giroux, 1981. (as cited in Gould, Stephen Jay. *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time*. Cambridge, Harvard University Press, 1988. p.3).

[257] Lane, Melissa. *Eco Republic*. Princeton, Princeton University Press, 2013. p. 153.

[258] Ibid. p. 149.

[259] Haudenosunee Confederacy of Nations

"Called the Iroquois Confederacy by the French, and the League of Five Nations by the English, the confederacy is properly called the Haudenosaunee Confederacy meaning People of the long house.…The exact date of the joining of the nations is unknown and said to be time immemorial making it one of the first and longest lasting participatory democracies in the world… Often described as the oldest, participatory democracy on Earth, the Haudenosaunee Confederacy's constitution is believed to be a model for the American Constitution. What makes it stand out as unique to other systems around the world is its blending of law and values. For the Haudenosaunee, law, society and nature are equal partners and each plays an important role."

"Who We Are." *Haudenosunee Confederacy*, https://www.haudenosauneeconfederacy.com/who-we-are/. Accessed 21 Mar. 2024.

making must consider the impact of these actions and decisions on the welfare of the living world through a good 150 years.[260]

This is a far cry from our current treatment of Future Earth, which public philosopher Roman Krznaric describes as “a distant colonial outpost where we can dump ecological damage and technological risk as if there is no one there.”[261] Like the Haudenosunee principle, he calls on us to bequeath agency to our descendants, for currently “the great silent majority of future generations is rendered powerless.”[262] It is unconscionable that the environmental crisis be dumped into the future to be solved then; we must consider the suffering that will manifest generations hence due to prevarication, procrastination. “We have an obligation because of *what we know*,” Krznaric says, “[to] spread empathy to the future.”[263] This imperative must challenge not only the current climate and extinction crises but also the unforeseen consequences of genetic engineering, artificial intelligence, bio-poisons, nuclear waste. Our poor stewardship has already truncated the time horizon for our ancestors, putting, in Kznaric’s words, “a limitation on their liberty.”[264]

We already live with ancestral short term thinking. The damage of slavery and the appalling treatment of indigenous peoples, for example, continues to be keenly felt. The “issue of race,” Krznaric points out, “is one of the windows of expanding our time horizons to look back into the past and to raise issues, for example, of reparation.”[265]

Too often the decisions made long ago embed in our psyche, making palatable and acceptable destructive practices, like the burning of fossil fuels. We happily continue

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[260] The philosophy of “Seventh Generation” is first recorded in “The Great Law of Haudenosaunee (Iroquois) Confederacy,” c. 1142 to 1500 AD.

“What is the Seventh Generation Principle?” *Indigenous Corporate Training Inc*, 30 May 2020, https://www.ictinc.ca/blog/seventh-generation-principle. Accessed 21 Mar. 2024.

[261] Krznaric, Roman. “How to be a Good Ancestor.” *Ted Talk,* Posted Oct, 2020, https://www.ted.com/speakers/roman_krznaric (0:21). Accessed 3 Jan. 2021.

[262] Ibid. (0:47).

[263] Ayed, Nahlah. “Our 'futurecestors' deserve a voice in today's decisions, says author.” *Ideas/CBC Radio*, Originally published 7 Sept. 2020 as “The Good Ancestor. Interview with Roman Krznaric,” Updated 5 Jul. 2021, https://www.cbc.ca/radio/ideas/our-futurecestors-deserve-a-voice-in-today-s-decisions-says-author-1.5710902. Accessed 7 Sept. 2020.

[264] Ibid. (16:32).

[265] Ibid. (18:19).

this practice today, as if out of habit. The legacy of environmental harms–from such pursuits as open-pit mining, overfishing, aquafer draining, river damming, old growth logging–takes generations to repair. Short term rewards are easy money and leave the earth to heal later.

Reparations are often short term solutions, ill-considered, and fail to fathom natural systems. A tree farm monoculture fails to 'web' itself to a sylvan community; it cannot repair the lost forest ecosystem. Just as the time horizons of the past make themselves felt today, we must confront our short attention spans and "decolonize the future" as Krznaric counsels, by "extending our time horizons towards a longer now."[266]

Time horizon reparation is happening in social movements such as Black Lives Matter–addressing systemic racism, and #MeToo–protesting misogyny and sexism. The youth initiative, School Strike for Climate, is one that flatly refuses to accept the time horizon of their parents. The School Strike kids demand a voice in political decisions; they rally against the embedded antipathy in democratic cycles where long term change has no immediate political gain.

A time horizonal shift is gaining momentum. People genuinely care about being, to use Kznaric's phrase, 'good ancestors.' Consider the Intergenerational Sustainability Dilemma Game created in Japan by a team of researchers to raise awareness of the generational disconnect.[267] The researchers divided a group of participants into two groups. One half were asked to take the position of a citizen from an imaginary future, while the other half argued as the present. This exercise proved compelling; the researchers found that "the forced salience of an imaginary future generation during negotiations improves benefits for that generation," [268] and that "when faced with members of an imaginary future generation, 60% of participants selected an option that promoted sustainability. In contrast, when the imaginary future generation was not

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[266] Krznaric TED talk (2:14).

[267] Kamijo, Yoshio et al. "Negotiating with the future: incorporating imaginary future generations into negotiations." *Sustain Sci* 12, 409–420 (2017). https://doi.org/10.1007/s11625-016-0419-8. Accessed 9 Sept. 2020.

[268] Ibid.

salient, only 28% of participants chose the sustainable option."[269] It would seem an act of imagination can inspire a long time horizon.

4.2.3. Lost Time Horizons

Some big, imaginative dreams are striving to right some of humanity's short-sighted wrongs. At the conjunction point of imagination and technology sits the 'bio rescue' of the functionally extinct Northern White Rhino.[270] Through a combination of stem cell technologies and cryogenic reproductive cells, five frozen embryos now await revival from their liquid nitrogen sleep.[271] This is a "species saving" measure says Thomas Hildebrandt, a specialist in critically endangered wildlife reproductive medicine, "We realized we were not yet at the end. There was suddenly a new horizon."[272]

It is deeply wounding to contemplate the fate of the northern white rhinoceros, slaughtered and dehorned by trophy hunters and poachers trafficking in the false medicinal magic and longevity myths. The fate of rhino now depends on the 'biological magic' of its very butchers to see its time horizon restored. Even if this bio-magic succeeds, the root motivations that fuel poaching and spread supernatural beliefs must be addressed in tandem. Of the last two living northern white rhinos, the mother Najin is ailing and her daughter Fatu will live out her years in Kenya under armed guard. Says their keeper James Mwenda says, "Fatu is an ending. This is her reality. She will have to

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[269] Ibid.

[270] As of January 2021, two female northern white rhinos are still living. The mother Najin and her daughter Fatu. Neither are capable of bearing offspring. The last two bulls, Suni and Sudan, died in 2014 and 2018, respectively.

[271] BioRescue is an international project for saving critically endangered animals, spearheaded by the Leibniz Institute for Zoo and Wildlife Research, Berlin.

Reproductive cells from Najin, Fatu and previously harvest cells from the bull Suni will regrow the population. Transfigured skin cells into stem cells provide the genetic diversity to avoid problems of inbreeding. A southern white rhino will provide a surrogate womb.

"BioRescue: Developing Advanced Reproductive Technologies." *Bio Rescue*, http://www.biorescue.org/en/home-0. Accessed 21 Mar. 2024.

"Prof. Dr. Thomas B. Hildebrandt." *Leibniz Institute for Wildlife Research*, http://www.izw-berlin.de/en/thomas-hildebrandt-en.html. Accessed 21 Mar. 2024.

[272] Bergman, Megan Mayhew. "And then there were two: can northern white rhinos be saved from extinction." *The Guardian*, 14 Jan. 2021, https://www.theguardian.com/environment/2021/jan/14/northern-white-rhinos-saved-extinction-stem-cells. Accessed 14 Jan. 2021.

bear the responsibility of being the last of her kind. She will be a symbol of political and human greed. That's what her loneliness stands for. That is her work."[273]

Work on species restoration requires a long term commitment, and perhaps also a new philosophical approach to the creation of life on the time line. Hildebrandt regards the harvesting of genetic material from the bull Sudan before his death as such a novel approach to creation. "Sudan is not dead for me," he says, "What is death? He is saving his species. This is life. It's a complex process, but it's possible to preserve life, and give opportunities to future generations."[274]

We must recognize how selective we are, choosing one species to sink into extinction while heroically rescuing another. Jonathan Watts points out Aldo Leopold's commemoration of the demise of the passenger pigeon, Leopold writing, "For one species to mourn the passing of another is a new thing under the sun," which Watts suggests is now "so common as to be banal."[275]

Elizabeth Kolbert draws attention to the Devil's Hole pupfish: A tiny band of a few dozen wild fish, the last of their kind, live in a geothermal pool in Nevada, under Supreme Court protection.[276] "[The fish] have been transplanted to a simulacrum," she notes, "built at a cost of $4.5 million and monitored by cameras and a team of four full-time staff. At one point, the ratio was one fishkeeper for every 16 fish."[277] The iridescent blue pupfish are no different than the northern white rhino, a charismatic species that we take an interest in saving. Kolbert describes how "We get to hear about stories when a population is down to the last survivors and only then is there a big push. It's how the

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[273] Ibid.

[274] Ibid.

[275] Watts, Jonathan. "It is the question of the century: will tech solve the climate crisis, or make it worse." *The Guardian.* 6 Mar. 2021. https://www.theguardian.com/books/2021/mar/06/it-is-the-question-of-the-century-will-tech-solve-the-climate-crisis-or-make-it-worse. Accessed 6 Mar. 2021.

Also see: Kolbert, Elizabeth. *Under a White Sky*. New York, Crown, 2021.

[276] Watts. "It is the question…" Interview with Elizabeth Kolbert.

[277] Ibid.

human mind works."[278] She calls animals like the northern white rhino and the pupfish "Stockholm species;" they are bonded to their captors, living in a "life support" cage. [279]

In allowing an extinct species–particularly one where we feel a culpable and moral responsibility–to re-establish itself in the nature world, we must consider the world in which it will reasserts itself. Can the world nurture it, sustain it, restore its temporal place; will the species thrive or will it irreparably alter an ecosystem that has adapted without it? In our excitement, in our efforts to assuage our guilt, remorse, and induce wonder, is the long term vision and impact well thought out?

This is an especially prescient concern in a time when whole ecosystems are resetting to cope with major changes brought about by global warming. It is curious, that with each prehistoric creature that emerges from the melting permafrost, and with each ancient DNA-viable sample retrieved from frozen tissue, the spectre of repopulating the earth using a deep time lost world steps outside the imagination's deep dream. Already, some species are already finding their way back to life–take the thawed out Pleistocene nematodes of the Siberian tundra, now eating and wriggling in a petri dish.[280]

So, what can we offer the earth's necrofauna? As we near the possibility of revivifying an organism from deep time, how well do we know how it will react within an extant landscape? How do we anticipate the social factors it may need: Pleistocene nematodes aside, how do we teach a lab mammoth how to be a mammoth? Our nostalgia for deep time creatures seems out of sync for the many ecosystems that suffer human interference; for every animal that we invite to join us in a new corner our heavy global footprint often hides stowaways in the treads.

Take the unintended consequences of the late Columbian drug lord Pablo Escobar's hippopotamuses: the four animals (three females and one male) were once securely ensconced in his compound but escaped into the environs of the Rio Magdalena in the mid 1990s. The hippos really like it there. Colombian ecologists wrestle with the dilemma posed by Escobar's 'cocaine hippos.' The population growth of

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[278] Ibid.

[279] Ibid.

[280] Solly, Meilan. "Ancient Roundworms Allegedly Resurrected From Russian Permafrost." *Smithsonian Magazine*, 30 Jul. 2018, https://www.smithsonianmag.com/smart-news/ancient-roundworms-allegedly-resurrected-russian-permafrost-180969782/. Accessed 10 Mar. 2021.

these mammals poses a major threat to the local ecosystem, however, the "animals' magnetic personality," says researcher David Echeverri-Lopez, makes it very popular.[281] The sheer size and deadly aggression of the animal notwithstanding, recent attempts at population control seem futile, "You can't even talk about [culling hippos] because the rejection is staggering … I am being called a murderer," laments ecologist Nataly Castelblanco-Martínez.[282] Surprisingly, the hippos are tolerated as a kind of Pleistocene megafauna rewilding– replacing the defunct South American Toxodon a large hippo-ish mammal that once roamed South American wetlands. [283]

Not all interlopers are charismatic megafauna. The pathogenic fungus *Cryphonectria parasitica* hitched a ride from East Asia into North America on imported trees in the early twentieth century; by the late 1950s every single American chestnut was dead. These magnificent giants that once cast their leafy splendor across Appalachia and down the Eastern seaboard of the Unites States, now have a chance of restoration. [284] With the addition of a protective enzyme to mitigate the blight; GMO chestnuts could soon be gracing our gardens. In considering the fate of this tree, Rowan Jacobsen asks, "Is the genetically engineered chestnut tree an act of ecological

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[281] Associated Press. "Pablo Escobar's hippos must be culled to halt biodiversity disaster – scientists." *The Guardian*, 10 Feb. 2021, https://www.theguardian.com/world/2021/feb/10/pablo-escobars-hippos-must-be-culled-to-halt-biodiversity-disaster-scientists. Accessed 10 Feb. 2021.

[282] Ibid.

[283] *Toxodon platensis. Toxodon* means 'bow-tooth.' An extinct large hoofed mammal similar in size to American bison. Late Pleistocene, early Holocene. Overlapped in time with humans in South America.

Charles Darwin collected a skull in Uruguay, 1833. Voyage of the Beagle.
"*T. platensis* would have looked a bit like a cross between a hippopotamus and a rhinoceros at first glance. When it was first described, it was assumed that it had a semi-aquatic lifestyle like hippos, although that is no longer thought to be likely."

Brewer, Pip. "What was Toxodon?" *Natural History Museum,* 9 Apr. 2018, https://www.nhm.ac.uk/discover/what-is-toxodon.html. Accessed 19 Apr. 2020.

Wilcox, Christie. "Could Pablo Escobar's Escaped Hippos Help the Environment?" *National Geographic*, 31 January 2020, https://www.nationalgeographic.com/animals/article/colombia-cocaine-hippos-rewilding-experiment-news. Accessed 11 Feb. 2020.

[284] The American Chestnut was a tree so grand it rose over 100 feet with a canopy that could span one-fifth of an acre. It covered Appalachia and the eastern coast of the US. Chestnuts provided nourishment for a variety of species. By 1950, 99.9% of population had been decimated by a non-native invasive fungus.

Jacobsen, Rowan. "The Nature of Nature." *Grow: The Nature Issue*, 2020. https://www.growbyginkgo.com/2020/06/23/the-nature-of-nature/. Accessed 21 Apr. 2021.

restoration or a threat to wild forests?"[285] The long term impacts of our genetic tweaking are akin to playing at evolution, an *unnatural* selection process, choosing which organisms we want to live and which other we can let die.

Our introduction of invasive species, whether knowingly or not, also disrupts natural evolutionary processes. "Human beings are whisking organisms around the planet at unholy speeds, bombarding ecosystems with thousands of alien genomes," Jacobsen writes, "There's nothing natural about that. … Everything is changing, whether we like it or not, and soon we may have to decide whether to let some of these species go extinct on principle, in the name of what's natural.[286]

Deciding what is 'natural' is a subjective exercise, and, although a lost time horizon is an extinction event, perhaps there is a different way to restore this loss that doesn't influence timelines but still allows us to honour the loss. A poetic restoration can be found in the work of bio-artist Alexandra Daisy Ginsberg and her immersive installation *Resurrecting the Sublime*. Working with a team of paleo-geneticists from Ginko Bioworks and smell researcher Sissel Tolass, Ginsberg recreated the fragrances of five extinct flowers including *Hibiscadelphus wilderianus* (Maui Hau Kuahiwi), the Mountain Hibiscus. Says Ginsberg, "Using genetic engineering so that we can once again experience a nature we have destroyed is both romantic and perhaps terrifying. It is sublime."[287]

The Mountain Hibiscus once blossomed on the ancient lava fields on the southern slopes of Mt. Haleakala, Hawaii. Colonization denuded the slopes for cattle grazing and by 1912, the flower's habitat–too niche and too unique–was gone. All that remains of this plant is a dried twig in Harvard University's Herbarium, but this was just

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[285] Ibid.

[286] Ibid.

[287] "Resurrecting the Sublime," is a new collaborative work bringing together cutting-edge scientific research and immersive installations, by Alexandra Daisy Ginsberg, Sissel Tolaas, and a team of synthetic biologists at Ginkgo Bioworks led by Christina Agapakis, with the support of IFF Inc." (5:33)

Ginsberg, Alexandra Daisy, creator. "Resurrecting the Sublime: Orbexilum stipulatum." *Vimeo*, 2019, (04:18). https://vimeo.com/326369990. Accessed 19 Apr. 2021.

Video also here:
Ginsberg, Alexandra Daisy. "Resurrecting the Sublime." *Daisy Ginsberg*, 2019, https://www.daisyginsberg.com/work/resurrecting-the-sublime. Accessed 19 Apr. 2021.

enough to procure a tissue sample to sequence DNA, identify the scent enzymes, and then assemble the relevant molecules in a lab.[288] The lost scent and the lost habitat of the Mountain Hibiscus was then reimagined in Ginsberg's artwork.

Ginsberg envisioned the aesthetic of her piece though the presentation of flora and fauna in natural history museums–preserved, dried, taxidermized in glass booths. "In a natural history museum," she reflects, "nature's contingency is trapped in time, the clock of creation-destruction stopped for us to look at."[289] In her installation, the audience steps inside the glass booths where, in the case of the Mountain Hibiscus, it is symbolically reduced to a single boulder of lava–to represent the lost landscape–and a diffusion of smell.

This installation is not a 'bio-rescue' or 'de-extinction' exercise, Ginsberg qualifies, "but a technological sublime, allowing us a glimpse of a lost flower blooming …the interplay of a species and a place that no longer exists."[290] It is a temporal memory, an essence of past brought forward. She draws attention to the words of philosopher Jean-Luc Nancy: "The sublime is not so much what we are going to as where we are from."[291]

The sublimity of a time horizon seems to lie in its connection to a lost point in the past and its futurity, an interplay that allows the creation of a perfume made from extinct flowers that we can inhale into our bodies: the fragrance of loss, an expression of sublime melancholia. This melancholic horizon is a blurry place, no longer attainable, relegated to a distant golden age, a mythical 'over there'. A vestige of memory remains, but it is temporally obscured.

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[288] The tissue sample was cut by Ginko Bioworks; the DNA sequence was done at the University of California, Santa Cruz; the sample was then sent back to Ginko Bioworks to find the scent enzymes which were cultured in yeast; mass spectrometry identified the molecules; the molecular list was sent to Sissel Tolaas in Berlin to reconstruct the smell in her lab; the 'potion' was then given to the artist Alexandra Daisy Ginsberg for her touring installation which premiered as "La Fabrique du Vivant" at Centre Pompidou in Paris, opening 18 Feb 2019.

[289] Ginsberg. "Resurrecting the Sublime." Video (04:37)

[290] Ibid. (05:20).

[291] Ibid. (05:34).

4.2.4. Arrows

"Deep time is so alien," writes Stephen Jay Gould, "that we can only comprehend it as metaphor."[292] Gould explores the time shapes of arrows and cycles; time's arrow is linear and directional. It represents "the intelligibility of distinct and irreversible events."[293] Time's cycle is "where fundamental states are immanent in time, always present and never changing."[294]

Arrows present lived time, histories that can never be repeated. Arrows draft in the mind's eye, points recorded and advancing. A good many of us live most of our lives along time's arrow, "the familiar 'standard' view of most educated Westerners today,"[295] Gould observes, noting also how it is "the particular product of one culture, now spread throughout the world, and especially 'successful,' at least in numerical and material terms."[296] Richard Morris further observes, "The linear concept of time has had profound effects on Western thought. Without it, it would be difficult to conceive of the idea of progress, or to speak of cosmic or biological evolution."[297]

This linear arrow of time is historical time, "where everything takes place as a process," writes Byung-Chul Han, explaining that "events are no longer arranged on a static *plane*, but on a progressive *line*."[298] Thus, "the temporal line has a direction, a syntax," but, Han continues, "historical time knows no lasting present."[299] In this progression forward along the arrow, "the present has no substance of its own; it is only a transition point. Nothing *is*. Everything *becomes*."[300]

Western culture is predicated on linear time; the units, the measurement, and the structuring of time provide a skeletal assembly for the science and commerce that fuel

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[292] Gould, Stephen Jay. *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time*. Cambridge, Harvard University Press, 1988. p. 5

[293] Gould. p.11.

[294] Gould. p.10.

[295] Gould. p.12.

[296] Gould. p.12.

[297] Richard Morris as cited by Gould. p.12.

[298] Han, Byung-Chul. *The Scent of Time*. Cambridge, Polity, 2017. p.13.

[299] Ibid. p.13.

[300] Ibid. p.13.

our advancing technologies and the global economy. Time's arrow, like other products of Western thought–democracy, capitalism, growth economics, and such, produces side effects.

A change in our perception of *velocity* is one such side effect. Our technological quest to accelerate through life, craving instantaneity makes everything happening *so fast*. We long for *more time*, and to *spend time with*. We want to *slow down*, although we are intractably fixed to this speeding arrow.

We are also cognisant of a strange feeling of living inside a time-lapsed, sped-up geology. Like the giant sheets of ice breaking from off the polar ice shelves, we feel the momentum of certain geological processes–ones that once belonged to deep time and should still, but now appear in real time. We say we accept the challenge even as we push it into the future for the hope of better minds. How is it that after a succession of global climate initiatives, from the Kyoto Protocol (1997) to the Paris Climate Accord (2015), that the atmosphere is still filling with carbon? The speed of anthropocentric development makes the social, political, economic factors in individual signatory nations impossible to synchronize. The global community fails to align on time's arrow.

Time's arrow has only forward momentum compelling us onward, a perpetual motion machine. This is also a side effect of European civilization that started with the shift from agrarian to city living, and progressed through the Enlightenment, the Industrial Revolution, and the Atomic Age. With the pace of life changing, the arrow gains Darwinian purpose, becoming, as Gould says, "a quirky sequence of intricate, unique, unrepeatable events linked in a unidirectional chain of complex causes (and gobs of randomness)."[301] For Jay Griffiths, the arrow encourages an eschatology, "that prays for [time's] end, so god could run it to the ground like the last wild animal, and kill it at the end of the line."[302]

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[301] Gould, p. 59.

[302] Griffiths, Jay. *Wild: An Elemental Journey.* London, Penguin Books, 2006, p. 418 (linear, Judeo-Christian eschatology)

4.2.5. Cycles

Cyclical time is organic and wild, the time of the natural world. With this metaphor, time is without direction, needing none. It has no historical complexations, but instead repeats and returns, not ending, but not beginning either. It is a metaphor for the *passage* of time.

Time's cycle is an ancient order, predating Western arrows. Mircea Eliade observes, "most people have viewed time's arrow as either unintelligible or a source of deepest fear," adding, "archaic humanity …defended itself to the utmost of its powers, against all the novelty and irreversibility which history entails."[303]

Time's cycle always seeks to re-establish its equilibrium against any burst of speed that tries to veer it off in one direction. "In this world of eternal recurrence," writes Han, "acceleration would make no sense at all. Only the eternal repetition of the same, even the reproduction of what was, of eternal truth, makes sense. Thus, prehistoric man lives in a lasting present."[304]

Outside historicity, the arrow is an unwelcomed shape, a challenge to constancy. Gould says, "Most cultures have recoiled from a notion that history embodies no permanent stability and that men (by their actions of war), or natural events (by their consequence of fire and famine) might be reflecting the essence of time–and not an irregularity subject to repeal or placation by prayer and ritual."[305]

4.3. Wild Time

Time's cycle is still a predominant metaphor for the passage of time in non-Western cultures. It is hardwired into ancient landscapes, its foundations in the vast pull

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[303] Eliade, Mircae, *The Myth of Eternal Return*. Princeton University Press, 1954, p. 48. (as cited in Gould 12-13).

[304] Han. p. 13.

[305] Gould. p. 12.

of tides, the freezing and greening land, the cosmic trails of animals. Herein lies the sublimity of wild time–a subsumption into a fierce temporal passion.

"All of wild nature expresses time as a cycle," writes Jay Griffiths, "and urges it to go on forever."[306] She draws attention to the Inuit seasonal event-based cycles with such names as "Sun is possible" (mid-January) and "Velvet peels from caribou antlers" (October).[307] These metaphors are recurring, built up over time, intuitive, evocative of how time *feels*. These metaphor-months are verbs–sun *is*, velvet *peels*–denoting a progressive, active engagement with the living landscape. Griffiths remarks how the Inuit have no word for time, composing instead a "transparent calendar, [whereby] one can 'see' the landscape."[308]

For those of us imprinted with the engineered time of urban life, a transparent calendar can feel bewildering when small, comforting increments of structured time give way to vast swaths of elemental 'nowness.' In the natural world, the cycle of time, the "intelligibility of timeless order," to use Gould's phrase, can be unsettling, especially if we believe this cycle orders itself in exactly the same way.[309] This idea deeply troubled earth historian Thomas Burnet as it erases history; in his in late-17th century inquiry, he writes "this takes away the subject of discourse for no event can be placed into the narrative if each occurred before and must happen again."[310]

However, cycles do not become unintelligible or devoid of narrative for time's cycle never exactly repeats itself. It is a living rhythm that accommodates new wisps of information. The maple leaves on the tree outside my window are turning red, just like they did last year and the year before and the year before that. Yet this year there is a different number of leaves on the tree and the winds blows the top branches bare earlier. Although the tree resembles last year's form and grows from the same place, it is wider and has absorbed changes in the landscape around. The tree's cycle is rooted in its living potential–in the maple keys shed into the soil, propelled on the wind.

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[306] Griffiths. p. 418.

[307] Ibid. p. 167.

[308] Ibid. p. 168.

[309] Gould. p. 14.

[310] Burnet's *Sacred History of the Earth*, as noted in Gould, p. 48.

In an urban environment such cyclical changes in the small living elements we allow to share our space are genuinely affective. When 'neighbourly' trees are cut down to accommodate new builds real sorrow is expressed in this loss; the tree cycle marked a passage of time that had been intimately relatable for many in the immediate community.[311] The continuity and the stability of a single element, like a tree, that represented a natural time cycle once removed cannot immediately be replaced, and in current climate conditions the viability of such trees–like the dying urban red cedars in Vancouver–is not assured. Many of the reliable natural time cycles have become uprooted and whatever solace we depended on to regulate our lives is no longer there. This feeds into feelings of sublime melancholia, a wistful appreciation for a newly ephemeral temporality, where "fundamental states" of cyclical time are no longer "immanent," or "always present and never changing."[312]

4.4. Time Control and Measurement

"Time, which measures every thing in our idea,
is often deficient to our schemes,
is to nature endless and nothing…"

~James Hutton, 1788. [313]

"Clocks: caging time. The watch: the manacle on the wrist. Deadlines like barbed wire. Coercive, cruel, crushing speed. Punctuality next to godliness. The work ethic. Efficiency *über alles*. Western Christian time, linear, dry, masculine and ripped away from nature, exemplified in the clock, tediously ticking you off, count, count, count."

~Jay Griffiths' polemic on mechanical time [314]

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[311] Seeber, Elisia. "Developer says it's 'exploring all options' to potentially save North Vancouver cedar tree." *North Shore News*, 22 Mar. 2021, https://www.nsnews.com/local-news/developer-says-its-exploring-all-options-to-potentially-save-north-vancouver-cedar-tree-3566862. Accessed.22 Mar. 2021.

[312] Gould. p. 10. From his definition of time's cycle "where fundamental states are immanent in time, always present and never changing."

[313] Hutton, James. *Theory of the Earth*. Royal Society of Edinburgh, 1788, p. 215, as cited in Gould, p. 64.

[314] Griffiths, Jay. "Pip Pip: A Sideways Look at Time." *Jay Griffiths*, http://jaygriffiths.com/books/pip-pip/. Accessed 7 Mar. 2021.

Measured, mechanical, ‘clock’ time relies on the symbolism of an organic cycle even as it demands time submit to human will. Time’s cycles live in the ancient shadows running around a Roman sundial and a sand-filled hour glass that must be turned end over end over end. The standard circular clock face of Western time even alludes to circular motion holding fast from a centre pin, the hour and minute hands spinning around and around the numbered dial.

The Western clock face provides a mechanism for visual orientation, giving a duration of time a kind of spatial dimension by way of geometric shape. The mathematical divisions of a circle, the degrees and angles, can be applied to describe segments of time. A duration of 15 minutes can be visualized in the space-shape between the hour and minute hand as a right angle, a 90° slice of clock pie. The dial itself can act as a (non-magnetic) compass, the four quadrants of direction–North, East, South, West as 12, 3, 6, 9 respectively. Clock ‘bearing’ is a navigation tool, used by the aerial and naval pilots to describe the relative position of another craft. Twelve o’clock is *above*, while 6 o’clock is *below*; 3 o’clock is *to the right* and 9 o’clock *to the left.* (This was an especially useful tool for aerial orientation in World War II to describe the position of enemy aircraft e.g. incoming bombers *at 2 o’clock*.) Spinning clockwise is to *go forward*; anti-clockwise is to *reverse, to go back*. The clock face unites duration, location, and direction.

Learning and memorizing the clock face is the skill of ‘telling time.’ It is a rudimentary necessity like learning the letters of the alphabet or basic addition and subtraction. Being able to draw and label the clock face is a standard test for dementia. To lose this skill is to, allegedly, ‘lose one’s mind,’ although with the advent and ubiquity of time’s digital display, it is fast becoming a lost art. The pervasiveness of the clockface is such that even if the numbers are replaced with symbols, or dots or lines, or even completely erased, we can still tell time by the position of the hour and minute hands inside a circle.

Telling time requires time keepers to ‘keep time.’ Anything with intervallic motion can be a clock–heartbeats or drops of water into a pan. The Neolithic standing stones of

Stonehenge are a prehistoric clock, measuring the arc interval of the sun in the sky from solstice sunrise to solstice sunrise.[315]

Today, using the broad strokes of periodic natural phenomena to measure a passage of time has limited usefulness. “Time is a necessary component of mathematical formulas and physical function,” write Jespersen and Fitz-Randolph, but unlike length, mass, or temperature which present as a concrete measurable reality, “time cannot be apprehended by any of the physical senses… we know it only through consciousness, or through observing its effects.”[316] Thus time’s, “fleeting and unstable nature,” makes it quantifiably difficult.[317] We can’t see time or smell it–we are dependent on something–a clock–to interpret time for us. Often, we of give this clock a voice: pings or chirps or ticks or tocks or chimes, to allow us, at least, some semblance of ‘hearing’ time.

Understandably, the mechanical clock is a revered invention of human civilization. Much of Western culture has been built using units of time. A device that measures temporal intervals and frequencies and can do so reliably is advantageous. The earliest foliot clocks of the late 13th century used a verge escapement–a system of gears, weights, and wheels to advance between intervals. Achieving constancy was a trial for these early clockmakers, and synchronization between devices a major challenge. A breakthrough in timekeeping accuracy came with Dutch polymath Christiaan Huygens’ invention, in 1656, of the pendulum clock. Inspired by Galileo’s drawings, Huygens perfected the pendulum swing, to within a gain/loss of just 15 seconds a day; he later refined the ‘balance spring’ regulator.[318] However, engineering precision requires more than an oscillating swing or wound spring. Pendulum clocks are subject to the vagaries of meteorological events, magnetic fields, gravity, and even the metal fatigue of moving cogs and wheels.

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[315] Stonehenge, Salisbury Plain, Wiltshire, England.

[316] Jespersen, James and Jane Fitz-Randolph, *From Sundials to Atomic Clocks.* Washington, National Bureau of Standards, 1977. p. 13.

[317] Ibid. p. 13.

[318] Galileo hypothesized that the swing of a pendulum (isochronism) was a constant–no matter the size of the pendulum.

The discovery of electricity proved an invaluable tool. In 1867, Jules Lissajous showed a tuning fork could be "sustained in vibration indefinitely by electronic means."[319] It took fifty years before this discovery was applied to clocks. Working from an accumulating body of research, Warren Marrison and J.W. Horton (Bell Telephone Laboratories) build the first quartz clock in 1927 (Seiko Group Corp., the first commercial quartz wristwatch, 1969).[320] Quartz crystal (silicon dioxide, SiO_2) is a hard, chemically stable material that can be cut into very fine planes, and when subject to an electrical current produces a beautifully secure oscillation. In an everyday type wristwatch, a miniscule quartz crystal, cut into the shape of a tuning fork, oscillates at 32,768 hertz (oscillations a second).

We can't *see* electricity; we can't see a quartz 'hertz' in action. Not without the help of machines that provide some kind of sensorial augmentation. Here, our quartz clock invention begins to drift into the technological sublime. Once we develop the machinery to see and count the vibrations of atoms, our technologically sublime clock reaches out into deep time.

The atomic clock comes in the wake of the atomic bomb. The mushroom cloud is every bit as part of the technical sublime as are the human-made megastructures/events like hydroelectric dams and rocket launches. These created objects and events–their scale and sound–supplant the dynamism (cascading water, volcanic explosion) of the natural world.

Atomic sublimity is as formless and elusive as time itself. And a clock made of vibrating atoms–nanoscopic swings counted by laser beams–counts away unseen, unfelt, unheard, operating beyond the capacities of our senses, possesses an essential awe.

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[319] Marrison, Warren A. "The Evolution of the Quartz Clock." Reprinted from The Bell System Technical Journal, Volume XXVII, 1948. pp. 510-588.
Ultrasonics, Ferroelectrics, and frequency Control Society. https://ieee-uffc.org/about-us/history/uffc-s-history/the-evolution-of-the-quartz-crystal-clock/. Accessed 21 Mar. 2021.

[320] The world's first quartz clock was built in 1927 by Warren Marrison and J. W. Horton at Bell Telephone Laboratories. The world's first quartz watch, however, was unveiled by Japanese watchmaker Seiko as the Astron in December 1969.
"Quartz Clock." *Wikipedia*, https://en.wikipedia.org/wiki/Quartz_clock. Accessed 21 Mar.2021.

The atom that currently powers atomic clocks is caesium (Cs, atomic number 55). It is nine million times faster than quartz crystal. Caesium is a soft, silvery-gold, highly reactive metal that is hard to find alone in nature as it reacts with just about everything. However, when isolated and subjected to an energy stream, Cs atoms, thus targeted vibrate at a rate of 9,192,631,770 Hz. This natural resonance, this "exquisite reproducibility of spinning atoms," to use Canada's National Research Council's poetic description, is what constitutes a 'second' of time.[321]

The first clock using caesium oscillations was built by physicist Louis Essen in 1955. It is the now the gold standard of time keeping, supporting all the synchronicity on which daily telecommunications relies. "Precise timekeeping underpins much of our modern world," writes Adam Mann, noting that satellite-based Global Positioning System of navigation (GPS) requires "[the] accuracy of about a billionth of a second in order to keep you from getting lost."[322] "In 2014, the National Institute of Standards and Technology (NIST) that sets official U.S. time, launched an atomic clock accurate to one second in 300 million years,"[323] a clock so precise that if it began to tick at the very beginning of the universe, it would only be out by half a second.[324] This degree of precision contributes to advancement in many fields of endeavour, from medicine to space travel. Atomic time also contributes to the 'accelerating' feeling of modern life, and perhaps a kind of hubris that comes with the feeling of mastery over an elemental (atomic) power.

The real master trick in calibrating precision is in constructing a clock using *just one atom.* Caesium atoms all oscillate at the same rate, however, they cannot be isolated and excited individually. "To keep perfect time," explains Jennifer Chu, "a clock would ideally track the oscillations of just one atom,"[325] but at this most basic level,

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[321] "Certifications and Evaluations Standards." *National Research Council of Canada*, Date modified: 9 Jan. 2020. https://nrc.canada.ca/en/certifications-evaluations-standards/canadas-official-time/what-cesium-atomic-clock. Accessed 14 Mar. 2021.

[322] Mann, Adam. "How the U.S. Built the World's Most Ridiculously Accurate Atomic Clock." *Wired*, 4 Apr. 2014, https://www.wired.com/2014/04/nist-atomic-clock/. Accessed 15 Mar. 2021.

[323] Ibid.

[324] Chu, Jennifer. "New type of atomic clock keeps time even more precisely." *MIT News Office,* 16 Dec. 2020, https://news.mit.edu/2020/atomic-clock-time-precise-1216. Accessed 15 Mar. 2021.

[325] Ibid.

natural laws fall away and quantum mechanics take over with its seemingly random complexity. “When measured,” Chu continues, “[an atom] behaves like a flipped coin that only when averaged over many flips gives the correct probabilities.”[326] Thus, each caesium atomic second is actually the averaged ‘flip’ of many atoms combined, a principle known as the Standard Quantum Limit.

In the quest to refine this Standard Quantum Limit, a clock using atoms of the rare earth metal ytterbium (Yb, atomic number 70), is in development.[327] Ytterbium promises an oscillation rate of 518,295,836,590,863.6 Hz.[328] To further enhance this precision, is a new method of counting Yb oscillations through ‘quantum entangling,’ whereby the individual oscillations of atoms tighten up around a common frequency, gives a result four times more accurate than that of random oscillating caesium.[329]

Why the need for even more meticulous precision? Time is a secret ingredient locked in dark matter, cosmic rays, and all the mysterious particles that hold clues to the origins of everything. A clock that could allow us to perfectly count back to the beginning of the universe (or into the future) would open many secrets. Yet, just this suggestion of such a conscious-altering opening, may prove too much to bear. Without such elemental secrets, could anything, anywhere, ever be truly felt as sublime again?

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[326] Ibid.

[327] “Each of NIST's ytterbium clocks relies on about 10,000 rare-earth atoms cooled to 10 microkelvin (10 millionths of a degree above absolute zero) and trapped in an optical lattice–a series of pancake-shaped wells made of laser light. Another laser that "ticks" 518 trillion times per second provokes a transition between two energy levels in the atoms. The large number of atoms is key to the clocks' high stability.”

“NIST Ytterbium Atomic Clocks Set Record for Stability.” *National Institute of Standards and Technology* (NIST), 22 Aug. 2013. https://www.nist.gov/news-events/news/2013/08/nist-ytterbium-atomic-clocks-set-record-stability. Accessed 15 Mar. 2021.

[328] Bennet, Jay. “Scientists measure the second with record breaking precision.” *Smithsonian Magazine*, 28 Nov. 2018, https://www.smithsonianmag.com/science-nature/scientists-measure-second-record-breaking-precision-180970908/. Accessed 15 Mar. 2021.

[329] Chu, Jennifer. “New type of atomic clock…”
MIT Quantum entangling, being developed at MIT Research Laboratory of Electronics: “In their new atomic clock, Vuletic and his colleagues entangle around 350 atoms of ytterbium, which oscillates at the same very high frequency as visible light, meaning any one atom vibrates 100,000 times more often in one second than cesium. If ytterbium’s oscillations can be tracked precisely, scientists can use the atoms to distinguish ever smaller intervals of time.”

4.4.1. Greenwich Mean Time

We take for granted our ability to ascertain where we are in 'time' and 'space,' forgetting that time and geographically-defined space are human constructs, and relatively recent ones at that. Imagine living in an age before Global Positioning Satellites or indeed any kind of navigational technology to help define one's place on the spherical surface of a rotating globe–a globe that was yet to be 'mapped out' in full, a globe fuller by far of blank spaces and great 'unknowns.' Furthermore, imagine being adrift on a featureless ocean–how could one feel anything but 'lost?'

The idea of latitude and longitude dates back to ancient Greece, perhaps as early as 300 BCE, although, as Derek Howse explains, these positioning coordinates were most likely thought of in terms of "quantities of time," the differences in local time between two places, rather than in geographical positions north or south of the equator, or east or west of a set meridian.[330] Hipparchus took a stab at figuring out longitude using the lunar eclipses–observable events–from two places, but his accuracy was stymied by the lack of correlation between 'local times.'[331] Claudius Ptolemy is considered the first to construct a mathematical 'grid' model of latitude–measuring from the equator, and longitude–as measured from the 'Fortunate Isles,' then the most western point of 'known' world.[332]

It would take a convergence of inventions in Europe from the 13th century onward to address the problems of navigation. The earliest "sea charts" date from 1270, the time of the Second Crusade.[333] However, these sea charts and maps were highly secretive documents, not shared among mariners let alone nations, and often the

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[330] Howse, Derek. *Greenwich time and the discovery of longitude*. Oxford, Oxford University Press, 1980. p. 1.

[331] Hipparchus (190 -120 BCE)
Greek astronomer, geographer, and mathematician. He is credited with discovering the 'procession of the equinoxes.'

Ibid. p. 2.

[332] Ptolemy (c.100-c.170 CE)
Alexandrian astronomer and mathematician' he was an advocate for the geocentric, Earth-centred model of the Universe.

The Fortunate Isles, also known as the Isles of the Blessed, may not be actual islands but rather ones that exist solely in Greek Mythology.

Ibid. p. 1.

[333] Ibid. p. 3.

‘compass rose,’ the design element with points indicating north, south, east, and west, provided the only indication of direction.[334] The Age of Discovery–the roughly two-hundred year period starting in the 15th century–saw an explosion in exploration and colonization of previously unknown regions of the globe including in Africa and Asia, the North and South American continents, and Australia–although these were hardly unknown regions to their respective indigenous peoples. To the European nations (Spain, Portugal, England, France, the Italian city states, and the Netherlands) all seeking power through empire building and global trading, the quest to perfect methods of navigation became imperative. Many instruments–the astrolabe, the cross-staff, and the quadrant–existed to primarily assist the mariner with determining latitude. The astrolabe determined the sun’s altitude or declination at noon, or if used at night, the declination of a star such as Polaris; the more accurate sextant was “doubly reflecting,” allowing the mariner, using mirrors, to view two objects at the same time. In “taking a sight” of two objects concurrently, and then measuring the angular distance between them and the horizon, a latitudinal coordinate could be ascertained.[335] Latitude is always given as an angle measurement. The equator being 0°, the North Pole 90°N, and the South Pole -90°S. Thus, as long as one could see the sky, it was pretty straightforward to calculate one’s latitude. However, longitude was a different matter. It required a confluence of expertise in the astronomy and precision time keeping.

Many of the astronomical methods used to ascertain longitude by such explorers as Columbus (the lunar eclipse) and Vespucci (the occultation of Mars) only really worked if they were anchored in a harbor and not at sea.[336]

Mariners recognized that an accurate timekeeping device would be a great compliment to the sextant in ascertaining longitudinal co-ordinates at sea. In theory, each 15° degrees of longitude is equal to an hour of clock time. Thus, if a mariner knows his ‘local time’ using the position of the sun or stars, and compares it to where he finds

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[334] Bratcher, Amy J. “History of Navigation at Sea.” *Water Encyclopedia*. http://www.waterencyclopedia.com/Mi-Oc/Navigation-at-Sea-History-of.html#google_vignette. Accessed 1 Aug. 2024.

[335] “Sextant.” *Wikipedia*, https://en.wikipedia.org/wiki/Sextant. Accessed 4 Aug. 2024.

[336] Howse. p. 6.
Christopher Columbus, anchored at Hispaniola, observed a lunar eclipse 14 Sept. 1494. However, his calculated longitude was 23° too far west; of Amerigo Vespucci’s longitude obtained observing Mars passing behind the moon, (23 Aug 1499, 82° west of Cadiz), Howse writes, “the accuracy of which is difficult to judge.”

himself at the same moment out at sea, he should be able to figure out his position.[337] However, mechanical clocks were useless at determining a precise temporal orientation on a rotating globe.

Galileo, in 1637, first theorised the pendulum as a practical regulator for clocks, and Christiaan Huygens, in 1657, put this idea to the test with an actual machine. This had a decided advantage over previous 'wind-up' type controllers as a pendulum is controlled by gravity; it is, as Howse explains, "isochronous …oscillat[ing] in equal spaces of time almost irrespective of the arc of swing or weight of the bob."[338] And it worked great on dry land. However, on a ship, pitching and rolling in a stormy sea, it was sorely lacking. Still, the conviction that a clock would solve the longitudinal problem persisted. "One [method of finding longitude] is by a Watch to keep time exactly," wrote Isaac Newton in 1714, "But, by reason of the motion of the Ship, the Variation of Heat and Cold, Wet and Dry, and the Difference of Gravity at different Latitudes, such a watch hath not yet been made."[339] Such was the urgency of creating this reliable watch that the governments England, France, Portugal, Spain and The Netherlands offered cash incentives and 'prize money,' to spur on its invention.[340] English clockmaker John Harrison's Sea Clock, an early chronometer, would be rewarded, but to function his machine required a reference point, in effect a Prime Meridian. It would take the further creation of a precision machine to establish this meridian and some brilliant brainpower to draw longitude into being, and these would come together at a place called Greenwich.

The physical place that is Greenwich occupies a deep, almost mythically space in the British psyche. Charles Jennings characterizes it as "a militarily significant bend in the River Thames," and it is most ancient bend, one exploited by the Romans founding Londinium around 60 CE. In Tudor England, Greenwich became the site, in Jennings' words, of "some of the most extravagant pieces of architecture in the country."[341]

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[337] Dolan, Graham. "The Royal Observatory Greenwich – A Brief History." *The Royal Observatory Greenwich*, http://www.royalobservatorygreenwich.org/articles.php?article=1. Accessed 7 Aug. 2024.

[338] Howse. p. 13.

[339] "Time and Navigation: Early Sea Clock Experiments." *Smithsonian*, https://timeandnavigation.si.edu/navigating-at-sea/longitude-problem/solving-longitude-problem/early-sea-clocks. Accessed 30 Jul. 2024.

[340] Ibid.

[341] Jennings, Charles. *Greenwich*. London, Little, Brown and Co., 1999. p. 32.

Humphrey, Duke of Gloucester, first built a palace here, as well as a massive library which would, in due course, become the core collection of Oxford's Bodleian Library.[342] Henry VIII was born at Greenwich as was his daughter Elizabeth I. After Henry became King, he razed Humphrey's palace to raise his own splendid Placentia. Greenwich was also adjacent to the royal shipyards and the vital docks needed for commercial and maritime power. In time, the Thames would silt up, and Greenwich's usefulness would wane as better harbours and ship building locations were found. Yet it still retains its' seafaring symbolism, becoming, as Jennings explains, "the repository for the nation's maritime memories."[343]

After all, Greenwich is where the body of Lord Nelson was taken in 1805 following the Battle of Trafalgar, transported abord his flagship Victory. Greenwich is also where Sir Francis Drake was knighted by Queen Elizabeth I in 1581 following his successful world circumnavigation. It is where Sir Francis Chichester was knighted by Elizabeth II in 1967–using the same sword Elizabeth I used to knight Drake–for his successful solo circumnavigation.[344]

Eventually, Henry VIII's Palace of Placentia would fall to the vagaries of progress. In 1675, Charles II commissioned architect Sir Christopher Wren to create a Royal Observatory to be staffed by an Astronomer Royal. This astronomer's mission would be to "apply himself with the most exact care and diligence to the rectifying of the tables of the motions of the heavens, and the places of the fixed stars, so as to find out the so much desired longitude of places for the perfecting of the art of navigation."[345] Britain's seafaring ambitions required crucial innovations in astronomy to support cartography, timekeeping, and navigation.[346] Wren chose the vantage of Greenwich hill for the Observatory. Here, he could also make use of the foundations of the Henry's palace that had since fallen into ruin, thus expediting construction.[347] The next summer,

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[342] Ibid. p. 33.

[343] Ibid. p. 84.

[344] Sir Francis Drake, explorer and privateer, first Englishman to circumnavigated the globe, 1577-1580. Of the 5 ships that set out on this expedition, only the *Golden Hind* returned. Sir Francis Chichester completed the first solo circumnavigation of the globe, 1966-1967, abord the Gypsy Moth IV.

[345] Royal Observatory, Greenwich." *Wikipedia*, https://en.wikipedia.org/wiki/Royal_Observatory,_Greenwich. Accessed 4 Aug. 2024.

[346] "History of the Royal Observatory." *Royal Museums Greenwich*. https://www.rmg.co.uk/royal-observatory/history. Accessed 31 Jul. 2024.

[347] Jennings. p. 71.

John Flamsteed became the first Astronomer Royal to take up residence in the Observatory and in the course of 42 years he made over 50,000 observations of the moon and stars.[348] Flamsteed commenced his observations with a 7-foot Equatorial Sextant, exchanging it for a Mural Quadrant and later a Mural Arc as these observational machines evolved.[349] In 1720, Flamsteed was succeeded by Edmond Halley (he of "Halley's Comet" fame), who continued to refine and plot the visible stars.[350]

In 1765, Nevil Maskelyne became the Astronomer Royal. It was though his meticulous astronomical tables for finding longitude, along with refinements in Harrison's chronometers, that longitude at sea became solvable. Dolan draws attention to his "organisational and administrative skills that lead to the publication in 1766 of the first Nautical Almanac, a volume of tables that removed many of the onerous calculations required by the lunar-distance method of finding longitude."[351] The wide distribution of this Almanac would become a contributing factor to the choice of Greenwich as the location for the Prime Meridian.

During the Victorian Era, the Royal Observatory took on a greater global leadership role in positional astronomy.[352] This was in large part due to Astronomer Royal George Biddell Airy and the creation of his Airy Transit Circle, a formidable telescope that he had designed to his exact specifications.[353] This telescope was "a mechanical marvel," having huge optical power over other telescopes of the day.[354] It remained in use until 1954. "The Airy Transit Circle," Daniel Belteki emphasizes, "thus

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[348]"History of the Royal Observatory." *Royal Museums Greenwich*.

[349] Dolan, Graham. "Telescope: Flamseed's 7-foot Equatorial Sextant (1676)." *The Royal Observatory Greenwich*, http://www.royalobservatorygreenwich.org/articles.php?article=937. Accessed 7 Aug. 2024.

[350] Halley's Comet. Returning orbit plotted by Edmund Halley in 1682.

[351] Dolan, Graham. "The Royal Observatory Greenwich–A Brief History."

[352] Ibid.

[353] George Biddell Airy (1801-1892), astronomer and mathematician. Astronomer Royal from 1835-1881.

[354] Belteki, Daniel. "At the ends of the line: How the Airy Transit Circle was gradually overshadowed by the Greenwich Prime Meridian." *Science in Context* (2021), 34, 249-264., Cambridge University Press. p. 250. doi:10.1017/S0269889722000187.

served as the starting point for producing time and space for the British Empire."[355] This is the machine that would define the prime meridian.[356]

Airy's telescope made two measurements: the time at which a star crosses the meridian as it travel east to west, and the angle of the star above the horizon.[357] The astronomer would, eye glued to the eyepiece, wait, as the earth rotates, for the star to come into view, and then note these celestial coordinates. Inside the eyepiece was a vertical wire or 'line.' This "middle wire," as Edwin Dunkin, the Chief Assistant (1838-1884), elucidates, "is the meridian line from which arcs of longitude on British maps are reckoned."[358] Dunkin when further to explain the significance of this dividing line: an observer, "when seated at the instrument, looking south, has his right arm in the western, and his left arm in the eastern hemisphere."[359]

In 1884, The International Meridian Conference was held in Washington D.C. to discuss the need for a universal meridian; delegates from 25 nations convened to discuss the site. Jerusalem and Washington DC were among the sites floated, but it was Greenwich that won out, although it would take many years for individual nations to formally accept Greenwich. Other recommendations from this conference which have since taken hold include the adoption of a 24-hour clock (so necessary for travel timetables and international commerce) and the concept of 'universal day,' starting at midnight rather than noon–as was preferred by astronomers.

By the start of the First World War, the Greenwich meridian had indeed become established as the Prime Meridian for the world. "Despite its slow and contested adoption," Rebekah Higgitt and Graham Dolan explain, "it was becoming a line almost with a status equivalent to the 'natural' line of the equator."[360] Moreover, they continue, "The idea that Greenwich was the point where east meets west, even the centre of the

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[355] Ibid. p. 250.

[356] "The telescope that defined the Prime Meridian." *Royal Museums Greenwich,* https://www.rmg.co.uk/stories/topics/airys-transit-circle-dawn-universal-day. Accessed 30 Jul. 2024.

[357] Ibid.

[358] Belteki. p. 257.

[359] [359] Higgitt, Rebekah and Graham Dolan. "Greenwich, time, and 'the line." *Endeavour*, Vol 34, Issue 1, March 2010, pp. 35-39. *Science Direct*, https://www.sciencedirect.com/science/article/abs/pii/S0160932709000921?via%3Dihub https://doi:10.1016/j.endeavour.2009.11.004. Accessed 4 Aug. 2024. p. 37.

[360]Ibid. p. 37.

earth, could be used to emphasise the importance of the Royal Observatory, and the nation, and this led naturally to the desire to mark out the line itself."[361]

Thus, a tangible, physical 'line' was constructed to traverse the Observatory's courtyard. Here it could be visited, touched; here the meridian was made 'real.' Its tourist appeal was readily acknowledged. In 1952, Frank Carr, Director of the National Maritime Museum, noted "the great attraction of the Royal Observatory and the Greenwich Meridian," and the benefits of allowing tourists access to the line, it being "the spot where they can stand, as it were, 'bestriding the narrow world like a Colossus' with one foot in the Eastern and one in the Western Hemisphere."[362]

After the Second World War, the Royal Observatory moved to a new site in Sussex. Today, the Old Royal Observatory is an annex of the National Maritime Museum. The Airy Transit Circle has, of course, been superseded with new technologies, reducing it to a museum object. Still, the symbolic power of Greenwich and 'the line' remain; they have indeed become an essential part of history in the creation of longitude and Mean Time. Of all our human ways to control and define the natural world for our own utility, surely this steel line denoting the division between hemispheres is one of the most emblematic. And the tourists still do come, all for that all important photograph, one foot in each hemisphere, astride the zero line. Whether or not this experience of standing in both hemispheres at the same time generates any feeling of sublimity remains to be seen, but perhaps it generates a feeling of *time control*.

4.5. Utopian/Dystopian Time

"I am completely operational,
and all my circuits are functioning perfectly."

~ HAL 9000[363]

Hidden in the quest for timekeeping perfection is a desire for a perfectly functioning world. Here, trains pull into the station exactly on schedule and a level of technical automation takes out all the messy, inchoate randomness of organic time. Yet,

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[361] Ibid. p. 37.

[362] Ibid. p. 38.

[363] Hal, the artificial intelligence in Stanley Kubrick's film *2001: A Space Odyssey*, 1968. Film.

the natural world does not behave in calculable ways. The weather report can predict avalanche conditions in the mountains, but not the timing of an avalanche. Seismometers can listen to grinding geologic faults, but earthquakes strike by their own clocks.

We cannot *time* the course of the natural world, but this doesn't mean we can't try. Whether through farmer's almanacs and climate fortune-telling calendars, or state-of-the-art satellite technology, we want to read the Earth's clock, not just for advice on when to plant and when to sow, but now also to synchronise our lives with fire seasons, hurricanes, temperature-changing ocean currents, even magnetic fields.

Bending the natural world to sync with our needs is not a new idea. Francis Bacon, he of the famous decree: "Time is the greatest innovator," took pains to subvert natural time to human will in his utopian dream, *New Atlantis*, 1627.[364] On his imagined island paradise in the South Seas, Bensalem, he created Salomon's House, "the noblest foundation" whose scholars perfected a method for refining the seasons (among other utilitarian bio-works).[365] "In an astonishing passage prescient of genetic engineering," Jay Griffiths comments, "Bacon describes how self-willed nature and self-willed time are both subjected to the will of man."[366] By Bacon's idealistic vision, every leaf sprouting on every branch is orchestrated "by art" in the time-space to the benefit of the islanders:

> "And we make (by art) in the same orchards and gardens, trees and flowers to come earlier or later than their seasons; and to come up and bear more speedily than by their natural course they do."[367]

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[364] Bacon, Francis. "Essays Civil and Moral: XXIV. Of Innovations. (1625) in The Works of Francis Bacon (1884)." *Wikisource*. p. 32. https://en.wikisource.org/wiki/Page:The_Works_of_Francis_Bacon_(1884)_Volume_1.djvu/160. Accessed 7 May 2024.

[365] *New Atlantis* is a Utopian novel by Francis Bacon, published in 1626. This work describes an idealized world; Bacon takes his dream inquiries into the natural philosophies of the day to Bensalem, an island paradise in Oceania. The novel explores a lost/ European shipwreck on island and reactions of crew to discovery a world of perfection and order. A kind of 17th c. sci-fi/speculative, Bacon imagines great scholarly achievements, and the island's 'Solomon House' is a precursor to a research university.

Bacon, Francis. *New Atlantis*. Project Gutenberg EBook, Recent Update: 1 Jan.2021. [EBook #2434]. https://www.gutenberg.org/cache/epub/2434/pg2434-images.html. Accessed 30. Mar. 2021.

[366] Griffiths. *Wild*. p. 235.

[367] Bacon, *New Atlantis*. Project Gutenberg EBook.

This utopian manipulation of the natural world often yields dystopian results. “The ‘control of nature,’” wrote Rachel Carson, “is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man.”[368] Carson was referring to the ill-effects of pesticide use but she could easily have included the kind of manipulation that Bacon suggests. In Bacon’s defence, he was an Enlightenment scholar, living in a time when exciting marvels of the natural world were coming into focus. *New Atlantis* was a fantasy born of these new discoveries, many that promised an alleviation of the woes of his time (disease, poverty, unrest).

Utopian worlds seem to have fallen out of favour in discourse of current popular culture. Disease, poverty, and unrest endures, exacerbated by the degradation of the natural world. It is the grim dystopias that have currency, and, this dystopian future imagines two responses. The first, is to abandon ship. Leave Earth, find a new planet. The second, is to acquire scientific superpowers to put things right. Pop culture is brimming with dystopian scenarios with superhero-scientists swooping in to save the good Earth.

Take as pop-culture example the dystopian world of the train Snowpiercer, a perpetual motion machine carrying the last living remnants of Earth, endlessly encircling the planet on great track, looping through an unviable ice world following a human-caused deep freeze.[369] Snowpiercer is a metaphor for human futility–a back-firing of a ‘control of nature’ experiment lost to the devasting powers of the natural world.

Bacon’s tweaking of seasons on his island pales in comparison with the ‘planet-altering’ technology we have available today. Even in an untried form, the salting of clouds with crystals to reflect light back into space as a global warming deflection, might

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[368] Payton, Brian. “Rachel Carson (1907-1964).” *NASA/Earth Observatory*. 30 Nov. 2002. https://earthobservatory.nasa.gov/features/Carson/Carson2.php. Accessed 1 Apr. 2021.

[369] Ho, Boon Joon, director. *Snowpiercer*. Moho Film, Opus Pictures, Union Investment Partners, Stillking Films. 2013.

Based on French graphic novel *Le Transperceneige* by Jacques Lob, Benjamin Legrand and Jean-Marc Rochette.

backfire on a global scale. Would there be unintended consequences from light/cloud variations or rainfall distribution?[370]

Dystopian time takes a long time to pass. After an apocalyptic event, how does the remains of the world settle back down into being the world? How much time does a reset require? This question was on the minds of the scientists testing the first atom bombs, and yet they chose to go ahead anyway. Richard Fisher writes:

> "Before the first atomic weapons test in 1945, scientists at the Manhattan Project performed calculations that pointed to a chilling possibility. In one scenario they plotted out, the heat from the fission explosion would be so great that it could trigger runaway fusion. In other words, the test might accidentally set the atmosphere on fire and burn away the oceans, destroying most of the life on Earth."[371]

An apocalyptic backfire was also a consideration for the architects of the Hadron Collider, a particle accelerator and the world's largest machine.

4.6. Losing Time

Orchestrating time has always been about control. The imposition of mechanical time was a colonial tool used to assimilate and conquer the peoples of the 'New World.' European missionaries, as Griffiths points out "wanted to control the minds of the people they conquered, and one of the ways of doing this was to order and command people's freedom of time, that most metaphysical of all freedoms."[372]

Orchestrating time is also about wielding power. Before the advent of personal timepieces, the clock tower in the town's square cast dominion over the life of the people below. First as a religious call to prayer and then to regulate commerce, the Great Clock

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[370] Szalai, Jennifer. "Electrified Rivers and Other Attempts to Save the Environment." *New York Times*, 10 Feb. 2021, https://www.nytimes.com/2021/02/10/books/review-under-white-sky-elizabeth-kolbert.html. Accessed 10 Feb. 2021.

[371] Fisher, Richard. "The moments that we could have accidently ended humanity." *The Guardian,* 18 Feb. 2021, https://www.bbc.com/future/article/20210217-the-moments-that-we-could-have-destroyed-humanity. Accessed 18 Feb. 2021.

[372] Griffiths. *Wild*. p.167.

was life-altering. Alan Lightman creates this narrative for the arrival of the 'Great Clock' into people's lives:

> "…Then in a small town in Italy, the first mechanical clock was built. People were spellbound. Later they were horrified. Here was a human invention that quantified the passage of time, that laid ruler and compass to the span of desire, that measured the exact moment of a life. It was magical, it was unbearable, it was outside natural law. Yet the clock could not be ignored. It would have to be worshipped…"[373]

This powerful feeling echoes on down into the luxury timepieces that grace the arms of rich, famous, and powerful people. Timepieces are significant cultural identifiers of importance, of value. As such, clocks and watches are often fabricated of precious metals and embellished with jewels. To own such a timepiece is to signify control, authority, to command power.

4.7. Symbolic Timekeeping

4.7.1. The Doomsday Clock

This January, as it does at the start of every year since 1947, the Bulletin of Atomic Scientists issues a press release with its countdown to the Apocalypse.[374] A clock face graphic accompanies this release: The hour hand is permanently fixed at 12 o'clock, the 'zero hour,' *the End*.[375] The minute hand pivots between the 9, 10, and 11 o'clock positions represented as black dots. The other numbered positions of a clock dial

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[373] Lightman, Alan. *Einstein's Dreams.* Vintage. 2004. pp.150-151.

[374] "Founded in 1945 by Albert Einstein and University of Chicago scientists who helped develop the first atomic weapons in the Manhattan Project, the Bulletin of the Atomic Scientists created the Doomsday Clock two years later, using the imagery of apocalypse (midnight) and the contemporary idiom of nuclear explosion (countdown to zero) to convey threats to humanity and the planet."

Mecklin, John, editor. "This is your COVID wake-up call: It is 100 seconds to midnight. 2021 Doomsday Clock Statement." *The Bulletin of Atomic Scientists*. 27 Jan. 2021. https://thebulletin.org/wp-content/uploads/2021/01/2021-doomsday-clock-statement-1.pdf. Accessed 27 Jan. 2021.

[375] The Doomsday Clock face was first designed by Martyl Langsdorf, the wife of Manhattan Project scientist Alexander Landsdorf Jr., one of initial members of the Bulletin's group of atomic scientists. https://thebulletin.org/doomsday-clock/faq/

are not included–even the perception of ‘more time left’ is too optimistic a position for this alarm.

The Doomsday Clock came into being following the detonation of the atomic bomb over Hiroshima and Nagasaki. The near annihilation of the citizenry and the poisoning after-effects of such a catastrophic weapon caused humanity to pause. A group of scientists involved in the Manhattan Project came together in 1945, to deliberate the magnitude of such a human-made atrocity, publishing their concerns in a newsletter two years later. [376] The Doomsday Clock made its first appearance as the cover graphic of this newsletter, the minute hand set at seven minutes to midnight, giving humanity this small window to reset its destructive propensities.

The Doomsday Clock is ‘non-linear;’ the minute hand can move forward or backward depending on the perceived threat we humans pose to ourselves and the natural world. In 1991, at the end of the Cold War, when the Unites States and the Soviet Union signed the Strategic Arms Reduction Treaty to reduce their respective nuclear arsenals, the Bulletin acknowledged this hopeful development and moved the minute hand back to 17 minutes to midnight. However, nothing since has come close to these encouraging 17 minutes.

It is not just Nuclear Armageddon that moves the minute hand on the Doomsday Clock. World conflicts, cyber security, bio-terrorism, and climate change can shake the remaining minutes and seconds off the clock hand. In January 2021, The Bulletin recognized a new existential threat–one gathering in strength from the previous year: “In 2020, online lying literally killed.”[377]

The wide dissemination of disinformation, the degradation of scientific work, and “vilification of prominent scientists” at the hands of a number of national leaders and influential people, created a situation that the Bulletin recognized as one where “global emergencies” were unchecked and allowed to escalate.[378] President, Rachel Bronson

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[376] The Manhattan Project–name of the American initiative, with contributions from UK and Canada, that oversaw the development of nuclear weapons during WWII, including the bombs dropped on the Japanese cities of Hiroshima and Nagasaki in 1945.

[377] Mecklin, John., editor. “This is your COVID wake-up call…”

[378] Chow, Denise. Interview with Doomsday Clock President and CEO Rachel Bronson. “Scientists keep Doomsday Clock at 100 seconds to midnight, same as 2020.” *NBC News*, 27

highlighted the slow political reaction to the coronavirus pandemic that saw many parts of the globe 'locked down' to contain its spread with varying degrees of effectiveness. Too many leaders, operating within the self-serving parameters of a time horizon truncated to "their own narrow interests and political gains," not only resisted a call to limit future harms but also failed to safeguard the welfare of the citizenry they serve. Bronson continued, "By undermining co-operative science and law-based approaches to managing the most urgent threats to humanity, these leaders have helped create a situation that will, if unaddressed, lead to catastrophes sooner rather than later."[379]

Although nuclear weapons and climate change are still grave threats, the pandemic response illuminated the disturbing deficiency of moral leadership. It is sobering that such a deficiency finds company with disaster. In January 2020, the clock hands were moved to 100 seconds to midnight, the closest ever to the 'zero hour,' and in 2021, a year into the pandemic suffering and death, this position remains the same.

The Doomsday Clock and the Apocalyptic Sublime

The Doomsday Clock is a secular countdown to the end of time. It differs from the 'countdown' eschatology employed by revenant faiths whose belief in such an 'End Time' colours humanity's treatment of the natural world. If the Earth is just a stepping stone to a higher world, and, if the Earth is going to crash and burn anyway (from humanity's egregious sins), then there is no point in trying to save anything. With 'The End' comes the Rapture; the chosen will be spirited heavenward and will leave the guilty mess behind. This countdown to the end is not fearful if one believes it opens a portal to the next realm (that suffers not from carbon accumulation). Adherents can enjoy the passion and fury of apocalyptic sublimity–viewing the violent storm from the safely of the upper floor of salvation. Believers are not compelled to act but rather passively wait it out. Even though the planet increasingly resembles the biblical disasters painted by William Blake and John Martin, these scenes are merely (like Thomas Burnet's *Sacred History*) the formation of the natural world by God's wrathful hand. [380]

Jan. 2021, https://www.nbcnews.com/science/science-news/doomsday-clock-set-100-seconds-midnight-perilously-close-catastrophe-n1255708. Accessed 27 Jan. 2021.

[379] Ibid.

[380] "Biblical Storms. John Martin's Apocalypse in Pictures." *The Guardian*, 20 Sept. 2011, https://www.theguardian.com/artanddesign/gallery/2011/sep/20/john-martin-apocalypse-tate-britain. Accessed 28 Jan. 2021.

The Apocalypse of the Doomsday Clock is one where we all remain on earth. No one gets out. Any survivors are left to crawl through the embers, poisons and bloody remains of a most god-awful end.

The Doomsday Clock is not designed to address the Apocalyptic sublime. It is not sublime or even subtle; its purpose is predicated on *absolute fear*. It is an alarm clock: wake up now or die. Yet, even such a strident siren can still fall on covered ears.

The Doomsday clock trades in nihilism no one wants to hear. Just as people turn off bad news (in favour of 'fake news') so too do the Doomsday Clocks' panicky ticks become the sound of numbing complacency. A great many harmful things like nuclear weapons are beyond the scope of action for ordinary citizens. For some nations (North Korea or Iran), they are a rite of passage, for the citizenry, a source of national pride. The potential for nuclear war seems stuck on a past time horizon, and although the fear should be alive and beating, it is not a front page fear. Its *awfulness* has made it too hypothetical: surely no nation *would dare*.

The other myriad crises menacing the planet also face similar despondency. And so, the Doomsday Clock's countdown–a symbolic gesture meant to spur change, fails. The apocalyptic 'awe' and 'fear' with which the clock tries to engage is lost in pessimism fatigue. And adding to this lethargic countdown is the belief in a scientific saviour to intervene at the end hour, even at the *very last second*.

4.7.2. The Clock of the Long Now

The Clock of the Long Now is buried inside a mountain of the Sierra Diablo range in Texas. Lowered into a carved shaft, the Clock is five-hundred-feet long, a most beautiful machine of silvery cylinders and rods, coppery disks and pendulums. The translucent, polished skin of the clock face is eight-feet in diameter and displays the astronomical cycles for the sun, the stars, the moon, the progression of the planets, as well as the position of the horizon, the year and the century.[381] A circular staircase winds inside the shaft so visitors can climb around the length of the clock; a sapphire crystal skylight lets the sun stream in like a cathedral's rose window. The Clock chimes to mark

[381] "Clock of the Long Now." *Wikipedia*, https://en.wikipedia.org/wiki/Clock_of_the_Long_Now. Accessed 1 Sept. 2023.

the year, the century, and every one-thousand-years, a ‘cuckoo’ comes out to sing.[382] From within its dark chute, it attempts to create a bridge to deep time.

This clock was first conceived by computer scientist/inventor Danny Hillis in 1986, and has since been championed by the Long Now Foundation, an organization devoted to long-term thinking. Its design team includes futurists Steward Brand and Kevin Kelly. It enlists the talent of Brian Eno (he composed the Clock’s chimes, based on an algorithm to never repeat the same melody in 10,000 years “so that a peal of ten bells makes a different peal every day for 10,000 years”[383]), and is funded by Jeff Bezos (the Clock is on his land, he owns the mountain, he’s paying for it).[384] Although this Clock is an expensive endeavour, the Foundation plan to build more, and the next one will be constructed in Nevada among the ancient bristlecone pine forests, home of Methuselah and Prometheus, and other millennially old trees.

For Brand, one of the motivations for the clock is to “do for thinking about time what the photographs of Earth from space have done for thinking about the environment. Such icons reframe the way people think.”[385] To help frame this ‘rethink’, the Foundation promotes the use of a five-digit date (e.g. 02021), to include the decamillenium.

As an entity submerged inside a mountain, The Long Now Clock’s purview is less Silicon Valley geek and more Land Art. It resonates with the conceptual earthworks of artist Walter De Maria. De Maria’s *The Vertical Earth Kilometer* (1977) in Friedrichspatz Park, Kassel, Germany, consists of a one-kilometer long solid brass rod inserted straight

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[382] The cuckoo has since been replaced in the clock with a ‘gong.’

A prototype of the 10K clock has been on display in the Science Museum, London England since 1999. When the machine hits the ‘1000’ year mark a ‘cuckoo comes out to sing.’ The creators were able to take an auditory test drive (hear the cuckoo sing) when the year 1999 rolled over to 2000.

[383] Brand, Steward. “The Long Now.” *TED2004*, Feb, 2004, Monterey California. 21:47, (06:13) https://www.ted.com/talks/stewart_brand_the_long_now?language=en. Accessed 24 Mar. 2024.

[384] Bezos has contributed 42 million to date.
“Clock of the Long Now.” *Wikipedia*.

[385] Brand, Steward. “About Long Now.” *The Long Now Foundation*, https://longnow.org/about/. Accessed 1 Sept 2023.

down into the Earth.[386] On its way down, it passes through six geological time layers.[387] The intended audience for the artwork is Mother Earth. All that surface life can see is the exposed five-centimeter diameter top of the brass rod, located with the aid of a red sandstone plate and four converging footpaths.

The Long Now Clock is not nearly as subtle as De Maria's earthwork, although arguably, its peals will mostly entertain the mountain. Although De Maria's work is in a public park, people scarcely know it is there (although memory of the lengthy and noisy seventy-nine day drilling is well-remembered by neighbours). The top, visible disk of the rod is like a large coin, easy to tread on. In comparison, The Long Now Clock is an opulent piece of craftmanship and yet, it is deliberately remote. Jeff Bezos, during the planning expedition for the Nevada Clock, advised, "Make the clock inaccessible. The harder it is to get to the more people will value it."[388]

The Technological Sublime and the Clock of the Long Now

The Clock of the Long Now is a machine designed to tell time for the next 10,000 years.[389] This is a deliberate number chosen by the design-engineers as a timeframe equal to the age of the oldest found remains–pottery shards and such–of human civilization. The clock invites us, as Kevin Kelly argues, to "measure out a future of civilization equal to its past."[390] This sanguine position Kelly emphasizes, "assumes we are in the middle of whatever journey we are on–an implicit statement of optimism." [391]

The technical sublimity of the Long Now Clock is overshadowed by its beauty, symmetry, and synchronicity of its gears. It is undeniably a fascinating machine to watch

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[386] "Walter De Maria, The Vertical Earth Kilometer." *Dia: Exhibitions and Projects*, https://www.diaart.org/exhibition/exhibitions-projects/walter-de-maria-the-vertical-earth-kilometer-site. Accessed 12 Sept. 2023.

[387] "Walter De Maria's Vertical Earth Kilometer." *Atlas Obscura*, https://www.atlasobscura.com/places/vertical-earth-kilometer. Accessed 12 Sept. 2023.

[388] Brand. *TED2004* (14:43).

[389] Maybe even 12,000 years, if lucky.

[390] Kelly, Kevin. "The Clock of the Long Now." *The Long Now Foundation*, https://longnow.org/clock/. Accessed 24 Mar. 2024.

Note: Long Now site is changing; this quote attributed to Kelly can also be found here: Henig, Samantha. "Clocks and Countdowns." *The New Yorker*, 26 Jul. 2011, Accessed 24 Mar. 2024.

[391] Ibid.

in motion. It could well be idealized as a sublime artifact, constructed in the early years of the twenty-first century, one that blends past clockmaking ingenuity with futuristic components making it part time-capsule, part spacecraft. That it is hidden away, like a secret message, a secret heartbeat inside the mountain is part of its allure.

"The Clock experience should be profound but should be invisible," says the Long Now's Steward Brand.[392] It exists to be contemplated, meditated upon. Its sublimity resides in imagining our planet ten millennia from now with this clock, nestled deep within a mountain, ringing music from an ancestral civilization into the ears of future beings. Contemplation of this 'long now date' aims to bring both humanity and the mountain landscape forward into existence. As such, the clock accepts a mechanical time challenge bridging current anthropocentric despair into optimism. This is uplifting. "Focusing on the 'Long Now,'" writes David Karpf, "provides an escape from wrestling with the dark times we are living through."[393] The conundrum being, as Karpf underlines, that this escape "can be an invitation to ignore the troubles we face today."[394]

The Clock's ambition is to generate a discourse on long time horizons. It is, as Melissa Lane suggests, "an attempt to recalibrate our temporal imagination."[395] It is also, as Karpf counters, "an ethical balm of sorts. After all, 10,000 years from now, who will remember the climate disasters?"[396]

Will this temporal recalibration be successful and will the Clock itself survive? The Clock may well be a long-term monument, but so were the pyramids of Egypt and a myriad number of other time-conceptual constructs, once worshipped, soon plundered. It also cannot escape the vagaries of impact meteors, tectonic motion, nuclear war or vandalism.

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[392] Brand. "The Long Now." *TED2004*.

[393] Karpf, David. "The 10,000-Year Clock Is a Waste of Time." *Wired,* 29 Jan. 2020, https://www.wired.com/story/the-10000-year-clock-is-a-waste-of-time/. Accessed 3 Feb 2021.

[394] Ibid.

[395] Lane. *Eco-Republic*. p.149.

[396] Karpf. "The 10,000-Year Clock Is a Waste of Time."

Importantly, the Clock cannot perform routine and necessary maintenance. Although it is designed to calculate time independently, it does not 'display' time to save energy.[397] Thus to see the clock in action, the strength of three people is required to wind a mammoth wheel. This necessary human interaction to power up the dials is a fantastically optimistic feature that anticipates us being around to nurture the clock and fix the odd misaligned gear.

The Clock cannot protect itself from being misunderstood. Just as some of the best time capsules, like the Golden Record abord the Voyager spacecraft (with its symbolic display for aliens to know how to 'play' the record) and *Future Library* (with graphic instructions on operating a printing press to print the books), the Clock must consider whether future beings will be able to figure it out. Although the designer/engineers have conceived it to be cognised visually, they have, just in case, left a cache of 'bronze-age tools' to assist the future humanoid in its operation, a precaution both visionary and insulting depending on one's point of view.

The Clock cannot protect itself from being forgotten. After all, when you hide something, it ceases to exist if no one knows what it is and where it is hidden. The Clock invites the philosophical query: If a tree falls in a forest and on one is around to hear it, does it make a sound?

The Clock is not without its critics: Karpf, writing in *Wired*, calls the Clock "a waste of time." "It is art of, by, and for the ultrarich."[398] What perhaps started as a cool, techno-gimmick is morphing into a luxury timepiece, one for the connoisseur. A headline in Popular Mechanics scathingly asks, "Jeff Bezos is building a 10-000-year Clock inside a mountain; seems like he could just buy a watch on Amazon?"[399] The Clock of the Long Now could well be considered a vanity project for Silicon Valley billionaires. For Bezos, it is certainly a small side indulgence from his commercial empire building and spacefaring ambitions. Karpf wonders if it is "a lesser escape route (than Blue Origin), promising to

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[397] Kelly, Kevin. "The Clock in the Mountains." *The Technium*, 16 June, 2011, https://kk.org/thetechnium/the-clock-in-th/. Accessed Sept. 2, 2023.

[398] Karpf. "The 10,000-Year Clock Is a Waste of Time."

[399] Delbert, Caroline. "Jeff Bezos Is Building a 10,000-Year Clock Inside a Mountain." *Popular Mechanics*, 27 Apr. 2020, https://www.popularmechanics.com/science/a31156395/jeff-bezos-clock-long-now-mountain/. Accessed 4 Mar. 2021.

intellectually transport its visitors beyond the bounds of our terrestrial troubles."[400] In doing so, it takes focus away from present-day challenges: "the 10,000-Year Clock is designed to affix in our minds the impermanence of today's social ills. It's supposed to bend our perspectives so we think beyond trivial matters—like curing cancer and getting carbon out of the atmosphere and maybe, just maybe, building a society that is a little less cruel."[401]

Beyond the Long Now Clock's mindful thinking is a business opportunity. It will be monetized, tickets sold, guides hired, packaged as an 'experience of sublimity,' in the same way an IMAX film promises a mind-blowing experience of dynamic phenomena. People will pay to pass through the jade portal, climb the circular staircase, turn a wheel to watch the gears spin. This will, in the long run, end up as an exclusive experience open to the very few.

The true intention of both the Doomsday Clock and the Clock of the Long Now is to trigger emotion: The Doomsday, *anger* and *fear*, the Long Now, *awe* and *wonder*. Martha Nussbaum argues emotions are essential elements of human intelligence:[402] "Emotions are not just the fuel that powers the psychological mechanism of a reasoning creature, they are parts, highly complex and messy parts of this creature's reasoning itself."[403] Both clocks are symbolic but manipulative attempts to tap into this psychological mechanism, this essential intelligence, to engage hearts and minds to affect behaviour.

However, the result is forced sublimity. Not the real thing. The Doomsday Clock, with its secular evocation of the apocalyptic sublime, wants to be the fearful catalyst that alters humanity's destructive trajectory; the Long Now with its dynamic object of technical sublimity, seeks to imbue people with the awe and wonder of deep time, to be mindful of the future. However, instead of generating theses emotional responses both clocks fall flat. Perhaps, in part, because they are just thought exercises and offer no tangible solutions to present crises. The Doomsday's alarm bell, in its hand-wringing

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[400] Karpf. "The 10,000-Year Clock Is a Waste of Time."

[401] Ibid.

[402] Nussbaum, Martha. *Upheavals of Thought: The Intelligence of Emotions*. Cambridge University Press, 2003. p. 3.

[403] Ibid. p. 3.

negativity, is just exhausting. The Long Now's bells are too esoteric, reverberating inside a chasm.

4.8. Sacred Time

Sacred time is a kind of primordial 'before time.' It is an unknowable essence that puts it in the same category of strangeness of a 'Wholly Other,' a charismatic and numinous presence that creates a feeling in the beholder of being overpowered, of complete nothingness. Sacred time is non-linear; it has the essence of time from the beginning of the world, that does not flow but rather *envelopes*.

Consider sacred time with the analogy of water on earth: All water that exists on our planet is the very same water that has ever existed. Every drop cycling hydrologically is constant; it can change forms–liquid, solid, evaporate, but the molecules of hydrogen and oxygen remain the same, no more, no less. Water is as old as the Earth. Deep time pours out of our taps–deep time water. Like the iron oxides that colour our blood red, these molecules come from the birth of the universe. Sacred time takes the molecules that form our bodies back to their own elemental births as matter.

Sacred time imbues and infuses. Linda Graber, in her study *Wilderness as Sacred Space*, describes how sacred space produces its magical effect.[404] She proposes the analogy of walking through a uranium mine. You can't see or feel the radioactivity; it is invisible yet everywhere, saturating the tunnels in the mine. Crackles of the Geiger counter prove what you already believe, and, in this belief of uranium's power, "simultaneously sought and feared," you wear protecting gear.[405] "Like radioactivity," Graber writes, "sacred power is morally neutral, burning those who approach too closely."[406] Sacred time provokes a similar awareness and can feel just as powerful (or dangerous).

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[404] Graber, Linda. *Wilderness as Sacred Space*. Univ. of Minnesota. The Association of American Geographers, 1976. p. 2.

[405] Ibid. p. 2

[406] Ibid. p. 2.

Sacred time animates the origin myths and folklores of every culture. Celestial and spiritual observances and rituals try to connect corporeal life to a sacred power beyond. Whether this manifests in such paleolithic monoliths like Stonehenge, attuned to the sacred beams of light, or in paper calendars thumb tacked on the back of bathroom doors, an acknowledgement of celestial events is an attempt to tap into the flow of sacred time.

Calendars are sacred documents as their purpose is to measure sacred time. Every faith has one. The Islamic calendar follows the moon; the Christian calendar takes cues from the sun. Religious practices that incorporate celestial observance are designed to bring the believer closer to spiritual goals. Inserting sacred ritual into prosaic everyday time, is to venerate the past, sometimes the deep past. Of course, there are always prayers for the future.

Sacred time is natural time. And we can see it melt out as escaping molecules in glaciers, in the cold travels of starlight. Sacred time comes from a great distance. 'Godspeed' we say–go as fast as light.

4.9. Geologic Deep Time

When we look to language to express time's unassailable essence, one metaphor stands out: time is *liquid*; it *flows*. "Time thickens, pools, flows, rushes, slows," writes Robert Macfarlane, traversing a cave tunnel."[407] "Water represents time," emphasizes Jay Griffiths, "Rivers are metaphors for time all over the world."[408] "Time is the stream I go a-fishing in," says Thoreau at Walden.[409]

We accept that the flow of water is inherently unpredictable: too much rain, a frozen lake, or a beaver dam create changes, but the flow of time is abstract. In his Einsteinian dreamscape, Alan Lightman writes, "Time is like the flow of water,

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[407] Macfarlane, David. *Underland: A Deep Time Journe*y. W. W. Norton. 2019. p. 4.

[408] Griffiths. *Wild*. p. 288.

[409] Thoreau, Henry David. *Walden*. 1854. "The Project Gutenberg eBook of Walden." *Gutenberg*, Jan.1995, https://www.gutenberg.org/files/205/205-h/205-h.htm. Accessed 7 May 2024.

occasionally displaced by a bit of debris, a passing breeze… some cosmic disturbance will cause a rivulet of time to turn away from the mainstream, to make a connection backstream. When this happens, birds, soil, people caught in the branching tributary find themselves suddenly carried to the past."[410]

The river of time is also a cosmic journey, spilling across the night sky like the Milky Way, a river of stars travelling as fast as light, but sometimes bending, warping, expanding exploding along the way. "To the cosmologist, the past is not some unreachable last realm," writes Katie Mack, it is an actual place, an observable region…"[411] Every twinkle of starlight, every progression of a planet has already happened. Light travels fast but it is not instantaneous.

4.9.1. Rock Flows

Figure 9. **Gneiss, metamorphic rock.**
Photo: S. Lockwood, 2004, Georgian Bay, Ontario.

[410] Lightman. *Einstein's Dreams*. p. 14

[411] Mack, Katie. *The End of Everything*. New York, Scribner, 2020. p. 15.

The hills are shadows, and they flow
From form to form, and nothing stands;
They melt like mist, the solid lands,
Like clouds they shape themselves and go.

–Alfred Lord Tennyson, In Memorium, CXXIII[412]

If one finds a rock boring, it's not the rock's fault.
~Zen proverb[413]

Deep time by its very nature is shot through and through with sublimity. Geological deep time is revealed in mountains, sea basins, fault lines, and the tectonic plates on the sea bed that pull and push the continents around.

The concept of deep time is relatively new, as is the discipline of geology, an offshoot of 18th century Natural Philosophy. Although geologist John McPhee, in *Basin and Range,* 1981, is credited with first using the term 'deep time,' the theory belongs to James Hutton (1726-1797). From an analysis of an unusual rocky outcrop in his native Scotland, Hutton reasoned that mere erosion and sediment accumulation could not have caused an angular juxtaposition of red sandstone and greywacke at Siccar Point; *something* had to thrust the rock layers into place.[414] He deduced that only a colossal lifting in the Earth's crust itself could have so folded the rocks, creating such a pattern, and that this process required an unthinkable timescale in the billions of years. "This

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[412] Tennyson, Alfred Lord. "In Memorium, CXXIII." *The Poetry Archive,* https://poetryarchive.org/poem/memoriam-extracts/. Accessed 25 Mar 2024.

[413] Talasek, J.D. "Imagining the Unimaginable: Deep Time through the Lens of Art." *Imagining Deep Time*, exhibition calalogue, J.D. Talasek, curator. National Academy of Sciences. 2015, https://www.academia.edu/99028574/Imagining_the_Unimaginable_Deep_Time_Through_the_Lens_of_Art. Accessed 5 Mar 2021.

[414] Keith Montgomery argues that Hutton had already sketched out his theories of geological cycle relying of French studies prior to finding Siccar Point. Rather, Hutton went looking for field examples with which to test his theory in his native Scotland. Thus, to say it all began with Siccar Point is a misconception.

Montgomery, Keith. 'Siccar Point and Teaching the History of Geology' *Journal of Geoscience Education*, Vol. 5 No. 5, November 2003, pp 500-505. https://www.researchgate.net/publication/290585402_Siccar_Point_and_Teaching_the_History_of_Geology. Accessed. 4 Jan. 2021.

idea," writes Paul Zweig, "was Hutton's Rosetta Stone, his geological code breaker."[415] Although his reasoning put him at odds with such earth historians as Bishop Ussher–by whose calculation the Universe transpired in the evening of October 22nd, 4004 BCE– Hutton's theory quickly gained traction as did the idea of an impossibly ancient Earth.[416] "The mind seems to grow giddy by looking so far back into the abyss of time,"[417] recounted the scientist James Playfair, who accompanied Hutton on many of his time hunts.[418]

Hutton called these folded time-rich rocks 'unconformities;' the strata not conforming to one age or method of materialization. This in turn led him to propose the idea of a 'dynamic earth,' regulated by a geological cycle, one operating by the same 'natural laws' since the very beginning of the earth's formation. These rocks, now hard, and cold, were not happenstance; they had once been in play and would be again. Wind and water erode the highest peaks creating sediment; this sediment is carried by rivers and washes into the ocean; the sediment accumulates and its weight heats the rocks below which buckle and crack; igneous magmas escape to build up new mountain ranges.

Hutton went on to describe the earth as a "beautiful machine,"[419] one that operates on a cycle, of "composition, dissolution, and restoration."[420] Although the Earth is constantly deteriorating down topographically, through sedimentation and explosive magmas, it regenerates.[421] Hutton's 'machine' is unimaginably powerful; it can move whole continents. As John McPhee would write a few centuries later, "it seems an act of

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[415] Zweig, Paul. 'Rhapsodist of Deep Time.' *The New York Times*, 17 May 1981, https://www.nytimes.com/1981/05/17/books/rhapsodist-of-deep-time.html. Accessed 21 Apr. 2021.

[416] 1650 calculation. James Ussher, Bishop, Church of Ireland, 1582-1656. Ussher used a literal reading of the Old Testament. He was precise in his calculations–with it starting in the evening of 22 October, 4004 BCE.

[417] Farrier, David and Aeon. "How the Concept of Deep Time Is Changing." *The Atlantic*, 31 Oct. 2016, https://www.theatlantic.com/science/archive/2016/10/aeon-deep-time/505922/. Accessed 7 Apr. 2021.

[418] Playfair provided the illustrations to Hutton's *Theory of the Earth*.

[419] Hutton, James. *Theory of the Earth or an Investigation of the Laws Observable in the Composition, Dissolution, and Restoration of Land upon the Globe*. Transactions of the Royal Society of Edinburgh,1788. pp. 209-215.

[420] From Hutton's title: *Theory of the Earth …*

[421] Gould. paraphrase pp. 65-66.

almost pure hubris to assert that some landmark of our world is fixed." Any locational coordinates are "a temporary description, at any rate, as if for a boat on the sea."[422]

Gould furthers this idea, "Continents and oceans change places in a slow choreography that can never end, or even age. Deep time becomes a simple deduction from the operation of the world machine."[423] The world machine, within this ongoing time dance, is time's artistic creation, its dynamic sublime in action. The dance is perpetual. Hence, Hutton's deep time conclusion, "We find no vestige of a beginning, no prospect of an end."[424]

Hutton's 'beautiful machine,' is a precursor to James Lovelock's *Gaia*, a self-regulating earth. It compliments Alexander von Humboldt's exposition of the hydrological cycle. It is crucial to Charles Darwin whose theory of evolution, as Farrier points out, "became imaginable thanks to the window Hutton pried open onto these terrifying new vistas."[425] It is only through the recognition of a vast timescale could Darwin formulate the processes for biological evolution.

Charles Lyell (1797–1875) through his own field work refined Hutton's inquiry. It is Lyell who establishes the discipline of geology; his *Principles of Geology*, 1830, solidifies Hutton's theory of Uniformitarianism–the Earth is continually changing in a cyclical nature, the 'present' being key to the 'past'. [426] Lyell finally extinguished Catastrophism–the theory that Earth's features were the result of catastrophic or even supernatural events, like the Great Flood. It led to the demise and even ridicule of Thomas Burnet's *Sacred Theory*.

It is telling that Darwin included both Lyell and Humboldt in his library abord the HMS Beagle. While ashore in Chile, Darwin had a firsthand encounter of the Earth's volatility. "A bad earthquake," he observed, "at once destroys our oldest associations:

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[422] McPhee, John. "Annals of the Former World." *New York Times Archives*, 1998, (Chapter 1, *Basin and Range*). https://archive.nytimes.com/www.nytimes.com/books/first/m/mcphee-annals.html. Accessed 25 Mar. 2024.

[423] Gould. p. 66.

[424] This sentence is the concluding sentence of Hutton's work. Online here:
Hutton, James. *"Theory of the Earth." Vancouver Island University*, Translated and prepared by Ian Johnston, 1998, https://web.viu.ca/johnstoi/essays/hutton.htm. Accessed 20 Feb. 2021.

[425] Farrier, "How the Concept of Deep Time…"

[426] 'The present is the key to the past' is the motto of uniformitarian science.

the earth, the very emblem of solidity, has moved beneath our feet like a thin crust over a fluid."[427] "Daily it is forced home on the mind of the geologist that nothing, not even the wind that blows, is so unstable as the level of the crust of this earth."[428] Darwin identifies the cycle of deep-time change: "Where on the face of the earth can we find a spot on which close investigation will not discover signs of that endless cycle of change, to which this earth has been, is, and will be subjected?"[429]

Hutton and Lyell's geological discoveries resonated alongside a new appreciation for a natural, powerful world. Justifiably, the contemplation of vast timescales contributed to Romanticism and the pursuit of the sublime. Farrier gives, by way of example, Percy Bysshe Shelley "smitten by the implacable power of Mont Blanc."[430] Shelley is overcome by the transcendent, supernatural aura of the mountain that will endure, while "all things that move and breathe with toil, and sound/ Are born and die; revolve, subside, and swell."[431] Humankind will subside and swell, but the impassive mountain remains, for "Power dwells apart in its tranquility."[432] "The affective register of deep time," Farrer explains, "was one of terror and wonder fashioned to fit a vision of the sublime that transcends and yet somehow affirmed humanity."[433]

4.9.2. Thinking like a Rock

It is understandable to marvel at the young mountain ranges, the European Alps, the Canadian Rockies, the Himalayan peaks with the coldest sharpest points, most dizzying heights. These are undeniable Thin Places, majestic and transformative. However, we should be just as moved as by the worn, thin hills of older rock.

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[427] Darwin, *Voyage* entry, Feb 20, 1835.
McPhee, John. "Darwin and the Chilean Earthquake." *The New Yorker*, 2 Mar. 2010, https://www.newyorker.com/books/double-take/darwin-and-the-chilean-earthquake. Accessed 20 Feb, 2021.

[428] Ibid.

[429] Ibid.

[430] Farrier. "How the Concept of Deep Time…"

[431] Farrier's example.
Shelley, Percy Bysshe. "Mont Blanc." *Poems of Shelley*. Oxford, Oxford University Press. 1924. p. 353, line 94-95.

[432] Shelley. p. 353, line 96.

[433] Farrier. "How the Concept of Deep Time…"

The great plates of granite of the Canadian shield, scraped clean by retreating glaciers, smooth, softened, and bare are the Earth's skin, soaking warm in the summer, and deeply iced a few months later. The oldest dated rocks of the Nuvvuagittuq Greenstone Belt are edgeless waves of super-fired sedimentary and volcanic minerals.[434] This "mantle-derived suite of rocks," is a rare remnant of the Earth's newly formed crust, 4.2 billion years in age.[435] Unlike most areas of the planet, churned over and crushed by tectonic activity, these have quietly lain in place along the northeastern shores of Hudson Bay waiting to give to the geologist secrets of the world's birthing pains.

Unconformities are everywhere, often found on either side of a highway blasted though a rocky landscape, a major distraction to geologists. "Geologists on the whole are inconsistent drivers," explains John McPhee, "When a roadcut presents itself, they tend to lurch and weave. To them, the roadcut is a portal, a fragment of a regional story, a proscenium arch that leads their imaginations into the earth and through the surrounding terrane."[436] Marcia Bjornerud echoes this, "For geologists, every outcrop is a portal to an earlier world."[437]

I have experienced the power of old rock in the dynamic rock blasts that bracket the highway, travelling north from Toronto to a holiday camping ground. I have wandered the bent gneiss bands along the shores of Georgian Bay, feldspar, quartz and mica ribbons of deep time. This is Group of Seven country. Here, these painters came here to

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[434] Currently, oldest in world; Nuvvuagittuq rocks are metamorphized mafic volcanic, silicate mineral or igneous rock that is rich in magnesium and iron.

"[A Greenstone] belt consists of a sequence of volcanic and sedimentary rocks which have been heated up to around 400 degrees Celsius at some point after they formed, prompting the growth of new metamorphic minerals such as chlorite (which provides the 'green' in 'greenstone'), and which are folded in and around a number of large granite intrusions."

Rowan, Chris. "What is a greenstone belt?" *Highly Allochthonous*, 12 Jul 2007, https://all-geo.org/highlyallochthonous/2007/07/what-is-a-greenstone-belt/. Accessed 25 Mar. 2024.

[435] O'Neil, Jonathan et al., "The Geology of the 3.8 Ga Nuvvuagittuq (Porpoise Cove) Greenstone Belt, Northeastern Superior Province, Canada." *Developments in Precambrian Geology*: *Earth's Oldest Rocks*, Vol 15, 2007, pp. 219-250. https://www.sciencedirect.com/science/article/abs/pii/S0166263507150349. Accessed 25 Mar. 2024.

[436] McPhee. "Annals of the Former World."

[437] Bjornerud. p. 163.

paint the rocks. Some of the most archival and emblematic images of Canadian identity are of unconformities.[438]

The Georgian Bay gneiss is deep time made palpable–you can chip off a chunk and hold it in your hand. It is not just the 'age' of these materials that is profoundly affective, but the agency imbued within them. In the undulating bands of gneiss we touch something hard and inert but recognize it was once full of energy, as if it had a life force within. "Rocks are not nouns but verbs," Bjornerud asserts, for they give "visible evidence of processes."[439] Herein lies geologic sublimity–in the rock, still rough and sharp from the tools that blew it apart. Now examined in the palm of our hands, the metamorphic ribbons, the mystery of living rock.

Photographer Terry Falke fills his portfolio with deep time landscapes of the American Southwest. He describes a photograph he has taken of three cyclists, stopped by the side of a highway to examine a roadcut in Utah; the cyclists have dismounted and one points above to an aspect of a great vertical slab face of vivid turquoise and pink colour. [440] There is nothing in human experience to understand this. "A person would have to take themselves out of the human context to begin to think in terms of geologic time," says Falke. "They would have to think like a rock."[441]

Liquid rock is a "flow" that the geologist has "put in motion," writes Jeffrey Kosky, surveying the New Mexican desert's concurrence of red sandstone and black lava."[442] Yet, in considering these solid rocks as flowing entities, he finds, "It is through a force alien to their objective presence as stable and secure identities."[443]

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[438] The 'Group of Seven' are a collection of landscape painters who "who memorialized the raw and rugged beauty of Canada." The Government of Ontario official travel site suggests Group of Seven 'Discovery Routes.'
"Group of Seven." *Destination Ontario*, https://www.destinationontario.com/en-ca/things-to-do/group-of-seven. Accessed 25 Mar. 2024.

[439] Bjornerud. p. 8.

[440] Falke, Terry. "Cyclists Inspecting Ancient Petroglyphs, Utah, 1998." Digital chromogenic print 30 x 40 inches. In *Imagining Deep Time*, catalogue.

[441] Talasek, J.D. "Imagining the Unimaginable…lens of art."

[442] Kosky, Jeffrey. *Arts of Wonder*. Chicago, University of Chicago Press, 2016. p. 39

[443] Ibid. p. 39.

Kosky draws attention to the experience of French philosopher Michel Serres viewing the Grand Canyon and the great chasm eroded by the Colorado River. “The water flows,” Serres writes, “but the cliff flows as well… just like water and human history.”[444] Here, Serres is thinking like a rock, giving the landscape agency:

> “If the mountain could perceive it, it would see things be born and disappear downstream from it and would believe, once again, itself to be leaning back–upstream, if I may and while it folds, rises, erodes and disappears–against a space in which the sun changes as little as the gardener before his roses.”[445]

Geological time drenches the landscape in a powerful evocation of sublimity. It is not just the eroded metamorphized particles of an earlier world that hold this but also the stardust molecules that harken back to the formation of the planet itself, when it was just a coalescing spinning form slowly turning into the molten ball that would become home.

Deep time rocks crack and spit with waves of planetary history. Rocks are a reminder of our mystifying deep space origin. “… I can no longer contemplate sun, stars and landscapes,” laments Serres, “without their time carrying our eyes and body away with its tremendous flood.”[446]

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[444] Serres, Michel. *The Incandescent.* London, Bloomsbury Academic, 2018. p. 4. Published online: 21 June 2018, DOI 10.5040/9781474297448.

[445] Ibid. p. 4.

[446] Ibid p. 5.

Chapter 5.

Time Capsules

"Je jette cette bouteille à la mer au milieu de l'Atlantique.
Nous devons arriver à New York dans quelques jours.
Si quelqu'un la trouve, prévenez la famille Lefebvre à Liévin."

~Mathilde Lefebvre, 13 years old,
April 13, 1912, RMS *Titanic*

5.1. Messages in bottles

What we place into the stream of time and what we leave behind for the future to find

A time capsule is both a gift and a contract between the sender and the finder. It is reciprocal. The sender, places the capsule purposefully into the stream of time to journey into the future. The finder intercepts this message from the past and in feeling all the emotions of discovery– wonder, curiosity, astonishment–fulfils the contract. The sender has imagined the finder many times, wondering what they will feel, whether the capsule will provoke a reaction.

The classic time capsule trope is the message-in-a-bottle tossed into waves: shipwrecked sailors sending out an S.O.S. The bottle begs the future for a rescue.

Thirteen-year-old Mathilde Lefebvre cast a bottle into the ocean on April 13th, 1912, but her message-in-a-bottle was not an S.O.S, rather a simple 'Hello, I am here.'[447] It was the sea-faring version of human greeting that traces all the way back to

[447] Rioux, Marie-Christine et Shanelle Guérin, "L'UQAR analyse une bouteille possiblement jetée à la mer à partir du Titanic." Radio Canada, 7 May 2021, https://ici.radio-canada.ca/nouvelle/1790949/titanic-lettre-bouteille-mer-uqar-france-retrouvee?depuisRecherche=true. Accessed 14 May 2021.

Mathilde's bottle and letter were radiocarbon dated at the University of Québec at Rimouski and found to be compatible with time period 1912.

the hand-print-on-a-cave-wall, a prehistoric silhouette of welcome.[448] “I’m arriving in New York in a few days,” Mathilde wrote, “If you find this please tell my family in Liévin.”

Forward now 105 years to a family strolling on the beach at the Bay of Fundy. They find Mathilde’s bottle in the sand: a fragile glass chamber, a dissolvable slip of paper inside, held in the ocean’s icy mouth for over a hundred years.[449]

For us, future beings, Mathilde’s message is imbued with pathos as she would perish two days later when RMS *Titanic* struck an iceberg. But she did not know it then. We can picture her standing on the deck, her arms resting against the ship’s cold rails, the Atlantic foaming past as she watches her bottle drift and dive. We can imagine her imagining us.

Mathilde’s time capsule pulls dispirit elements into one object: a young girl, a message, a ship that sank; it gathers them together into one narrative. The mundane glass bottle now has significance. Mathilde was part of an adventure, a special ship, a historic voyage. Now she will be remembered as the author of a message that is being widely read, shared, and honoured. She is no longer just a name on the ship’s manifest. For although she perished, her time capsule is a sublime survivor.

5.2. Survival narratives

A time capsule is, by its very essence, a survivor, whether intentional or not. The time capsules we find and open today are physical, tangible pieces of the past that we can slide into place within the historical record. Cosmologist Carl Sagan, a time capsule architect himself, identifies Esarhaddon, King of Assyria, seventh-century B.C., as one of the first people to consciously create an object to be found in the future. Esarhaddon left monuments of “bronze, lapis lazuli, alabaster … and white limestone,” along with cuneiform “inscriptions of baked clay,” buried within the foundations of buildings

[448] Referencing Margaret Atwood. See Chapter 6, 6.3.3 Future Library, re hand-print-on-the-cave-wall analogy.

[449] Bottle found by Nacera Bellila, El Hadi Cherfouh and their kids, Hopewell Rocks, Bay of Fundy, New Brunswick, 2017.

throughout his Empire.[450] These messages were personal testaments to his exploits and glories lest his legacy be forgotten. “For those who have done something they consider worthwhile,” Sagan writes, “communication to the future is an almost irresistible temptation, and it has been attempted in virtually every human culture.”[451]

Time capsules are often made to inaugurate something special, to deliberately cement a memory, or to add symbolically a footnote to ongoing civilization. Take the lead-covered box filled with coins and the names and photographs of the workmen who participated in the 1989 restoration of the south side of Westminster Abbey in London, England. The box, embedded into the stonework, will perhaps only be found and opened if the cathedral crumbles to the ground. But these workmen have added their voice to the continuum of a building that has been in progress since the eleventh century.[452]

No one makes a time capsule that they never want to be found. Those capsules that involve a group of people, joining together, are celebratory investments. Through the social structures of communal adoption, the capsule maintains memory in the participating consciousness, and care is given to its continuity. As such, some capsules come with instructions; some are found with a map or place coordinates, or a pirate ‘x’ for treasure. For a time capsule, the exercise of creation must assist in its retrieval.

Sometimes a time capsule’s retrieval is a very personal and solitary exercise between an individual and their future self. The personal time capsule can be a curated collection of specially chosen objects selected for time travel: photos, postcards, love letters, a newspaper clipping, an essay, a family tree, a toy. Time capsules made in childhood are often hidden safe within the intimacy of a home environment, carefully interred in a tin box in the backyard or left in an attic shoebox. The capsule bides its time patiently as it travels forward with its memorial intent. Mathilde’s bottle belongs to this

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[450] Sagan, Carl. ‘For Future Times and Beings.’ In Carl Sagan, F.D. Drake, Ann Druyan, Timothy Ferris, Jon Lomberg, Linda Salzman Sagan. *Murmurs of Earth*. New York, Random House, 1978. Title page.

[451] Sagan, p. 5

[452] Westminster Abbey, first iteration as Romanesque church completed in 1060, consecrated in 1065.
“Architecture.” *Westmister Abbey,* https://www.westminster-abbey.org/about-the-abbey/history/architecture. Accessed 9 Sept, 2021.

childhood shoebox ritual meant to be recovered by a future adult self, or in Mathilde's case her family in Liévin.

Sometimes capsules are a solitary and personal exercise as a means to cope with a particularly meaningful life episode by hiding away an assemblage of hope, of unrequited longing. Think of the memorialist in Joni Mitchell's *Tin Angel*: "Letters from across the seas/ Roses dipped in sealing wax/Valentines and maple leaves/ Tucked into a paperback/ Guess I'll throw them all away…" she sings when her assemblage is no longer needed.[453] Christina Lalanne deduced this same emotion in the pages of a 100-year-old diary that fell out of the basement ceiling of her historic San Francisco home during a renovation. It was a diary started in 1900, shared and written in by two people chronicling their love for each other and their sadness of being unable through distance and circumstance to be together. Lalanne became a detective to piece together a love story between the two teenagers, Hans and Anna, that started on a farm in Denmark and lead to their separate journeys to America and unhappy marriages to other people. It is unknown whether they ever were together although Lalanne uncovered details that they lived within three blocks of one another at the time of their deaths. Hans in his last entry writes, "Anna, Anna why is everything against me… Everything that I have is your letters and the memory of you. … Hope disappears. I hope it will rise again."[454] By restoring the shared diary of Hans and Anna, Lalanne gives voice to Hans's yearning for hope and also her own desires. "I am desperate to communicate with the past," she writes as she sits in Hans's study in the house he built, "but so much of it is elusive, scattered, unknowable." She reflects on the time capsule Hans left hidden: "I found it, heard it, and told it the best way I know how."[455]

The impact of the diary of Hans and Anna, that of a sad love story and very human experience of leaving home and falling in love tugs poignantly at our heartstrings. But consider the scope of impact of the little red and white-checkered diary found hidden in the secret annex of a house in Amsterdam. From June 1942 to August 1944, teenager Anne Frank wrote of her life within the claustrophobic confines of a few rooms, windows

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[453] Mitchell, Joni. "Tin Angel." *Clouds*. Reprise Records. May 1, 1969.

[454] Lalanne, Christina. "Castles in the Sky." *The Atavist Magazine*, No. 109, November 2020, https://magazine.atavist.com/castles-in-the-sky-san-francisco-denmark-diary-love-mystery/. Accessed 9 Sept, 2021.

[455] Ibid.

all blackened, as she with her family and four others sheltered from the persecution of Jews in German-occupied Netherlands. The diary ends when their hiding place is discovered by the Gestapo and they are sent to the death camps. Anne Frank's diary is one of the world's most famous books, translated in over 70 languages and selling 30 million copies.[456] This time capsule she first gave to herself, as a friend. Anne would often reread her earlier entries and make notes to her past self, even as she projected her aspirations for her future–she hoped her diary would be published. Her hope was granted by her father Otto, the only survivor of the family.[457] Anne Frank's diary, as a time capsule, is considered a defining document of the Holocaust, and Otto Frank, in an effort to resist any corruption of his daughter's memory, restricted efforts to interpret her words even in tribute. Yet, Anne Frank's diary has become a time capsule that is kept replenished through our emotional engagement with her words. As the museum, Anne Frank House, in Amsterdam declares, "Anne belongs to all of us."[458] Poems, novels, films, plays, works of visual art, music and dance all contribute to Anne's capsule; people want to get close to her and touch her life. Memorial tributes flourish–in the form of gardens, parks, schools, and many sites of public remembrance all over the world–as notes the museum.[459] Anne's diary travels through time with a host of helpers now. Her story has even been fictionalized, with "alternative outcomes." Her words have been incorporated into "sacred ritual" like the celebration of Passover seder.[460] The Anne Frank House observes how many who, "inspired by encounters with the intimacy and artistry of Anne's writing, forge their own creative attachments to her," and that "Growing in number and variety over the years, these many different forms of connecting with Anne constitute a noteworthy phenomenon in its own right."[461] Anne's diary is still in motion; it is time travelling. Despite the trauma of creation, the words of a spirited and

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[456] Van Es, Bart. "Anne Frank: the real story of the girl behind the diary." *The Guardian,* 25 May 2019, https://www.theguardian.com/books/2019/may/25/anne-frank-full-story-bart-van-es Accessed 7 Sept. 2021.

[457] "The Diary." *Anne Frank House*. https://www.annefrank.org/en/anne-frank/diary/. Accessed 11 Sept. 2021.

[458] Ibid.

[459] Ibid.

[460] Ibid.

[461] Ibid.

thoughtful young girl are imbued with an optimistic futurity. Her diary has become a holy book, full of wonder, emanating sublimity.

5.3. Optimistic futurity

Most time capsules are imbued with optimistic futurity. Carl Sagan recalls the capsule created to commemorate the World's Fair in New York of 1939, as a gesture of "confidence." He remembers, "there was something graceful and very human in the gesture, hands across the centuries, an embrace of our descendants and our posterity."[462]

This same optimism, this gesture of confidence can be found in the contents of *Time Capsule 2020*, a virtual encapsulation of a year spent living through a global pandemic.[463] Created by BBC Future and the School of International Futures, the capsule team suggest 37 objects for inclusion. Many express resilience, creativity and hope: take how the "obvious" choice of a face mask was instead represented by "needle and thread," for as team member Pupul Bisht explains, "in 2020 the humble needle and thread emerged as two of the mightiest tools against the deadly pandemic" as people tapped into resourcefulness to sew personal protective coverings.[464] The BBC's Richard Fisher nominated "a sealed vial of clean city air" to symbolize the dramatic drop in air pollution levels in urban environments due to lockdowns; Will Park put forth a *kintsugi*-repaired bowl–*kintsugi* being a restoration art in which broken pottery pieces are lovingly reassembled with polished lacquer joining the seams. Bishat also submitted "a flaming red bombax flower," for as she recounted, the bombax blooming outside her New Delhi

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[462] Sagan. p. 3.

[463] Fisher, Richard "Time capsule 2020: The 37 objects that defined the year." *BBC Future*, 25 Dec. 2020, https://www.bbc.com/future/article/20201217-time-capsule-2020-the-37-objects-that-defined-the-year. Accessed 27 Apr. 2021.

"BBC Future decided to assemble a virtual time capsule – a list of objects that matter, and that tomorrow's generations should know about, 100 years from now. Collaborating with the School of International Futures we asked their network and global next-generation fellows to nominate a series of objects."

Also see: *School of International Futures*. https://soif.org.uk. Accessed 27 Apr. 2021.
and *Next Generation Foresight Practitioners*. https://nextgenforesight.org. Accessed 7 May 2024.

[464] Ibid.

window became a symbol of seasonal constancy; it brought a “sense of normalcy” to her life in lockdown. She also chose it because “flowers bloom in dystopias too.”[465]

5.4. Crypto capsules

In the summer of 2018 the crew and passengers of the Russian nuclear-powered icebreaker *50 Years of Victory* left a time capsule in the icy slurry at the North Pole. This engraved metal cylinder contained photos, a map, wine corks, postcards; in Rory Carroll’s words “ephemera from the early 21st century.”[466] In a mere two years the cylinder travelled 2,300 miles from the North Pole to Donegal, Ireland. When it washed ashore, the capsule was at first thought to be a bomb and then, because of the engraving, to be “somebody’s ashes.”[467] Although everyone aboard *50 Years of Victory* knew the polar ice was melting, they expected the capsule’s time journey to last at least 50 years. As Carroll writes, “the future came pretty swiftly.”[468]

If the future is really coming so swiftly, we must think of adaptations for time capsules. In an age of climate crisis, where ice melts quickly and currents of movement in the land, ocean, and air are shifting, the journey of a physical object can be in unexpected directions or it can be prevented from travelling at all. One adaptation is the ‘crypto’ time capsule, a digital expression that lives in ‘the cloud.’ This is being explored with earnestness. Can digital technology devise a capsule that can survive a decent number of human generations? Can it leave a retrievable legacy for future descendants? This is predicated on the continuation, development, and security of the technologies we use to store and send information in digital formats. To the shoebox of mementoes, add huge encrypted files full of testimony.

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[465] Ibid.

[466] Carroll, Rory. “Arctic time capsule from 2018 washes up in Ireland as polar ice melts.” *The Guardian*, 5 Nov. 2020, https://www.theguardian.com/world/2020/nov/05/arctic-time-capsule-from-2018-washes-up-in-ireland-as-polar-ice-melts. Accessed 9 Nov. 2020.

[467] Ibid.

[468] Ibid.

The media production company *Not Forgotten*, is advertised as a "a small but mighty tech startup obsessed with saving stories."[469] You can purchase a *Not-Forgotten Time Capsule*, and 'bury it' in their *Digital Presentation Trust Vault* where it will be "cataloged, mapped and archived for centuries." The cost of preserving a 'digital personal archive' depends on the time duration selected. A basic 50-year time capsule costs US $69.00, while the 300-year-plus *Virtual Videographer Time Traveller* goes for US $399.[470] These archives contain video messages (not unlike home movies) full of thoughts, feelings, reminiscences of personal histories and life anecdotes. These are not static sepia photos but animations of living people eager to preserve their voice, laugh and gestures, as they talk to their descendants about their time on earth. This practice is perhaps aimed at alleviating the fear of death and existential nothingness. It could well be just a scam if it fails to deliver, but then, what is the price of 'hope?' It taps into a 'legacy need' to save and send a "priceless family treasure" to make meaning of one's life.[471]

The website *Defuse* offers a variation on the crypto time capsule–with a caveat. Users can upload their message to the future which is then saved and locked away using "elliptic-curve cryptography," however, these messages once 'locked' are not easily retrievable.[472] *Defuse* estimates that an ordinary, 'classical' type of computer (binary; bits and bytes) will take millions of years to recover these messages, so this is not a message-in-a-bottle to a near time shore. *Defuse*'s encryption requires future technological development–that of the quantum computer (data in *qubits*). Explain the developers, "This gives us a unique opportunity to save messages in a format that won't be possible to read until somebody manages to build a quantum computer."[473] Although quantum computers are in development now; they are atmospherically sensitive machines–just a few air molecules can cause 'quantum decoherence.'[474] So, during the

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[469] "Not Forgotten." *LinkedIn*, https://www.linkedin.com/company/notforgotten. Accessed 23 May 2021.

[470] Ibid.

[471] Ibid.

[472] "Time Capsule: Send a Message to the Future." *Defuse*, https://defuse.ca/quantum-computer-time-capsule.htm. Accessed 23 June 2021.

[473] Ibid.

[474] Lu, Donna. "What is a quantum computer?" *New Scientist*, https://www.newscientist.com/question/what-is-a-quantum-computer/. Accessed 3 Sept. 2021.

wait for the personal quantum desktop computer to progress, the site asks message senders to download the archive as a kind of back-up:

> "It might take a long time for humanity to invent the technology we need to read these messages, and this website will probably go down before then. So, after you've added your message, please consider downloading the entire archive so that a future historian might one day find your copy of it."[475]

Crypto capsules may well endure in the short time and perhaps caretaker AI will extend their reach, but leaving a digital footprint in the stream of deep time may well prove impossible. It is hard to imagine that these coded capsules as legible or legitimized in the deep future. They are not dinosaur footprints preserved in the Alberta Badlands' mud but buried in mega warehouses on servers with voracious energy appetites. The servers are not self-perpetuating; they are machines that all require service. What happens when they cost more to maintain than to save. "The stability of the data is as good as the solvency of the companies that store the data," advises Harish Bhaskaran, a professor of applied nanomaterials at Oxford University.[476] The vagaries of 'cloud storage,' with its evocation of mysterious wisps of water and dust, seems an especially vulnerable medium to entrust with memory. David Farrier posits that the heat signature of 'the cloud' will be all that remains: "Traces of this ephemeral data will persist into deep time of the future, as rising concentrations of carbon warms the atmosphere."[477]

There is the conundrum that if 'clouds' of data do persist through layers of time that they will form a particularly confusing puzzle. Future beings may reconstitute the data in such a way as to bear little resemblance to its original intent. They may concoct

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[475] "Time Capsule… Future." *Defuse*.

[476] Prof. Harish Bhaskaran–Led the research on world's first light world's first entirely light-based memory chip to store data permanently; Photonic computing.
"Light-Based Memory Chip Is the First Ever to Store Data Permanently." *University of Oxford*, 22 Sept. 2015. https://www.ox.ac.uk/news/2015-09-22-light-based-memory-chip-first-ever-store-data-permanently. Accessed 27 Apr. 2021.

Quoted in Jackson, Lauren. "News That Can Last a Million Years." *New York Times*, Published 31 Dec. 2020; updated 5 Jan. 2021, https://www.nytimes.com/2020/12/31/insider/time-capsule-coronavirus.html. Accessed Apr. 28, 2021.

[477] Farrier, David and Aeon. "How the Concept of Deep Time Is Changing." *The Atlantic*, 31 Oct. 2016, https://www.theatlantic.com/science/archive/2016/10/aeon-deep-time/505922/. Accessed 7 Apr. 2021.

an ‘altered hierarchy’ of information. This is a consideration of Chris Baraniuk, who asks, “If digital media survive long enough to be studied by future historians …how will that influence their judgements about us as people?”[478] He points to the exponentially growing archive of films, videos, photographs, music files as well as social media posts, noting that, “never before in human history have we documented so excessively the minutiae of living.”[479] So much of this minutia is self-referential. Chopped up into tweets and ‘selfies’ the future cloud is dusted with our faces and obsessive opinions. Says Baranuik, “The fact that people care so much about this might bemuse researchers of the future.”[480] Will this ‘jump out’ as important? He draws attention to information scientist Katrin Weller (GESIS Leibniz Institute for the Social Sciences, Germany) who says, “Imagine [future] galleries or museum collections you wander through and see the most influential Instagrammers of today and what they were posting.”[481] Although it is hard to imagine any sublimity in so much of our throwaway media culture, the old adage, ‘one man’s garbage is another man’s treasure,’ might apply to even the most depreciated aspects of our media. Weller also emphasizes the impact of all the coded sequencing and digital programming by which we navigate through time, “This currently is the age where algorithms shape a lot of our lives.”[482] Furthermore, Baranuik posits that, in our age of ‘disinformation,’ the future historian may be unable to unpack truth from all the ‘alternative facts.’ He writes, “Imagine people 100 years from now scouring digital newspaper columns, blogs and tweets, and having the same disagreements over, say, the benefits of Brexit or the behaviour of former U.S. President Donald Trump, because they have huge stores of polarised messaging to pore over.”[483] This is even more troublesome when memes, deep fakes, holograms, and AI-authored blogs will populate the twenty-first century time capsule to a disorientating degree. Baranuik points

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[478] Baranuik, Chris. “Social media posts, algorithms and conspiracy theories might shape how future generations understand the world today.” *BBC*, 18 Aug. 2021, https://www.bbc.com/future/article/20210819-what-will-todays-data-tell-future-historians. Accessed 18 Aug. 2021.

also see Baranuik, Chris. “The online data that is being deleted.” *BBC*, 15 Jul. 2021, https://www.bbc.com/future/article/20210715-the-online-data-thats-being-deleted. Accessed 18 Aug. 2021.

[479] Ibid.

[480] Ibid.

[481] Ibid.

[482] Ibid.

[483] Ibid.

to historian John Randolph's view who says, "I think we're going to present future generations with the archival equivalent of a really rich hoarder's attic in which you have lots of random stuff."[484]

Time capsule architect Martin Kunze has no faith in a digital hoarder's attic.[485] "There will be very little permanent information left from our time because it's all digital," he says, "And it will fade away. That's not questioned anymore."[486] To counteract both the algorithm-dependent crypto-capsules, and also the Anthropocene's "trash islands," Kunze has returned to ceramics to craft something concrete and meaningful. Kunze's time capsules are ceramic tablets designed to withstand millennia. They harken back to the tablets of Esarhaddon, King of Assyria, as objects of historical documentation. These tablets are also informed by the existence of Paleolithic ceramics–evidence that clay is an outstandingly durable medium, one that withstood the last ice age.[487]

Kunze, through his *Memory of Mankind* project, endeavors to create a record of the history of human civilization containing not just the major events or discoveries of the past but, like the idiosyncratic randomness of all the stuff in the 'cloud,' also the minutia of day to day life: "We want to collect the mundane and tell it to the universe, tell it to eternity."[488]

If any sense of the sublime is to be found in Kunze's curated mundanity, it is surely embedded into the tablets' construction itself. Kunze's histories are not scraped into the surface of the ceramic like a cuneiform inscription; they are too microscopic for a human hand to write. Each tablet has space for a 1,000 page book.[489] Micro-digitized text and images are processed and sent through an ink jet printer which has been

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[484] Ibid.

[485] Martin Kunze, artist and researcher, Hallstatt, Austria. Memory of Mankind is a project he initiated in 2012 to preserve the history of human civilization. This project is vast in scope; The New York Times is helping him in the curation of the project.

[486] Jackson, Lauren. "News That Can Last a Million Years." *New York Times*, 31 Dec. 2020; updated 5 Jan. 2021, https://www.nytimes.com/2020/12/31/insider/time-capsule-coronavirus.html. Accessed 28 Apr. 2021.

[487] Associated Press. "Pottery fragments found in a south China cave have been confirmed to be 20,000 years old, making them the oldest known pottery in the world, archaeologists say." *The Guardian*, 28 Jun. 2012, https://www.theguardian.com/science/2012/jun/28/ancient-chinese-pottery-oldest-yet. Accessed 2 Aug. 2021.

[488] Jackson. "News That Can Last a Million Years."

[489] Ibid.

adapted to use ceramic glaze as toner. The ink jet transfers the data to paper which is then bonded and fired onto the clay tablets at a temperature of 850 degrees Celsius. The finished tablets are housed in an abandoned salt mine in the Hallstatt mountains of Austria–a dry and seismically safe environment. Contributors to the time capsule are gifted a small ceramic coin imprinted with a drawing of the mine's location. It is these coins that go the distance as heralds of the time capsule. "[Kunze's] hope," writes Lauren Jackson, "is that these coins, scattered across the continents will one day be unearthed by 'future finders' amid the ruin."[490]

5.5. Corporeal time capsules

Time capsules are heavy objects. Some accrue power and sacred energy along their time journey. Human remains transform into especially potent time capsules. Consider the early Christian practice of creating reliquaries, often beautifully ordained containers of precious metals that protect a sacred object, often bone or hair, or swatch of clothing associated with a sacred being. For example, the hand bones of Saint Basil, a fourth century theologian, are kept in a silver reliquary at the Greek Orthodox Cathedral of St. George in Venice, Italy. The box is made in the shape of the saint's hand; the back hinges to reveal the finger bones. Here, the bone acts as a conduit between earth and heaven, a portal between the profane and the sacred. [491]

Relics, Celeste Olalquiaga explains, "are not mere souvenirs or objects of historical interest; they convey the present, ongoing manifestation of the sacred dimension. Relics heal and perform miracles exclusively through direct or indirect touch (i.e., the visual 'caress'), and thereby act as a form of contagion (from the Latin *contangere*, 'touch'), transmitting their sacred energy from one source to another."[492] So powerful is this belief that a hierarchy of relics has come into being. Although bones

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[490] Ibid.

[491] Basil of Caesarea, bishop and theologian in early Christian church, 300-379 CE. Byzantine Empire
Olaquiaga, Celeste. "Nothing Sacred: Celeste Olalquiaga on the value of relics." *Artforum International*, July/August 2020, Pdf, https://www.artforum.com/print/202006/celeste-olalquiaga-on-the-value-of-relics-83283. Accessed 3 Apr. 2021.

[492] Ibid.

(*Insignis Reliquia*) are the most potent, fragments of cloth (*brandea*), and stones, soil, or anything that has been in close proximity (*sanctuaria*) also are revered.[493]

Relics travel through "touch," and touch, as Olalquiaga explains, is "the underestimated human sense that once was able to bridge heaven and Earth in the imagination.…"[494]

Powerful objects that, over time become imbued with sacred energy are said to be hierophantic. A hierophany is an object that manifests the sacred. In the natural world it could appear as a rock or river or unusual formation in a landscape that comes to possess a supernatural aspect that joins the human being to a spiritual world. Think of Uluru in the Northern Territory, the River Ganges, the caves at Lascaux.

Some time capsules seek to tap into the sacred energy of both relics and hierophanies: Consider the capsule that is Tutankhamen's tomb.[495] Imagine the fearful responsibility of this ancient timeship's chandler tasked with the inventory of items to go inside. He must anticipate everything the young king will need for a voyage to the next world, for the king is a time traveller. With him goes a cargo of grain, fruit, oil, and wine to nourish him, fine clothes and gold jewellery to clothe him, and tools, weapons, chariot wheels, his cheetah skin shield, his sandals–everything he will need to present himself when he arrives at his destination.[496] In all, the ancient chandler outfits the king's capsule with over 5,000 items. Then, into it goes the king himself, and in jars the two bodies of his stillborn daughters, his only children. Now complete, the time capsule is sealed and floated towards Osiris.

Tutankhamen's capsule was never meant to be recovered by future human beings; it was destined to be opened in another realm. The afterlife time capsule is a

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[493] Ibid. (rephrase)

[494] Ibid.

[495] Discovered by archeologist Howard Carter in 1922. Tut reigned from 1333 BCE until his death in 1323 BCE. 19 years old. Significant as a rare and intact tomb of an Egyptian king from the 14th c. BCE.

[496] Keyes, Allison. "For the First Time, All 5,000 Objects Found Inside King Tut's Tomb Will Be Displayed Together: Take a sneak peek at the collection of the new Grand Egyptian Museum, opening in early 2018." *Smithsonian Magazine*, 21 Dec. 2016, https://www.smithsonianmag.com/travel/grand-egyptian-museum-next-big-thing-180961333/. Accessed 3 Mar. 2022.

widespread practice in many cultures. Take the Anglo-Saxon ship unearthed from Sutton Hoo in 1939, the time journey of an unknown king.[497] Also consider the 8,000 terracotta warriors revealed near Xian in 1974, an army to accompany the time journey of third-century B.C.E. emperor Qin Shihuang.[498] These journeys, interrupted by archeologists, are all on full display as objects of great pride and wonderment. We respect the accomplishments of our ancestral human beings; we recognize their rituals, beliefs and complex spirituality; we marvel at the toll and trials, the many hours of ancient labour required to bring these capsules to fruition. We honour the ancient Anglo-Saxon men who constructed a massive trench and dragged the Sutton Hoo ship uphill from the River Deben.[499] We are amazed by the ancient craftsmen who assembled and installed the clay soldiers in vast underground fields, and carved river basins to flow alchemical shimmers of liquid mercury.[500] Today we devote our own care hours to maintaining these capsules, and it is right that we do so.

The contents of Tutankhamen's time capsule are on display at the Grand Egyptian Museum, Cairo, and have been 'toured' around the globe. Tut's body has been X-rayed; his DNA sequenced. Although it is macabre to consider corporeal remains as a time capsule, ancestral humans are such potent time travellers, so full of revelation.

Ötzi 'the Iceman,' is a 5,300-year-old mummy, found in the glacial melt in the Senales Valley, South Tyrol.[501] Like Tutankhamen, Ötzi's body has been painstakingly scrutinized, and unlike Tut, he is a 'wet' mummy, all his organs intact. Thus, analysis of his body reveals much biological history (Lyme disease, arteriosclerosis, lactose

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[497] Perhaps Raedwald, King of East-Anglia, 560-624 C.E.

[498] Terracotta Army, mausoleum of first Qin emperor of China, Qin Shihuang, c. 221-206 B.C.E., Qin Dynasty.

[499] Sue Brunning, curator, British Museum Early Medieval European Collections.
"The Anglo-Saxon ship buried at Sutton Hoo." *The British Museum*, https://www.britishmuseum.org/collection/death-and-memory/anglo-saxon-ship-burial-sutton-hoo Accessed 3 Apr. 2022.

[500] The tomb was meant to represent a microcosm of China, with the Yellow and Yangtze River. High levels of mercury in soil indicated liquid mercury rivers did once exist.
Ball, Philip. "Flowing rivers of mercury." Chemistry World, 6 Jan. 2015, https://www.chemistryworld.com/features/flowing-rivers-of-mercury/8122.article. Accessed 3 Apr.2022.

[501]The Iceman was found by hikers in September 1991 in the Ötztal Alps. He lived approx. 3400-3100 B.C.E.
"Ötzi the Iceman." *The Iceman*, South Tyrol Museum of Archeology, 2016, https://www.iceman.it/en/the-iceman/. Accessed 5 Apr. 2022.

intolerance).[502] We know his height (1.6m), weight (50 kg), age (45 years), and hair colour (dark brown). Stereolithography and CT scans allow paleo-artists to create a realistic physical reconstruction. “Since there is little subcutaneous fat,” write the museum curators, “he must have cut quite a wiry, sporty figure.”[503]

Not only do we have a mental image of Neolithic Ötzi but also a precise narrative to describe his final days: his last meal was of einkorn wheat and game, the deep cut on his right palm indicates combat a few days earlier, and the arrow wound through his scapula caused his death. Ötzi, a murdered man, frozen for five millennia is a time capsule crime scene.[504] However, Ötzi is neither hierophany nor relic. The museum built around him advertises him as “Archaeologic sensation, media star, research topic, museum object.”[505] The same can be said of Tutankhamen. However, these deeply enigmatic ancestral beings are infused with mystery; they crackle with hierophantic energy by virtue of the portal they open back to the past.

For Tut and Ötzi this chasmic portal runs so deep into the past it erases all traumatic memory. However, there are other beings whose portals hail from more recent times, where memory can be re-animated, illuminating the nature of the trauma. Take the body of British mountaineer George Mallory, another ‘Iceman.’ For over 75 years, every climber on Everest’s North Face was on the lookout for him and his climbing partner Sandy Irvine who both disappeared on a summit attempt in 1924. For three-quarters of a century Mallory’s legend grew fueled by mystery and curiosity about his fate. The perennial question–did he succeed; was he the *first* to climb the world’s highest mountain–kept his memory alive.

Mallory was finally found a few hundred meters from the summit in 1999.[506] A feeling of gravity permeated the discovery. “We weren’t just looking at a body,” observed Dave Hahn, one of the discovery team climbers, “We were looking at an era, one we'd

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[502] “The Mummy.” *The Iceman*, https://www.iceman.it/en/the-mummy/. Accessed 5 Apr. 2022.

[503] Ibid.

[504] Although this crime will remain unsolved, forensic DNA detectives have located 19 men with Ötsi as an ancestor.

[505] “Ötzi the Iceman.” *The Iceman*.

[506] Discovery by the ‘Mallory and Irvine Research Expedition,’ lead by American mountaineering guide Eric Simonson, with climbers Conrad Anker, Dave Hahn and others, 1999. Mallory’s climbing partner Sandy Irvine has not yet been found.

only known through books. The natural-fiber clothes, the fur-lined leather helmet, the kind of rope that was around him were all so eloquent."[507] Still, the appearance of his body was painful: lying face down, his arms outstretched above his head, his fingers clawing into the scree to brace his fall. His tweed jacket was torn open exposing the skin on his back; bruising and cuts from the rope that had failed to tether him and Irvine (his body still unfound) to the mountain was around his waist, compressing his ribcage; he had a visible wound to his head; one leg was broken, his 'good' leg crossed protectively over it.[508] He had gone so far, so high, but lost his life.

The discovery team chose to bury him under a small cairn of scree, with as much solemnity as can be done at an altitude of 8,100 meters. They read the Anglican funeral service over the body of Mallory, 'the Galahad of Everest.' Few bodies on Everest are allowed such dignity. No other lost climbers have attracted the same attention as the active Search and Rescue expeditions for Mallory and Irvine. Most of the climbers who succumb in the high mountains lie where they fall. Some are carried down by glacial melt; a few mummify into a crevasse, perhaps becoming an 'Östi' for far-future beings to discover and dissect.

However, Mallory is not Ötsi: he was a lost man, long sought, and when found he was *re-hidden*. The location of his body is kept secret to prevent treasure hunters and profiteers–even at death zone heights–but also to preserve his hierophantic *presence*. The sale and publication of photographs of his body has been met with outrage as a sacrilege.[509] Artifacts collected from his body are highly sensitive items–issues of copywrite and ownership notwithstanding.[510] Said expedition team leader, Eric Simonson, at the press conference in a Nepali hotel following the mission as the 'Mallory

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[507] Simonson, Eric, Jochen Hemmleb, Larry Johnson. "Ghosts of Everest." *Outside Magazine*, 1 Oct. 1999, https://www.outsideonline.com/outdoor-adventure/climbing/ghosts-everest/. Accessed 21 Sept. 2021.

[508] Ibid

[509] Douglas, Ed. "Everest row over photo profits from body of pioneer Mallory." *The Guardian*, 9 May 1999, https://www.theguardian.com/uk/1999/may/09/theobserver.uknews. Accessed 21 May 2021.

[510] The artifacts were placed "in the care of the American Foundation for International *Mountaineering Exploration & Research* (AFFIMER)"
Potterfield, Peter. "Daily Dispatches: Mallory's Artifacts and The Continuing Search." *Mountain Zone*, 25 May 1999, https://www.mountainzone.com/everest/99/north/disp5-25peter.html. Accessed 25 Sept. 2021.

treasures' lay displayed as proof of his discovery, "We're climbers, not treasure hunters… It is not, and never was, our intention to enrich ourselves from this expedition."[511]

Among the items taken from Mallory's body are a monogrammed handkerchief, an altimeter, a pocket knife, a pair of scissors, a pair of goggles, beef bouillon lozenges, and three letters found in a pocket near his heart (from his sister, his brother and an unknown woman).[512] Together, they make for an enticing time capsule as evidenced at the press conference:

> "The appearance of the long-awaited artifacts resulted in a simultaneous, almost involuntary forward surge by the room full of journalists as all pressed closer for an up-close look at the items, protected by Ziploc bags. Nepali security guards were on hand to safeguard the rare artifacts."[513]

These items, belonging to this lost man were, after all, found at 27,000 feet; they are the highest time capsule in the world.

The artifacts are now being held in the basement of the Washington State History Museum, the home state of expedition leader Simonson: "It's just kind of amazing to think that George was blowing his nose in this," he said, as he examined the handkerchief through a protective plastic bag.[514] An exhibit of Mallory's private and personal effects feels like it crosses a line even if it satisfies a prurient interest in the climber's last moments of life. The items remain emotionally charged, resonant. What is perhaps more interesting is what is missing: a photograph of his wife that he kept in his breast pocket that he intended to leave on the summit and his camera–the roll of film is still deemed viable–preserved in the dry cold of the mountain.

Mallory's personal effects are augmented by the discovery of the frayed rope that in breaking, cast him and Irvine to their deaths. Mallory's daughter, Clare Millikan, was

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[511] From a 'daily dispatch' via satellite phone from Eric Simonson to Mountain Zone. Potterfield. "Mallory's Artifacts…"

[512] Murphy, Kim. "Dealing With Artifacts of Everest Climber Mallory Poses New Challenge." *Los Angeles Times*, 12 Jun.1999, https://www.latimes.com/archives/la-xpm-1999-jun-12-mn-45714-story.html. Accessed 21 Sept. 2021.

[513] Potterfield. "Mallory's Artifacts…"

[514] Ibid.

just a child when he perished, and she had always imagined a peaceful end for him, but the rope suggests otherwise:

> Since this occasion, I've thought about it more and more, and wondered if retroactively someone can look back through time and comfort someone as they're dying. He must have been in some pain lying there, with his leg broken, sort of holding his hands out. All these years, I had rather hoped he would be like the Ice Man, and he would be there sort of leaning against a rock and going to sleep against the cold."[515]

Through the frayed rope, Millikan time travels back to her Ice Man father to enact a gesture of solace.

A gesture of solace may reconcile traumatic memory but is not always successful. Some wounds are unhealable, and remain fresh even over many generations. Indeed, for many indigenous peoples who suffered the traumas of European conquest and colonization, the practice of the taking of their ancestral bones for museum relics is deeply horrifying. Take the skulls of Demasduit and her husband Nonosabusut: Nonosabuset was killed by a bayonet wielded by British furriers in Newfoundland in March 1819; Demasduit was captured and taken to St. Johns where she contracted and died from tuberculosis.[516] In 1820, their skulls were taken to the Museum of Scotland, Edinburgh, under the guise of scholarship.[517] They were among the last known living of the Beothuk peoples. The First Nations of Newfoundland have not forgotten them: In 2015, Mi'kmak chief Misel Joe performed a purification ceremony over the skulls, but because of many layers of bureaucratic red tape he was unsuccessful in his bid to repatriate them back to Beothuk territory. "Maybe what I need to do is go and dig up [Robert] Burns," he told the CBC [Canadian Broadcasting Company], "maybe that will open somebody's eyes … I mean, what's the difference in me going to dig up Burns and bringing him back to study in Newfoundland than them

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[515] Ibid

[516] Shariatmadari, David. "'They're not property: the people who want their ancestors back from British museums." *The Guardian*, 23 Apr. 2019, https://www.theguardian.com/culture/2019/apr/23/theyre-not-property-the-people-who-want-their-ancestors-back-from-british-museums. Accessed 15 May 2021.

[517] Beothuk: "The Beothuk are the Indigenous people of the island of Newfoundland. They were Algonkian-speaking hunter-gatherers who probably numbered less than a thousand people at the time of European contact."
Pastore, Ralph T. "The Beothuk." *Heritage Newfoundland and Labrador*, 1997, https://www.heritage.nf.ca/articles/indigenous/beothuk.php#. Accessed. 21 Mar. 2024.

taking the remains of our people to study for all these years?"[518] In 2019, the skulls were transferred to the Canadian Museum of History in Gatineau Quebec; they are still many hundreds of miles away from their ancestral lands in Newfoundland.

On the other coast of Canada, the Haida peoples are also intent on repatriating ancestral remains from European museums. "We were horrified to find the amount of ancestral [human] remains–our ancestors–stored away in museums all over the place," says Haida Gwaii's Vince Collison.[519] Colliston has established an inventory of Haida ceremonial objects and human remains, and although the return of 500 *kuuniisii* (Haida ancestors) from institutions has taken place, the repatriation is ongoing. "They [the museums] still have a very extensive collection of our people," he says, "And it's not right that they have our ancestors."[520] As stated by the Council of the Haida Nation, "Our ancestors are our grandmother and grandfathers–they are a part of us a people."[521]

The taking of ancestral remains by colonial powers is not unique to Canada and is a source of trauma for indigenous peoples in New Zealand, Australia, Hawaii, and throughout the Americas. At the heart of the continuing trauma is issues over 'ownership' beset by institutionalized racism that renders human remains as historical objects and that refuses to recognize the dignity of each individual person, denying them the peace of a final resting place among their loved ones. Lying in museum drawers, these human remains fall outside the veneration of human remains accorded Christian relics. They are not the finger bones of saints to be meted out between cathedrals in bejewelled boxes (although they have been traded and displayed). These indigenous peoples don't belong to the linear, Christian arc of time; they come from communities where time is cyclical. Indeed, it is wrong to consider the remains of Demasduit and her husband as 'corporeal time capsules.' Although the museum 'dates' them and assigns them a temporal place, they do not 'age.' There is no voyage into the future. They are still vital beings, and

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[518] Shariatmadari. "They're not property…"

[519] Hamilton, Wawmeesh. "'We were horrified': Fights to repatriate Indigenous ancestral remains continue worldwide." *CBC News*, 15 Mar. 2020, https://www.cbc.ca/news/canada/british-columbia/indigenous-remains-repatriation-efforts-1.5489390. Accessed 7 Sept. 2021.

[520] Ibid.

[521] "Haida Laas Newsletter, August 2001: Haida Protocol for the Discovery of Human Remains on Haida Gwaii. (p.11)." *Haida Nation*. https://www.haidanation.ca/wp-content/uploads/2019/01/aug.01.pdf. Accessed 24 Mar. 2024.

although they have passed beyond living memory their absence is still keenly felt in their communities.

Reparation of indigenous remains is one act of reconciliation. The Haida Nation's Reparation Committee is working with the Museum of Anthropology in Vancouver and the American Museum of Natural History in New York City to return stolen people and their belongings to their communities where they may be received with the honour denied them in death. In the fall of 2017, the remains of 15 *kuuniisii* were returned to Haida Gwaii: "Haida gathered and welcomed home their relatives with song, prayer, and tears."[522] In the words of Committee member Gaagwiis *Jason Alsop*, "We're trying to right these wrongs that were done to us. …It's hard to understand what would make someone want to take them away. It's hard to reconcile with that. So, it's great to have our friends and neighbours here. We're all part of helping to try and make things right."[523]

'Making things right' required advocacy. Neither Tutankhamen nor Ötsi have people to act on their behalf, to 'liberate' them from their display case internments, although in Ötsi's case, 19 men living in the South Tyrol Valley have been identified as his direct descendants. These men were all blood donors; sequencing of their DNA–taken from their donations–was compared with that of their early ancestor. The men have not been told of their very ancient connection.[524]

The remains of 'stolen' people, like the indigenous people taken to foreign institutions, are not time capsules, they are people.

5.6. Disaster capsules (aircraft and shipwrecks)

Time capsules belong to the long arc of narrative creation found in human cultures. They are a unique genre, full of awe and wonder. Those containing elements of mystery, crime, disaster, or disappearance, are highly emotionally charged. Take, as

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[522] "Repatriation: Making things right." *Haida Nation*, 20 Oct. 2017, https://www.haidanation.ca/repatriation-making-things-right/. Accessed 7 Sept. 2021.

[523] Ibid.

[524] "Link to Oetzi the Iceman found in living Austrians." *BBC News*, 10 Oct. 2013, https://www.bbc.com/news/world-europe-24477038. Accessed Sept 7, 2021.

example, the small collection of artifacts recently recovered from a lake in the Netherlands: a plate of fuselage with a serial number, a cigarette case initialed J.B.C., and three parachute locks. Just these few pieces of information and the story of a lost Second World War aircraft springs back to life. We now can relate that RAF Short Stirling bomber BK716, that set out from England on a bombing raid to Berlin on March 29, 1943, was shot down. The stricken crew of seven airmen had no time to eject and deploy their parachutes. The aircraft sank, and was entombed in the mud of Lake Markermeer.[525] Today, the painful ephemera of a wartime loss gathers together to give healing and closure. As more artifacts are retrieved, a son waits to receive the remains of a father he never knew.[526]

As traumatic memory recedes wonder sets in. There is added pathos to the ephemera born of tragedy, disappearance, or unexplainable phenomena. This is enhanced if the objects are found in elemental places where the sublimity of the landscape embraces the cruel event, even hides it. Such is the case with Mathilde's bottle or the good-bye letters of Capt. Robert Falcon Scott found under his frozen body in the Antarctic.[527] There is a particular poignancy to shipwrecks, for nearly always the victims of these disasters are overcome by the elemental world–waves, winds, and especially the crushing force of ice. The evocative sequence of photographs taken by Frank Hurley, (photographer, for Sir Ernest Shackleton's Imperial Trans-Antarctic Antarctic Expedition, 1914-1917), of the sinking of the ship *Endurance* in the Weddell Sea are emblematic of 'shipwreck sublime.' The black timbers of the ship twist, splinter, and sink while an orphaned group of shattered men and dogs gather on the ice watching. [528]

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[525] John Michael Campbell, Leonard Shrubsall and six others perished.
Rankin, Jennifer. "Dutch salvage mission begins for RAF bomber shot down 77 years ago," *The Guardian*, 7 Sept. 2020, https://www.theguardian.com/world/2020/sep/07/dutch-salvage-mission-begins-for-raf-bomber-shot-down-77-years-ago. Accessed Sept 8, 2020.

[526] Ibid. "After 77 years, Richard Shrubsall may finally see laid to rest the father he never knew. Leonard Shrubsall was declared missing after his plane was shot down while returning from a bombing raid on Berlin in 1943. His wife, Beatrice, was three months pregnant with Richard when she received the telegram with the news."

[527] Robert Falcon Scott, British explorer, perished on return from South Pole, January 1912. Search party discovered his last tent, bodies of Scott and two of his men, Oct. 1912.

[528] Imperial Trans-Antarctic Expedition led by Sir Ernest Shackleton. Although *Endurance* sank in 1915, the men escaped and were rescued after a hellish ordeal sheltering under their upturned lifeboats on Elephant Island, 1917.

The iceberg collision of the *Titanic* is of the same time period as *Endurance*. Evocative vignettes of this disaster–the ship's band playing on deck as it sunk, and the desperation of passengers trying to board lifeboats of which there were too few–illuminate the tragedy. Submersibles have located *Titanic*, and very recently, Shackleton's *Endurance*.[529]

Of the many time capsule shipwrecks that lie patiently in waiting, accumulating mystery, 'thin place' isolation assists in preservation. Although *Endurance* is badly damaged, scientists believe a combination of flat seabed, a lack of sedimentation, and the wreck lying well below the maximum depth of iceberg keel mean it will have many mysteries to reveal. Says Julian Dowdeswell of the Scott Polar Research Institute, "Glaciologically and geophysically–*Endurance* should be unharmed," all of which, in Jonathan Amos' words, "augurs well for future attempts to find what is among the most famous of all wrecks."[530] On 5 Mar, 2022, Endurance was finally discovered, "in remarkable condition" at a dept of 3,008 meters in the Weddell Sea.[531] Thomas Lundy describes the vessel, "Timbers intact, the ship's stern still bears the name *Endurance*, visible and defiant."[532]

Before *Endurance*, the most famous polar shipwreck was undoubtedly that of the two ships, *HMS Erebus* and *HMS Terror*, piloted by Sir John Franklin on his quest to find the Northwest Passage through the Arctic in 1845. Like Shackleton's *Endurance*, Franklin's ships were also beset by sea ice. Despite Inuit accounts of seeing crazed, starving men wandering on King William Island–the bodies of 30 of the crew were eventually discovered there–numerous search parties failed to locate the stricken vessels. Over the years a sprinkling of grim clues spread across swaths of arctic terrain deepened the puzzle of the perished.[533]

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[529] Amos, Jonathan. "Will anyone ever find Shackleton's lost ship." *BBC*, 22 Apr. 2020, https://www.bbc.com/news/science-environment-52376090. Accessed 3 May 2021.

[530] Ibid.

[531] Lundy, Thomas. "Shackleton's lost ship Endurance found in remarkable condition below Antarctic ice." *Canadian Geographic*, 10 Mar. 2022, https://canadiangeographic.ca/articles/shackletons-lost-ship-endurance-found-in-remarkable-condition-below-antarctic-ice/. Accessed 24 Mar. 2024.

[532] Ibid.

[533] McKie, Robin and Vanessa Thorpe. "What happened on HMS Terror? Divers plan return to Franklin wrecks." *The Guardian*, 14 Mar. 2021,

The fate of the Franklin Expedition became an archetypal Victorian mystery, one that remained unsolved until 2014 when the remains of *Erebus* were located, followed in 2016 by *Terror*.[534] Slowly clues are resurfacing–ceramic dishes, a lieutenant's epaulette, shoes, pipes, books, even pieces of an accordion. "These [artifacts] are touchstones to those lives and they have incredible poignancy," says Claire Warrior, senior curator at the National Maritime Museum, London.[535] The pristine water of the high Arctic has cradled the sunken vessels, protecting the cache of secrets of these disaster capsules.

5.7. Disaster capsules (Pompeii and Pripyat)

There are disaster time capsules that present on a far greater scale than downed aircraft or shipwrecks. Whole cities stricken and immobilized by disaster offer moments when time stops still and human activity is suspended precisely as it is being lived. When opened, these city time capsules release manifestations of both the sublime and the uncanny. We feel them to be sublime, because–from our vantage point–we can survey the disaster from a position of safety. We are not there, so the fearful aspects of the disaster become a source of wonder and fascination. We feel a sense of the uncanny, because the suspended animation of daily activities are like those we also participate in–grocery shopping or going to school–and are now in wholly unrecognizable and troubling environments as so rendered by the disaster.

Eric Rangno calls the time capsule cities of Pompeii and Pripyat "accidental capsules;" they are completely different from "manufactures capsules" we human make

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https://www.theguardian.com/science/2021/mar/14/what-happened-on-hms-terror-divers-plan-return-to-franklin-wrecks. Accessed 4 May 2021.

[534] In 1845 Sir John Franklin led an expedition piloting his ship Erebus and Terror through the Canadian Arctic. He was searching for the Northwest passage a trade route to Asia. The men are thought to have abandoned ship after two years trapped in the ice. Everyone perished and despite many search efforts the mystery of the adventure lay undiscovered for 173 years. "Wrecks of HMS Erebus and HMS Terror National Historic Site." *Parks Canada/Government of Canada,* https://www.pc.gc.ca/en/lhn-nhs/nu/epaveswrecks. Accessed May 27, 2021.

Also see:
Urbanus, Jason. "The Wrecks of Erebus and Terror." *Archeology*, January/February 2021, https://www.archaeology.org/issues/406-2101/features/9328-canada-franklin-wrecks. Accessed May 27, 2021.

[535] McKie and Thorpe. "What happened on HMS Terror?"

that are “a form of self-invention.” He observes that “Particularly in times of distress, humans are susceptible to a certain utopian impulse that distills who they wish to be from who they really are.”[536] Accidental capsules are not beholden to these impulses, this “motive” to showcase our better selves. This is the underlying paradox of time capsules, he explains, “Their deepest truths come from our failure to accurately represent our own current reality.” However, accidental capsules are not beholden to our whims, he continues, “Sudden, unpredictable and catastrophic conditions capture moments in time and the difference in the stories they tell demonstrates that historical objectivity is more easily achieved through destruction than creation.”[537] There is an accuracy, a kind of ‘purity’ that premeditated collections can never achieve: “Catastrophe best reveals who we are.”[538]

Vesuvius is an active volcano on the Italian mainland, southeast of Naples. In October, 79 C.E., Mt. Vesuvius erupted, suffocating the Roman cities of Pompeii and Herculaneum with poisonous gas. Over the next two days searing volcanic ash slowly blanketed the cities until they were completely hidden. Sealed from view, the cities drifted on a time journey for 1669 years until in 1748 and a surveying engineer opened the ancient capsule.

Pompeii is the “longest continually excavated site in the world,” observes Steve Ellis, of the Pompeii Archeology Research Project.[539] Every year more content is uncovered, adding to our knowledge of this flourishing Roman civilization. Consider a recent discovery, in Nov 2020, of the bodies of two men seemingly in the act of fleeing–1,981 years ago–from Civita Giuliana just beyond the Pompeii’s walls.[540] Unlike Ötsi or Tutankhamen, these men do not leave behind frozen or mummified remains. They are

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[536] Rangno, Erik. “The Paradox of Time Capsules.” *The Atlantic*, 17 Aug. 2015, https://www.theatlantic.com/technology/archive/2015/08/time-capsules-futurism/401327/ Accessed 4 Aug. 2020.

[537] Ibid.

[538] Ibid.

[539] Twenty-two hectares of Pompeii still have yet to be excavated.
Buckley, Julia. “The race against time to save Pompeii.” *CNN Travel*, 7 Mar. 2021, https://www.cnn.com/travel/article/pompeii-new-excavations-looting/index.html. Accessed 8 June 2021.

[540] Geddo, Benedetta. “Macabre and fascinating new discovery made in the ruins of Pompeii.” *Lonely Planet*, 30 Nov. 2020, https://www.lonelyplanet.com/news/pompeii-new-discoveries. Accessed 8 June 2021.

cyphers. The Vesuvius-created time capsules are remarkable for *what is missing*. Architectural elements–inert mosaic floors, inanimate artifacts–remain, but all organic matter has been incinerated–transformed into empty 'shapes,' like bubbles trapped in ice as it freezes. The fiery volcanic ash both entombs and destroys, leaving a three dimensional outline. The bodies of the fallen must be 'reshaped' through a process of poring plaster into the hollows in the hardened ash, allowing it to set and then excavating the plaster cast.

These men of Civita Giuliana leave behind their casts posed in an act of escape. These plaster portraits are detailed enough to extrapolate ages (one man is between 18-25 years, the other in the 30-40 range), and their social status (the older man is better attired, the younger man is probably a slave). The plaster even suggests the fabric of their clothes (wool). Nearby were found the void of three thoroughbred horses, one wearing a bridle and harness.[541]

In each spectral form unearthed from ash, another detail is discovered, another narrative comes to life. And this is true for even more spectral remains like the "human-shaped gap" and the presence of phosphate in the soil which reveals the king's body at Sutton Hoo.[542] The position of a sword beside the body-void suggests a left-handed man. And although items like this sword end up in museum cabinets, they are not static. "While these objects might sit quietly in a display case," curator Sue Brunning says, "they're not actually quiet objects. They are loud with information… These wear patterns on the sword were made by this person's actual hand… we can almost reach through time and touch them."[543]

Time capsules are a living archeology; they don't stop being in motion when they are opened. A city-capsule like Pompeii attracts a voyeuristic notoriety but also it revives and challenges our knowledge. "Everyone has heard of Pompeii," says tour guide

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[541] Buckley. "The race against time to save Pompeii."

[542] The acidic soil caused the decomposition of the King's body.
"The Anglo-Saxon Ship Burial at Sutton Hoo." *The British Museum*, https://www.britishmuseum.org/collection/death-and-memory/anglo-saxon-ship-burial-sutton-hoo. Accessed 18 June 2021.

[543] Ibid.

Fiorella Squillante, “but what people never expect is that it’s still a *living* city, whose image changes and will continue to change, because its story hasn't all been written.”[544]

Disaster does not consciously create a time capsule for the future, but by suddenly freezing of a precise moment from a violent event, it enters collective consciousness, and is recognized and remembered on a global scale. The sublimity of disaster manifests in the intrigue of the frozen danger. It is worth noting that Pompeii is emblematic of the Romantic sublime; it is a Romantic Era discovery, and contributes to the powerful allure of dangerous natural phenomena. For the Romantic Era aesthete, a tour through Europe necessitated not just an experience of breath-taking Alpine landscapes, but also a fire-breathing mountain. The trauma of 79 C.E. was replaced with sublime appreciation for the romantic ruins of a city nestled in the shadow of a monster.

Like Pompeii, the city of Pripyat in northern Ukraine is a time capsule disaster. The ‘capsulization’ of Pripyat is the result of a catastrophic human-made disaster. On April 26, 1986, the No. 4 reactor at the nearby Chernobyl Nuclear Power Plant exploded.[545] Radioactive material shot into the atmosphere endangering much of Northern Europe and the then Soviet Union. Pripyat, the power plant’s supply city, was rendered into a dead zone. In the space of 36 hours, the entire population of 49,000 was evacuated. People snatched up a few belongings before being bused away, leaving behind their animals to wander, tasks unfinished, meals half-eaten. Pripyat is a ghost town of schools, swimming pools, hospitals, playgrounds, cinemas, shopping malls; a heavily lived environment up until the very moment it sickened.[546]

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[544] Buckley, “The race against time to save Pompeii.”

[545] 30 people were killed in the immediate blast and 2000 from radiation poisoning in days following radiation exposure. The Chernobyl disaster is considered to be the worst nuclear disaster in terms of casualties, contamination, and after effects of radiation poisoning.

“The April 1986 disaster at the Chernobyl nuclear power plant in Ukraine was the product of a flawed Soviet reactor design coupled with serious mistakes made by the plant operators. It was a direct consequence of Cold War isolation and the resulting lack of any safety culture.”

“Chernobyl Accident 1986.” *World Nuclear Association*, Updated May 2021, https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx. Accessed 22 June 2021.

[546] Note: Quick evacuation part of city’s disaster planning,
“Abandoned City of Pripyat.” *Atlas Obscura*, https://www.atlasobscura.com/places/abandoned-city-of-pripyat. Accessed 24 Mar. 2024.

The romanticization of the ruins of Pripyat prove a paradox. Among discarded shoes and bicycles are industrial objects thrown out of the reactor by the force of the explosion that now menace the urban landscape. Archeologist Robert Maxwell, who journeyed to Pripyat in 2011 for a field study, describes 'The Claw,' a massive claw-shaped head or hand of a machine thrown in the blast that crackles with radioactivity. It is, he writes, an object of "pure death," adding, "If you fell asleep against it you would almost certainly die."[547]

In time capsules, there will always be elements that seem out of place, that defy interpretation. The claw, Maxwell observes, "was a Leviathan made immortal by the Nuclear Age, beheaded yet seemingly sentient, humming its electron hum in the Ukrainian forest for millennia."[548] And because of enduring toxicity, objects such as the claw venture forward into deep time, acquiring an elemental tension. The claw, in Maxwell's romantic poetry, "will sing of disease and loss until the stars burn out, until we are all dust, forgotten and gone."[549]

Like Pompeii, the city of Pripyat presents sides of the sublime and the uncanny. It is sublime in its fearful unapproachability. Its sheer lethality–the city is considered to be radioactively dangerous for human habitation for at least 24,000 years–demands isolation.[550] And yet, it is this very isolation that engenders sublimity, for the natural world is so *unafraid* to reach in and gently rewild the site. In the thirty-five years since the disaster, organic life has crept back, oblivious to danger. The 'greening' of Chernobyl is somehow miraculous. This disaster capsule is being transformed by foxes and wolves reclaiming the space. Although radioactive, animals are seemingly thriving; deer, elk, bears and boars also live here now. Trees grow through living room floors and flowers bloom in hallways. Rain and condensation peel Soviet-era posters from walls. There is romanticism in watching nature overtake these hazardous ruins, the air gradually scrubbing away invisible poisons. There is even a romantic sensibility to radioactivity,

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[547] Maxwell, Robert. "The Claw: A Song of Electrons," in *Object Stories: Artifacts and Archaeologists*. Steve Brown, Anne Clarke, Ursula Frederick, Eds; Left Coast Press, 2015. pp. 147-152. 150.

[548] Ibid. p.150.

[549] Ibid. p.151.

[550] Hilton, Lynn. "Inside the abandoned city of Pripyat, 30 years after Chernobyl – in pictures." *The Guardian*, 5 Apr. 2016, https://www.theguardian.com/cities/gallery/2016/apr/05/inside-abandoned-city-pripyat-30-years-chernobyl-in-pictures. Accessed 18 Sept. 2021.

the killing power of an invisible energy. In this isolation, the radioactively entombed city develops a mythology. We skirt around its glowing perimeters, probing a hazard that magnetizes our curiosity. Maxwell is cognisant of this dichotomy: “there are entities in the world that are as attractive as they are repellant.”[551] Chernobyl is “intoxicatingly toxic.”[552]

The far edges of Pripyat are slowly being reinhabited by people displaced by the disaster–people for whom the displacement from their homes proved a worse fate that their fears of disease. Beneath a cement and steel sarcophagus robots are busy disassembling the deadly components of Reactor No. 4.[553] Tour companies are slowly seeking to accommodate the curious with tools to mitigate the risk such as time limits and safety suits. Says the travel website Atlas Obscura, “All tours end with a screening for radiation levels.”[554] There is also the “vicarious experience” as Eric Rangno remarks, provided through the computer games *S.T.A.L.K.E.R.: Shadow of Chernobyl* and *Call of Duty 4: Modern Warfare*, which gives the inhabitants of the exclusion zone “special powers like ESP, and a hive mentality.”[555]

The heightened risk in visiting this nuclear disaster site elevates the sublime quest but a feeling of the uncanny goes in tandem. The citizens of Pripyat abandoned everything: meals on tables, bicycles in grass; opened lessons in school books, empty cars on the street. All the clocks read 11:55, the time when the electricity ceased to flow.[556] In this unsettling and instant abandonment, in this immobilization of time, the uncanny takes hold. Wonder and unease shuffle together. And yet, this is really no different than the unsettling attention we give to other events of great suffering, from natural disasters to war zones. In return for the experience of horror, we offer our empathy, our fascination, and our memory. Thus, the Chernobyl-Pripyat time capsule is both a foreshadowing of an apocalyptic future and the memorialization of its aftermath.

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[551] Maxwell, Robert. “The Claw: A Song of Electrons.” p. 148.

[552] Ibid. p. 148.

[553] “During construction of the Shelter Object, about 345,000 cubic meters of concrete were placed, and 7,000 tons of steel structures were assembled.”
“Accident and Elimination.” *Chornobyl NPP*, https://chnpp.gov.ua/en/about/history-of-the-chnpp/accident-of-1986. Accessed 24 Mar. 2024.

[554] “Abandoned City of Pripyat.” *Atlas Obscura.*

[555] Rangno. “The Paradox of Time Capsules.”

[556] Ibid.

Maxwell posits that on that April 1986 day, a concept was birthed that "would go on to root itself in our culture and language, in our thought patterns and synaptic responses. Just as green means 'go' and red means 'stop', for a great many children of the twentieth-century Chernobyl means annihilation, poison, toxin, cancer, mutation, and irradiation forever and ever."[557] And yet, as we proceed through the twenty-first century, that April day must also include some provision for reparation and healing. Over time the hydrosphere will absorb and cleanse the poisons from the air and soil. "We have evolved to heal," in the words of forestry ecologist Suzanne Simard, however, some poisons take much longer to lose their insidiousness. [558]

5.8. Lethal capsules (consequences and containment)

If a time capsule is a contract between a sender and the finder, how unconscionable then the assembly of a lethal time capsule. What manifestation of our dark-selves would engineer a deadly handshake across the *time-space*? Imagine opening a small, 'hey there' blast of a past apocalypse. Yet, a 'lethal time capsule' is a by-product of a great many technologies developed over the last half of the twentieth century onward–when we make something dangerous and then don't know what to do with it, we hide it, isolate it.

Our technologies sometimes fail us in spectacularly horrific ways. The Chernobyl nuclear disaster was a tragic, preventable accident. A combination of design flaws in the reactor itself, human error in its operation, and, as the World Nuclear Organization pointedly observes, "a direct consequence of Cold War isolation and the resulting lack of any safety culture," show how limited are our resources to manage lethal materials of our own creation when they escape our control. [559] Even with a stronger safety culture in place, for example–the three nuclear power plants along the north east coast of Japan had earthquake sensors installed that automatically shut down the plants during the

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[557] Maxwell. p. 148.

[558] "Finding the Mother Tree: A Conversation with Suzanne Simard." *Sierra Club, BC*, Webinar, 19 May 2021, https://sierraclub.bc.ca/finding-the-mother-tree-a-conversation-with-suzanne-simard-webinar/. Accessed 19 Mar 2021.

[559] "Chernobyl Accident, 1986." *World Nuclear Organization*.

2011 earthquake–these plants did not have safeguards to withstand an ‘act-of-god’ tsunami. The Fukushima Daiichi nuclear power plant experienced a meltdown.

A geopolitical environment still exists among nations in which lethal materials (radioactivity, novel pathogens, chemical hazards) are developed in the ‘national interest.’ A perception of ‘mastery’ of such materials makes the nation state feel powerful on the world stage. Thus, the safety culture around malevolent technologies proceeds inside a dome of secrecy and hostility.

The concrete tomb over Chernobyl’s No. 4 reactor is only a limited and time-sensitive solution. Maximum security biological or chemical laboratories–even with a system of airlocks, positive pressurized suits and decontamination protocols–still produce substances that are absolutely deadly to organic life (from nerve agents like Novichok to haemorrhagic viruses like Ebola). These agents are not so easily destroyed, cannot be secured, and as we have seen with the highly infectious virus Sars-CoVi-2, difficult to contain once it takes hold globally. We have a duty to consider what we create and what we hide in the earth, so that we don’t bequeath a twenty-first century plague to our far-future ancestors, who may have no immunity or resources to combat it.

With technology must come responsibility. When the Apollo 11 astronauts returned from their lunar mission great care was taken to ensure they did not bring back a case of “moon plague.”[560] As a time capsule, command module Columbia’s time journey was eight days, three hours, 18 minutes and 35 seconds from blast-off to splashdown. It was not a long time journey but one of great distance; and it carried men who had walked on the moon. It was not without fear that the recovery crew approached the spaceship bobbing in the Pacific Ocean. A swimmer cautiously opened the capsule hatch; just the mere act of tossing the three astronauts isolation suits (with built in breathing apparatus) meant potentially releasing an uncontrollable pathogen from inside the capsule into the air over the ocean. The astronauts, along with a support crew, then spent three weeks in quarantine. They knew even a slight physical discomfort would be scrutinized as a harbinger of extraterrestrial disease. This threat was treated with absolute seriousness. Jason Schwartz, a historian of medicine at the Yale School of

[560] Bartels, Megan. “Apollo 11 Astronauts Spent 3 Weeks in Quarantine, Just in Case of Moon Plague.” *Space*, 24 Jul. 2019, https://www.space.com/apollo-11-astronauts-quarantined-after-splashdown.html. Accessed 22 Jun. 2021.

Public Health, explains, “You had a very, very small risk of something that could be very, very, very significant.”[561]

The seriousness of time travel pathogenic transmission is still very real today. From satellites to Mars rovers, every effort is made to ensure terrestrial bugs don’t hitch a ride out of the atmosphere.

We currently don’t aim to ship our deadly materials *ex terra* (although using the moon as a nuclear waste site has been considered).[562] Our Earth is constantly threatened by hazardous space junk falling from orbit. Most of these spent machines burn up in re-entry, but those that don’t can crash down with potentially catastrophic results. Skylab, the precursor to the International Space Station, showered the skies over Australia and the Indian Ocean with fireworks during its atmospheric re-entry in 1979. The 23-ton rocket booster, Long March 5B, crashed into the Indian Ocean, May 8, 2021; its descent was anxiously watched from the shores of Oman.[563] Luckily more ocean covers the Earth’s surface than does land, and one particular stretch of water in the Pacific Ocean, known as Point Nemo (after Jules Verne’s submarine captain) is considered to be “the ocean point of inaccessibility.” Point Nemo is 2,700 km from land. This makes it the perfect spaceship graveyard. [564] Twenty-five tonnes of the Russian space station Mir, brought back down through careful engineering, lie here, and one day, after it has reached the end of its useful life, the International Space Station will join it.

Our oceans bury our space waste but also toxic materials from weapons development. The Beaufort Dyke is a 50-kilometer long trench stretching under the narrow sea linking the geologically similar ‘Thin Places’ of Fingal’s Cave, Scotland and the Giant’s Causeway, Ireland. This trench is a British military dump filled with a million

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[561] Ibid.

[562] Murphy, Meg. “Would it be feasible to dump nuclear waste on the moon?” *MIT School of Engineering*, 9 Oct. 2017, https://engineering.mit.edu/engage/ask-an-engineer/would-it-be-feasible-to-dump-nuclear-waste-on-the-moon/. Accessed Sept 27, 2021.

[563] Jones, Andrew. “Long March 5B falls into Indian Ocean after world follows rocket reentry.” *Space News*, 9 May 2021, https://spacenews.com/long-march-5b-falls-into-indian-ocean-after-world-follows-rocket-reentry/. Accessed Sept. 11, 2021.

[564] Shepherd, Tory. “Thousands of kilometres from anywhere lies Point Nemo, a watery grave where space stations go to die.” *The Guardian*, Sept. 3, 2021, https://www.theguardian.com/science/2021/sep/04/thousands-of-kilometres-from-anywhere-lies-point-nemo-a-watery-grave-where-space-stations-go-to-die. Accessed Sept 11, 2021.

tons of unexploded munitions, chemical weapons, and radioactive waste.[565] The stormy seas and strong ocean currents do not add a protective layer over these dangerous materials.

We bury some of the truly dangerous materials we produced on Earth deep within it, where it is dry, without ground water, and seismically quiet. Subterrain capsules full of toxic material are forays into deep time capsule building; they require deep time labelling to not only prevent them from being opened but also ensure far-future generations understand the deadly risks. The following message is a proposal for warning signage of radioactive waste:

> DO NOT DESTROY THIS MARKER. THIS MARKING SYSTEM HAS BEEN DESIGNED TO LAST 10,000 YEARS. IF THE MARKER IS DIFFICULT TO READ, ADD NEW MARKERS COMPOSED OF LONGER-LASTING MATERIALS AND COPY THIS MESSAGE IN YOUR LANGUAGE ONTO THEM. [566]

Depending on the nature of the material and strength of its radioactive decay, waste from nuclear reactors, uranium ore mining, and weapons development, can persist for tens, even hundreds of thousands of years. Once released into a globally dispersing medium like air or water, it cannot be sucked up or neutralized (as evidenced by the Chernobyl, and the more recent Fukushima Daiichi Nuclear Power Plant meltdowns).

In the desert of New Mexico, the Waste Isolation Pilot Plant (WIPP) endeavors to situate a deep-time geological repository for long-lived radioisotope-rich defence-related transuranic waste (TRU).[567] A cavern repository created from excavated rock salt at a

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[565] O'Hare, Maureen. "The UK wants to build one of the world's most ambitious bridges" *CNN*, Updated 3 Jul. 2021. https://www.cnn.com/travel/article/northern-ireland-scotland-bridge-project-cmd/index.html. Accessed 3 July 2021.

[566] Proposed signage for poisonous radioactive waste sites. Permanent Markers Implementation Plan, United States Department of Energy, Waste Isolation Pilot Plant, Carlsbad, New Mexico, 19 Aug. 2004. Capital letters (sic).
"Permanent Markers Implementation Plan." OSTI (Office of Scientific and Technical Information), https://www.osti.gov/biblio/990726. Accessed 26 Mar. 2024.
None, None. "Permanent Markers Implementation Plan." United States: N. p., 2004. Web. doi:10.2172/990726.

[567] "In the USA, defence-related transuranic (TRU) waste – which has similar levels of radioactivity to some ILW – is disposed of in the Waste Isolation Pilot Plant (WIPP) deep geological repository in New Mexico."
"Storage and Disposal of Radioactive Waste." *World Nuclear Association*, Updated May 2021, https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/storage-and-disposal-of-radioactive-waste.aspx. Accessed 30 May 2021.

depth of 650 meters houses this danger. Steel drums full of TRU are arranged on pallets. The rock salt environment is bone dry and the “plastic creep” of the salt eventually seals the drums.[568] Since 1999, over 90,000 cubic meters of nuclear waste has been so disposed in the WIPP. Although this material is isolated geologically, it must remain so over time. Should the barrels resurface before their decay is complete, it is imperative that a suitable warning will alert future generations and convey an urgent ‘do not touch.’

The Permanent Markers Implementation Plan identifies the following criteria to keep lethal capsules from causing harm. The signage must be able

> To alert intruder to the existence of the site
> To convey a warning about the danger to an intruder
> To inform an intruder about the degree and nature of the danger
> To endure in form and function for the longest possible time [569]

Even with such warnings–displayed through diagrams and written in multiple languages–there is no guarantee that it will be understood and heeded by far-future beings.

The nuclear waste time capsule is not a fragile bottle. Like the capsule repository in New Mexico, many nations have developed methods for securing nuclear waste through boreholes (5,000 metres deep), mined repositories (tunnels and caves) and burying in ‘self-sealing’ strata. Further restraints such as ‘overpacks’ of copper (a corrosive resistant metal that can retain its integrity over thousands of years), and back-filling boreholes with bentonite, asphalt, or concrete caps also seek to stabilize these deep-earth terminals from tectonic churn. [570] The metrics of past geological ages–albeit operating on a deep time scale–do reveal the limitations of deep earth terminals. Just think of the seabed fossils that crown the limestone summit of Everest and ancient forests of gingko and pine that nestle inside Antarctic sandstone.[571]

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[568] Ibid.

[569] Permanent Markers Implementation Plan, pdf. page 7.

[570] Storage and Disposal of Radioactive Waste.” *World Nuclear Association*.

[571] “Fossils from the Antarctic.” *British Antarctic Survey*, National Environment Research Council, 2015, https://www.bas.ac.uk/data/our-data/collections/geological-collections/fossils-from-the-antarctic/. Accessed 26 Mar. 2024.

5.9. Natural Disaster-made Time Capsules

On Mar 11, 2011, about 72 miles east of Japan's Oshika Peninsula, the ocean seafloor ruptured. The heavy Pacific Plate subducted under the Eurasion plate, initiating a magnitude 9.0 earthquake and a series of tsunami waves–some over 38 meters in height–that decimated the coastal communities of the Tōhoku region on Japan's main island of Honshu.[572] It was an especially deadly and ruinous natural disaster, and this suffering was compounded when waves knocked out the generator to the Fukushima Daiichi Nuclear Power Station, causing a partial meltdown. This was followed by fires and explosions releasing radioactive particles into the sea and air. The exposed nuclear core added poison to quake and wave.

The Kuroshio Ocean current takes water from the east coast of Japan over 5,000 miles across the Pacific Ocean to the beaches of Haida Gwaii. On April 18, 2012, beachcomber Peter Mark, walking along the shore of Graham Island found a message from the Tōhoku disaster.[573] It was not a note in a bottle but a battered motorcycle inside the remains of the back of a box truck. The motorcycle had Japanese plates. The ocean had carried the bike in its maw for a year only to spit it out on a Haida beach. This discovery was weirdly inspiring. It made news all over the world. The Harley-Davidson Motor Company expressed a wish in restoring the bike. A search began for its owner–if the owner was even alive.

"I found out at night from a friend and it kept me wide awake," recounted Ikuo Yokoyama, on learning of his motorbike's voyage across the Pacific.[574] Yokoyama lost three members of his family in the Tōhoku disaster. His home was sucked into the ocean. Although nothing can assuage the magnitude of such a loss, the discovery of his bike was a small and curious solace. Sea waves that had caused such harm had also

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[572] The most powerful quake to hit Japan since 1900; over 20,000 people died in the tsunami. Pletcher, Kenneth and Rafferty, John P. "Japan earthquake and tsunami of 2011." *Encyclopedia Britannica*, 4 Mar. 2024, https://www.britannica.com/event/Japan-earthquake-and-tsunami-of-2011. Accessed 26 March 2024.

[573] "Motorcycle washed up in B.C. may be Japanese tsunami debris." *CBC News*, Updated 29 Apr. 2012, https://www.cbc.ca/news/canada/british-columbia/motorcycle-washed-up-in-b-c-may-be-japanese-tsunami-debris-1.1237580. Accessed June 21, 2021.

[574] "Tsunami motorcycle owner located in Japan." *CBC News*, Updated 1 May 2012, https://www.cbc.ca/news/canada/british-columbia/tsunami-motorcycle-owner-located-in-japan-1.1279536. Accessed 21 June 2021.

carefully, even miraculously, returned a cherished object. Now, this motor bike is no longer just a bike. Like Mathilde's bottle, it has a story; it has significance. It is a time-travelling object, heavy with memory. In taking a year-long beating untethered inside the box, tossed and crashed by waves, the motorbike becomes imbued with a feeling of 'survival.' Precipitated by disaster, its fearful journey astonishes us; the bike becomes a symbolic object of perseverance and endurance. And it becomes a sublime object that must now must be cared for to honour the loss of life.

5.10. Geological Time Capsules

Geologists have divided up the physical history of the earth into time divisions stretching from its fiery birth to its current blue marble iteration. Geologically speaking, Earth starts in the grimly named Hadean Eon. This early earth is still a molten coalescing ball when an asteroid cleaves off a chunk to create the moon and bangs a tilt into our spinning axis to give rise to seasons and tides. Over 4.5 billion years, the earth cycles through life creations and extinctions, ocean and continent churn, and melds into the shape of the world we know now.

Current scholarship desires to name this 'now,' this 'age of humans,' as a geological epoch unto itself. This human age would slot into place on the time chart atop the Holocene–the epoch that began at the last great Ice Age, 11,650 years ago, and extends into the present. As an interglacial period, the Holocene has had a pretty consistent climate with a few exceptions. This consistency (a complex formula of jet stream, ocean temperature, and polar ice) has enabled the rich biodiversity and species distribution in which humanity thrives. Yet, it is also the epoch human beings seem intent to *evolve out of*, having dramatically influenced the natural processes of the earth, inducing and accelerating changes that would normally only occur on a deep-time scale. The term "Anthropocene' is proposed to reflect this.[575]

The adoption of Anthropocene as a distinct epoch is not without critics. It plays into the idea of human exceptionalism. Just how will our 'exceptional' time layer

[575] The term 'Anthropocene' was devised in 2000, by Paul Crutzen and Eugene Stoermer. 'Anthropocene' has not yet been ratified by International Union of Geological Sciences.

manifest? Despite our extensive planetary reshaping, to envision that we will leave behind anything spectacular in the geological record is, in Peter Brennan's blunt estimation, "a joke." [576] "All is vanity," he argues, "Very little of our handiwork will survive the obliteration of the ages."[577] To consider 'the age of humans' as a deep time 'epoch' is a gross miscalculation of our importance. "What humans are doing to the planet… is extremely transient," Brannen writes; we are merely 'an event,' and one which is "blisteringly short."[578] To demonstrate this, he draws attention to the long reign of the dinosaurs–over 180 million years. Before the asteroid obliteration 66 million years ago, dinosaurs thrived.[579] Yet there are relatively few found in the fossil record. Brannen also remarks on the laborious accumulation rate of marine sediments–a little more than a centimeter per 1,000 years. Thus, he says, "a dozen centimeters of muck seems an optimistic goal for [human] civilization."[580]

Arguably, the concept of the Anthropocene is less as an identifiable band in deep time strata and more as a contextualization of our time on Earth for our benefit. If we want a presence in the deep time record, we should perhaps consider ways to facilitate our 'optimum thriving' for the continuation of our species to extend our time blip. As Earth accelerates into a heating cycle, this outlook seems increasingly remote; Carbon-based (and silicon-based) life forms cannot handle extremes of temperature.

5.11. The Anthropocene Midden

A time capsule should be an object of truth, a truth-teller from the past. We may well want to manipulate the future, but time has a way of drawing truth from trick. Before

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[576] Brennan, Peter. "The Anthropocene is a Joke." *The Atlantic,* 13 Aug. 2019, https://www.theatlantic.com/science/archive/2019/08/arrogance-anthropocene/595795/. Accessed 22 May 2021.

[577] Ibid.

[578] Ibid.

[579] The Mesozoic Era ended 66 million years ago with a mass extinction due to massive asteroid impact–75% of all animal (reptile) life lost.
Osterloff, Emily. "How an asteroid ended the age of the dinosaurs." *Natural History Museum*, https://www.nhm.ac.uk/discover/how-an-asteroid-caused-extinction-of-dinosaurs.html. Accessed 26 Mar. 2024.

[580] Brennan. "The Anthropocene is a Joke."

we return to stardust, it behooves us to consider our time legacy: far deep time will erase us, however, *near* deep time record will hold a memory.

In 10,000 years, the middens of twenty-first century civilization will expose our presence. We will reveal ourselves in our waste. Our anaerobic landfills form near-deep time capsules that preserve organic evidence and clues to our nature. For the near-deep time anthropologist the midden is a gold mine.

In the Anthropocentric landfill, mummifying among the plastics and e-waste, the bones of one species are be a standout.[581] The chicken is the world's most populous bird and the most popular food bird. Bred by humans to be eaten by humans–some 60 billion chickens are killed every year–the bony remains thrown out in our kitchen waste.[582] Chicken bones are a "a signal of a human reconfigured biosphere," writes Carys Bennett, University of Leicester, co-author of a study into the chicken's impact, "Broiler chickens, now unable to survive without human intervention, have a combined mass exceeding that of all other birds on Earth; this novel morphotype symbolizes the unprecedented human reconfiguration of the Earth's biosphere."[583]

Another material also signifies human reconfiguration; in the Anthropocentric landfill plastic is in abundance. This material is the synthetic reconstitution of crude oil, natural gas and coal.[584] Hard plastics are made to last forever. A plastic milk jug can survive for a million years; a plastic bag for one thousand.[585] To make materials of this

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[581] The midden is full of e-waste which pollutes; it does not biodegrade but releases a toxic soup of heavy metals into the soil.
"How Long Does it Take Electronic Waste to Decompose?" *ERI*, 3 Nov. 2015, https://eridirect.com/blog/2015/11/how-long-does-it-take-electronic-waste-to-decompose/. Accessed 26 Mar. 2024.

Wong, Sam. "When humans are wiped from Earth, the chicken bones will remain." *New Scientist*, 12 Dec. 2018, https://www.newscientist.com/article/2187838-when-humans-are-wiped-from-earth-the-chicken-bones-will-remain/. Accessed 26 Mar. 2024.

[582] Farrier and Aeon. "How the Concept of Deep Time is Changing."

[583] Bennet, Carys E., et al. "The broiler chicken as a signal of a human reconfigured biosphere" *Royal Society Open Science.* 12 Dec. 2018. https://royalsocietypublishing.org/doi/10.1098/rsos.180325. Accessed May 31, 2021.

Bennett CE et al. 2018 The broiler chicken as a signal of a human reconfigured biosphere. R. Soc. open sci. 5: 180325. http://dx.doi.org/10.1098/rsos.180325

[584] Baheti, Payal. "How is plastic made?" *British Plastics Federation*, https://www.bpf.co.uk/plastipedia/how-is-plastic-made.aspx. Accessed 3 July 2021.

[585] "How Long Does it Take Electronic Waste to Decompose?" *ERI.*

resilience, oil, gas and/or coal are refined in a furnace. Through a process known as fractal distillation the vapours and solids of hydrocarbons are separated by weight and boiling point into different hydrocarbon chains for separate uses. Chemicals added to the hydrocarbon beads adjust the polymerization recipe for resins, paints, adhesives, solvents, textiles, vinyl, diaphanous wraps or clear hard bottles. From the organic oil (the rendered bodies of trillions of ancient sea creatures) a synthetic construction of molecular elements is created–elements that the natural world cannot fold back into itself (the ethylene, polystyrenes, propylene, butanes).

We sign our plastic. The far-future midden archeologist will find our plastic laced with clues and codes. Our 'signatures' present as symbols–a number contained within the arrowed 'recycling' triangle. The number '3' signifies polyvinyl chloride (PVC), '6' is the name of polystyrene (PS). Plastic relics replacing the artifacts of the pre-plastic midden (glass, wood, bone, ceramic), appear in an array of colours and textures–all stamped with a generic 'made-by-humans' signature.[586]

The poisons of our throw-away manufacturing, the toxic persistency of chemicals, e-waste heavy metals, fertilizers, pesticides, and pharmaceuticals, leech from the time capsule middens soiling and seeping into ground water, running into rivers, flowing to the seas. Much of this ecological manipulation is lost in time, however, the scars of monumental scale of our earthworks and extraction industries remains. Mountain-top removal coal mines, like those found in the Appalachian region of the United States require deep-time healing to regenerate.[587] The unnatural disfigurement of the boreal forest in northern Albertan due to oil sands development can be seen from space. David Farrier observes, "A single mine in Canada's tar sands region moves 30 billion tons of sediment annually, double the quantity moved by all the worlds' rivers combined."[588]

Arguably, the most dangerous planetary manipulation brought about by human activity is the accumulation of atmospheric carbon. The resultant greenhouse gas dome

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[586] Ibid.

[587] "What is Mountaintop Removal Mining." *Earthjustice,* 4 June 2010, https://earthjustice.org/features/campaigns/what-is-mountaintop-removal-mining. Accessed 15 June 2021.

[588] Farrier, David. "How Cities Will Fossilise." *BBC Future,* 5 May 2021, https://www.bbc.com/future/article/20210505-how-cities-will-fossilise. Accessed June 15, 2021.

is cooking the planet underneath. As the ice mass is lost from the world's tallest mountains, the weight of water in the rivers and ocean's increases, and the hard, continental Earth, "behaving like an elastic body, uplifts in a response to the load loss."[589]

The ice mass loss and subsequent water redistribution from the earth's polar regions has shifted the earth's axis. "The poles have always wandered very gradually," explains Jeremy Plester, "but in 1995 the north pole turned away from Canada towards Russia and accelerated over the next 15 years, 17 times faster than the previous 15 years."[590]

Ice loss through warming ocean temperatures causes sea levels to rise, and intensifying weather volatility. Hurricanes are stronger and more frequent. The weight of rain that fell on city of Houston from Hurricane Harvey (August 2017) was 275 trillion pounds. As detected by global positioning satellites, the water "deformed" the ground in Texas, pushing it down by two centimeters.[591]

5.12. The Techosphere Time Capsule

The human-built environment is also 'deforming' the Earth's crust. The concentrated mass of the urban environment is causing cities to sink making us more susceptible to flood events. Tom Parson estimates that by the year 2050, over 70% of the world's population will live in metropolitan areas, causing "urban subsidence." "As global populations move disproportionately toward the coasts," he forewarns, "this

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[589] Madrigal, Alexis. C. "The Houston Flooding Pushed the Earth's Crust Down 2 Centimeters." *The Atlantic,* 5 Sept. 2017, https://www.theatlantic.com/technology/archive/2017/09/hurricane-harvey-deformed-the-earths-crust-around-houston/538866/. Accessed May 3, 2021

[590] Plester, Jeremy. "How melting glaciers have accelerated a shift in Earth's axis." *The Guardian*, 6 May 2021, https://www.theguardian.com/environment/2021/may/06/how-melting-glaciers-have-accelerated-a-shift-in-earths-axis. Accessed 6 May 2021.

[591] Madrigal. "The Houston Flooding …"

additional subsidence in combination with expected sea level rise may exacerbate risk associated with inundation."[592]

"Anthropogenic mass" is equal to and now exceeding the weight of organic life. The weight of Earth's life forms is calculated to be 1.1 trillion metric tonnes, a number, Maggie Stone estimates, is not changing, while "the amount of concrete, asphalt, metal, and plastic on Earth is growing fast." "This year [2020]", she writes, "may mark the point when artificial stuff outweighs living things."[593] She draws attention to a research team of scientists led by palaeobiology Jan Zalasiewicz, University of Leicester, UK, and their attempt to measure the 'technosphere.' [594] They included "not just wholly artificial buildings and products, but also the approximate weight of the land and seafloor that we've excavated, modified or trawled to build cities, plant crops, raise livestock."[595] Zalasiewicz and his team reveals how this 'technosphere,' as it progresses into deep time, will contain an array of "complex objects" or "technofossils." They write:

> If assessed on palaeontological criteria, technofossil diversity already exceeds known estimates of biological diversity as measured by richness, far exceeds recognized fossil diversity, and may exceed total biological diversity through Earth's history. The rapid transformation of much of Earth's surface mass into the technosphere and its myriad components underscores the novelty of the current planetary transformation.[596]

The far-future archeologist may have a far more curious assortment of relics in the fossil record than just chicken bones and plastic.

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[592] Parsons. Tom. "The Weight of Cities: Urbanization Effects on Earth's Subsurface." *AGU Advances*, 14 January 2021, https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020AV000277. Accessed 17 June 2021.

[593] Stone, Maddie. "Human-made materials now equal weight of all life on Earth." *National Geographic UK, 9* Dec. 2020. https://www.nationalgeographic.co.uk/environment-and-conservation/2020/12/human-made-materials-now-equal-weight-of-all-life-on-earth. Accessed 1 May 2021.

[594] Zalasiewicz, Jan et al. "Scale and diversity of the physical technosphere: A geological perspective." *The Anthropocene Review*, Vol 4. Issue 1, Published online 28 Nov. 2016. https://journals.sagepub.com/doi/abs/10.1177/2053019616677743?journalCode=anra&. Accessed 5 July 2021.

[595] Stone. "Human-made materials…"

[596] Ibid.

The ‘fossilization of cities’ is an area of research for David Farrier.[597] “Fossils are a kind of planetary memory of the shapes the world once wore,” he writes, asking, “Just as the landscapes of the deep past are not forgotten, how will the rock record of the deep future remember Shanghai, New York and other great cities?” Farrier, drawing on Zalasiewicz’s research, dissects the fossilization of Shanghai Tower, a structure weighing 850,000 tonnes, with a steel framework of 632 meters tall, with 20,000 panes of glass and 60,000 cubic metres of concrete.[598] This tower, currently the world’s second tallest, will over the span of deep time warp and fracture, fill with water and muds, dissolve, erode, carbonize, and compress until it is reduced to a strata layer of only a few meters in thickness. Billions of years from now, Farrier explains, “all that [will be] left of Shanghai Tower is a geological anomaly studded with the fossil outlines of chopsticks, chairs, sim cards, and hair clips.”[599] “Geology,” he asserts, “never stands still.”[600]

5.13. Interstellar Geological Time Capsules

One reason that space rocks are so fascinating is, with a few exceptions (e.g. the Apollo moon rocks), they have come from somewhere we cannot go. Asteroids are of particular fascination; they are the leftover pieces from the dawn of our solar system. Most are held in place, orbiting between the gravitational forces of Mars and Jupiter, but every so often, an asteroid breaks away and strays earthwards. Most asteroids become meteorites in the earth’s atmosphere burning up before they hit the ground. A massive asteroid impact–like the one some 66 million years ago that is theorized to be behind the mass dinosaur extinction–is cataclysmic. Every year thousands of meteorites illuminate

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[597] Farrier, David. “How Cities Will Fossilise.”

[598] Ibid.
Also see: Shanghai tower: construction started in 2008. It is currently the world's second tallest building

“Shanghai tower by gensler is the world's second tallest building.” *Design Boom*, https://www.designboom.com/architecture/shanghai-tower-china-tallest-building-skyscraper-gensler-01-15-2017/. Accessed 15 June 2021.

[599] Farrier. “How Cities Will Fossilise.”

[600] Ibid.

our nights skies as shooting stars, and the ones that fail to fully incandesce crash as meteors.

Sometime during our near-deep past, four to five thousand years ago, a 600-tonne asteroid, travelling at 14,000 km/h slammed in the Earth's upper atmosphere at a near right angle. The resulting explosion sprayed meteorites over a 1,350 square kilometer range in northern Argentina. The ancient forests underneath were instantly carbonized.

The remains of thousands of these iron stars still exist, glinting blackly in the dusty soil of this cratered plain–the Campo del Cielo, the Field of the Sky. El Chaco, one of the largest meteorites at 37 tonnes, is on display at the site; the Otumpa mass, at 635 kilograms, is in the British Museum. Many smaller meteorites are collected like pocket change by poachers and sold on the black market for as much as gold.[601,]

The Campo del Cielo is a deep time debris field. The Campo meteorites are pure extraterrestrial metal: taenite and kamacite, an iron-nickel alloy with a unique crystalline lattice (the Widmanstätten pattern) found only in meteors when ore cools at a rate of one degree centigrade per million years.[602]

The Campo meteorites are time capsules of interstellar geology; they are filled with the primordial memory of 4.6 billion years. They are travellers from other worlds that have stepped out of their deep time journey to grace Earth. Here on Earth, we have not yet knowingly received any 'alien-made' objects into our solar system (the cigar shaped *Oumuamua* notwithstanding).[603] Any shooting star that defies atmospheric burn is a

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[601] Viano, Lucas. "Meteorite Thefts Pose a Problem in Ancient Impact Field" *Scientific American*, 19 June 2015, https://www.scientificamerican.com/article/meteorite-thefts-pose-a-problem-in-ancient-impact-field/. Accessed 11 Mar. 2024.

Herman, Gonzalo. "The Sad Story of Argentina's Disappearing Space Rocks." *Worldcrunch*, 1 Oct. 2019. https://worldcrunch.com/tech-science/the-sad-story-of-argentina39s-disappearing-space-rocks. Accessed 10 Oct. 2021.

[602] "The Widmanstätten Pattern and one of the oldest things on Earth." *Physics Online*, You Tube. 8 Jan. 2017. https://www.youtube.com/watch?v=uEBsklSKtc4. Accessed 13 Oct. 2021.

[603] Oumuamua ('Messenger' in Hawaiian), discovered on 19 October, 2017. This asteroid may be the first interstellar visitor to our solar system. It has been suggested that this asteroid is an alien probe.
Chotiner, Isaac. "Have Aliens Found Us? A Harvard Astronomer on the Mysterious Interstellar Object 'Oumuamua.'" *The New Yorker*, 6 Jan. 2019, https://www.newyorker.com/news/q-and-

tangible, hold-in-your-hand piece of deep space time. These meteors, in escaping from the heavens, become hierophantic objects.

In 2012, Scottish artist Katie Paterson was commissioned to create an artwork using a *Campo del Cielo* meteorite. Paterson, whose work deals with time and space approached this project in a novel way. The rock had come to earth as a 4.5 billion-year-old time capsule, and she wanted to send it back home into space as "a new version of itself." [604] The meteorite was thus cast, melted, and recast. The forgery Paterson employed has never melted such a metal before. Cut in half to fit into the furnace, the ancient metal revealed the unique striations and lustre of a completely alien object.

The finished recast meteorite is identical to its original form in every way, except that it is not: the atoms have changed places. "The iron, metal and dust inside have been reformed," Paterson explained, "and the layers of its cosmic lifespan–the intermixing of space and time, the billions of years of pressure and change–have become collapsed, transformed and then, by the hand of human technology, renewed."[605] The new object is "still ancient and a part of space, a part of the universe, [but also] part of the earth."

On July 30, 2013, with help from the European Space Agency, the reformed time capsule hitched a ride on the Automated Transfer Vehicle, *Georges Lemaître*, on route to the International Space Station where it was released back on its time journey.

It may yet again fall back to earth as a shooting star.

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a/have-aliens-found-us-a-harvard-astronomer-on-the-mysterious-interstellar-object-oumuamua Accessed 11 Oct. 2021.

[604] Paterson, Katie. "Campo del Cielo, Field of the Sky by Katie Paterson for Exhibition Road Show 2012." *Vimeo*. Uploaded 28 July 2012. 05:01, https://vimeo.com/46536435 Vimeo 05:01. Accessed 10 Oct. 2021.

[605] "Meteorite science meets an artist's dream of spaceflight." *European Space Agency*, 28 June 2013, https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/ATV/Meteorite_science_meets_an_artist_s_dream_of_spaceflight. Accessed 13 Oct. 2021.

Chapter 6.

Sublime Artifacts

Time capsule case studies

Some time capsules, due to circumstances of their creation or discovery, attain an 'iconic' status. They manifest in the global imagination as sublime objects, arks of human civilisation and survival. Released into the stream of time from a point in the past, they travel on as our proxies, our emissaries into a future state beyond our imagination. These capsules come to possess a prophetic, hierophantic human energy: they are something *of ourselves* made sacred through a time journey we cannot control.

This section presents a detailed examination of three time capsules that manifest such hierophantic energy and are emblematic of *sublime melancholia* for our age. The first is the Golden Record, affixed to both Voyager spacecraft. Although it is an artifact from 1977, and several generations of people born since Voyagers' launch may feel unrepresented by its contents, the Golden Record is still resonant. The Voyager probes, now sailing through interstellar space, are reaching the end of their useful tether to the earth. Communication will cease in the very near future and when this happens the Golden Record will be but a small outpost of humanity buried in the cosmos. This realization is profoundly affective. This time capsule may very well be they only extant remnant of human civilization in millennia to come.

The second time capsule considered here is the Svalbard Global Seed Vault. This is a capsule that is still *in progress*, still acquiring contents. The 'sealing off' date is unknown and may never come. It has been called both a "Doomsday vault" and a "frozen garden of Eden." Much of its sublime melancholia ties into its perceived *raison d'être*–that of a life raft thrown out to save any human survivors after the 'end of the world.' The necessary existence of a seed bank forces us to confront the terrifying wonder and sadness of our destructive proclivities. This is especially relevant as more and more of humanity face the spectre of the climate crisis.

Like the Svalbard Vault, Future Library, the third time capsule of this inquiry, is a capsule in progress. Future Library is an artwork that involves the assembly of 100

manuscripts over 100 years. It is also a ‘living’ capsule–quite literally–as it is embedded into the growth of a forest of trees. Unlike the Golden Record or the Svalbard Vault, it is human-scaled (its time journey is the upper reaches of a human life span) and therefore operates on a level of intimacy that the others lack. It is not adrift in space or buried in a polar cavern; the forest can be reached on public transport. It presents a hopeful antidote to the deep well of *solastalgia* endemic to present days by reaching a welcoming hand in the direction of our future kin. It suggests that the human need for connection to and communication with each other and the natural world can be achieved in smaller, mindful exercises of compassion.

Strands of connection have been made between these three time capsules before. This inquiry affirms these and seeks to strengthen these strands as it present these capsules as *sublime artifacts*.

6.1. The Golden Record

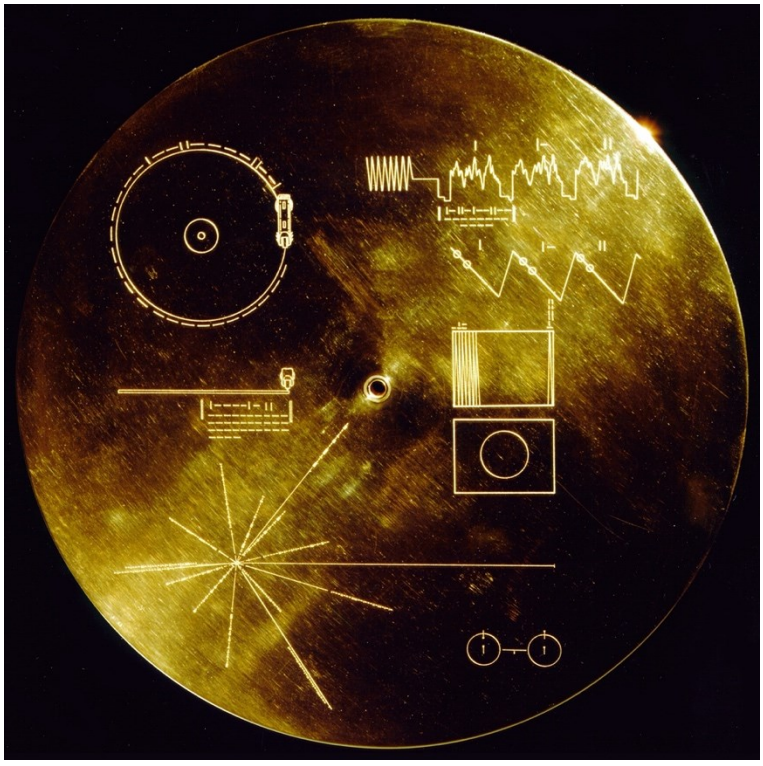

Figure 10. Voyager Golden Record Cover.
Photo: NASA/JPL-Caltech. Public Domain.
https://science.nasa.gov/image-detail/voyager-record-cover-446eb9/.

"The thing the Time Traveler held in his hand was a glittering metallic framework,
scarcely larger than a small clock, and very delicately made.
There was ivory in it, and some transparent crystalline substance.…
It is my plan for a machine to travel through Time."

~H.G. Wells, *The Time Machine*, Chapter 1.[606]

"We are a ball of fire in a dizzying descent toward the planet… we are a falling star.
If it were night, someone, somewhere would be wishing on us.

~Samantha Cristoforetti

(Soyuz TMA-15M landing, Kazakhstan, June 11, 2015).[607]

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[606] Wells, H.G. "Excerpt from The Time Machine." *Penguin Random House Canada,* https://www.penguinrandomhouse.ca/books/188557/the-time-machine-by-h-g-wells/9780375761188/excerpt. Accessed 26 Mar. 2024.

[607] Cristoforetti, Samantha. *Diary of an Apprentice Astronaut*. Allan Lane/ Penguin Random House, UK, 2020. p.1.

6.1.1. The Voyager Missions

In the summer of 1977, NASA launched the twin Voyager spacecraft on an interplanetary mission to look and listen to four giants of our solar system, Jupiter, Saturn, Uranus, and Neptune, and then continue on into interstellar space.[608] These four Giants presented in “a once-in -a-lifetime” alignment, allowing the spacecraft to harness the gravitational forces of each to ‘slingshot’ them forward to the next.[609]

The planetary sights did not disappoint: From arrival at Jupiter in early 1979 through to leaving Neptune’s last moon Triton in 1990, the twin Voyagers beamed back impossibly resplendent visions of the giant planets. Voyager 1 filmed Jupiter’s ‘Great Red Spot,’ a colossal Earth swallowing anticyclone that has raged for hundreds of years.[610] Voyager 2 sent back images of volcanic plumes 100 km high, erupting on Jupiter’s moon Io.[611] Voyager 1 watched sunlight spill through the grooves of Saturn’s rings. Skimming the robins’ egg-coloured cloud-tops of Uranus, Voyager 2 marvelled at Miranda, an irrational, violently-formed patchwork of rock, the planet’s “Frankenstein moon.”[612] In a close flyby of Neptune, Voyager 2 transmitted home images of another ‘blue marble,’ but this one quite unlike our own, instead, a dead ball of ice wreathed in inexpressibly cold, cobalt-coloured rimes.[613]

These visions of other worlds seem a very long time ago now; it has been over 30 years since the last images of Neptune were radioed home. Yet in the 44 years and

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[608] Voyager 2 was launched on 20 Aug. 1977; Voyager 1 was launched on 5 Sept.1977. Both launched from Cape Canaveral, Florida atop a Titan-Centaur rocket. Although Voyager 2 was launched before Voyager 1, it is on a slower trajectory. Voyager 1 reaching the Giants first.

[609] This alignment occurs once every 176 years.
A Once-in-a-Lifetime Alignment.” *Voyager/ Jet Propulsion Laboratory, NASA,* https://voyager.jpl.nasa.gov/mission/timeline/#event-a-once-in-a-lifetime-alignment. Accessed. 17 Oct. 2021.

[610] “Jupiter's Great Red Spot Viewed by Voyager I” *NASA*, 19 Mar. 2014, https://www.nasa.gov/content/jupiters-great-red-spot-viewed-by-voyager-i. Accessed. 17 Oct. 2021

[611] “Io.” *Jet Propulsion Laboratory/NASA,* Image Gallery, 14 Oct. 1999, https://www.jpl.nasa.gov/images/io-3, Accessed. 17 Oct. 2021.

[612] “Miranda.” *Science NASA*, https://science.nasa.gov/uranus/moons/miranda/. Accessed 17 Oct. 2021.

[613] “30 Years Ago: Voyager 2’s Historic Neptune Flyby.” *NASA*, 26 July 2023, https://www.nasa.gov/feature/jpl/30-years-ago-voyager-2s-historic-neptune-flyby. Accessed 17 Oct. 2021.

counting since the Voyagers' launch, NASA still tracks their progress by the second. Even so, we must consider whether this first 'reconnaissance mission' still has emotive value. We have been conditioned, over the last 50 years, to seeing our planet from above. Whether from weather satellites, drones, or Google Earth, we have formed a three-dimensional picture of Earth. The philosopher Timothy Morton observes, "Google Earth actually abolishes Earthrise as a distanced, aesthetic object with an aura… since you can zoom in and out and see many, many different places and angles on a whim."[614] We can almost completely satiate our curiosity about just about any nook or cranny of Earth if the information can be collected from above. This is not altogether a good thing, as Morton continues, "You can see my mother's fish pond in Wimbledon, London. But this intimacy is achieved at the expense of simultaneously evacuating the deep, surrounding, immersive lifeworld."[615] Moreover, the dynamic aspects of our planet that so thrilled the Romantics, from the raging storms to the transcendent summits, we can view from a vantage point that shows them in their entirety. This 'God view' disables sublimity. In identifying the pinwheel shape of a hurricane or diving down into Morton's mother's fish pond, there are less places for sublimity to hide.

In as much as the Voyagers were animators, turning the gas and ice giants into three-dimensional worlds, they have no supernatural power. Their 'God-view' was just an eyelash flutter, a glimpse behind a Thin Place veil. Here, we found objects illuminated by our own sun, and, in that fluttering veil, these planets appeared brilliant and numinous, their 'aesthetic auras' still intact, full of mystery. But the wonder of discovery was fleeting, for the two spacecraft sped past and away, their trajectories diverging. Voyager 1, after passing Saturn's moon Titan travelled north out of the planetary elliptical plane into the Kuiper Belt. Voyager 2, after passing Uranus then Neptune headed towards interstellar space.

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[614] 'Earthrise' is a reference to the photo taken by Apollo 8.
Morton, Timothy. *Ecology Without Nature*, Mar 30, 2009. Blog.
http://ecologywithoutnature.blogspot.com/2009/03/fiddlers-on-roof.html. Accessed 23 Oct. 2021.

[615] Ibid.

6.1.2. Artifacts of Infinity

Voyager 1 and 2, in 2004 and 2007 respectively, crossed Terminal Shock, the edge where interstellar plasma pushes up against and slows the solar winds. In 2012, and 2018, they breached the shield of the Heliosphere, that thin bubble-like membrane blown from the mouth of the sun that secures all the planets and matter orbiting within it. NASA estimates that in 40,000 years' time, Voyager 1 will float 1.6 light years of the star AC+79 3888, in the constellation Camelopardalis, and that in 296,000 years from now, Voyager 2 will drift within 4.3 light-years of Sirius, the 'dog-star', the brightest star in the night sky.[616] Barring the ravages of cosmic rays and micrometeorites, there is nothing to stop the spacecraft from continuing on their journey. Says NASA, "The Voyagers are destined—perhaps eternally—to wander the Milky Way."[617]

This eternal wandering is of particular note, for we know that Earth is not destined for eternal life in our galaxy. In 5 billion years from now, our sun will run out of fuel and turn supernova, incinerating our planet.[618] Interstellar spacecraft may all that is left of us, of our civilization, of our world. The Voyagers may become the sublime artifacts of infinity.

6.1.3. Pale Blue Dot

Perhaps it was a foreshadowing of our impending cosmic insignificance or a realization that this journey was one into infinity, that Carl Sagan, an advisor to the Voyager program, initiated a 'good-bye' gesture. Voyager 1 had just finished its fly-by of Neptune and the technicians communicating with the probe were preparing to power down its electronic eyes to save energy. Sagan asked them to turn the craft around for one last 'look.'

On Valentine's Day, 1990, at distance of 6 billion kilometers from the sun, Voyager 1's camera was turned back to face Earth to take pictures. From these digital

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[616] "Voyager– the Interstellar Mission." *Voyager/Jet Propulsion Laboratory/NASA,* https://voyager.jpl.nasa.gov/mission/interstellar-mission/. Accessed 26 Mar. 2024.

[617] Ibid.

[618] Frazier, Sarah. "Why the Sun Won't Become a Black Hole." *NASA*, 26 Sept. 2019, https://www.nasa.gov/image-feature/goddard/2019/why-the-sun-wont-become-a-black-hole. Accessed 26 Mar. 2024.

images sent home NASA created a 60-frame mosaic, “a family portrait” of our solar system. Voyager 1 photographed all the planets save Mercury (too close to the sun), Pluto (a ‘dwarf planet,’ too dark and tiny), and Mars (obscured by lens glare). The most remarkable frame is the one showing Earth. It is not entirely recognizable: all the intuitive features, from the swirling clouds to the blue oceans that we have come to expect in images of our planet from space are absent. Instead, we strain to see Earth. In this grainy, low-fi image, a bluey-grey background stippled with shafts of sunlight, it is a blue fleck, just a one and a half pixels high. If it were not for the sun’s rays, we would miss it altogether. ‘Pale Blue Dot’ is Sagan’s expression for this blue pixel, this infinitesimally small Earth, “a lonely speck,”[619] he says, just a “mote of dust suspended in a sunbeam.”[620] This image inspired Sagan to write a paean to human exceptionalism and our cosmic insignificance:

> “From this distant vantage point, the Earth might not seem of any particular interest. But for us, it’s different. Consider again that dot. That’s here, that's home, that’s us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was, lived out their lives…”[621]

This deeply evocative image is a heightened sublimity. ‘Pale Blue Dot’ is a defining moment. Just as the ‘Earthrise’ photo situated our relationship with the moon and the black of space, the pixel-sized ‘Pale Blue Dot’ established our place in our solar system. NASA’s Jet Propulsion Laboratory, which maintains the Voyager program, mounted a 20-foot long solar system “family portrait” on a wall in its Theodore von Kármán Auditorium. The Earth panel proved mesmerizing: “Members of the Voyager imaging team said in a 2019 research paper that the image of Earth had to be replaced often because so many people touched it.”[622]

The Voyager spacecraft are emissaries of the technosphere, and although they seem technologically ancient to us today, they are still, albeit very quietly, talking to

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[619] “Carl Sagan's Pale Blue Dot OFFICIAL.” *Carlsagandotcom/YouTube*, https://www.youtube.com/watch?v=GO5FwsblpT8. Accessed 15 July 2021.

[620] Rosen, Rebecca J. “An Early Draft of Carl Sagan's Famous ‘Pale Blue Dot’ Quote.” *The Atlantic*, 3 Feb. 2014, https://www.theatlantic.com/technology/archive/2014/02/an-early-draft-of-carl-sagans-famous-pale-blue-dot-quote/283516/. Accessed 15 July 2021.

[621] Rosen, “An Early Draft…”

[622] “The Pale Blue Dot–Revisited.” *Science NASA*, Historical Date: 14 Feb. 1990, https://solarsystem.nasa.gov/resources/536/voyager-1s-pale-blue-dot/. Accessed 16 July 2021.

Earth. This conversation now takes a long time–a signal, sent at the speed of light, takes over 42 hours and counting to be beamed to us and our reply relayed back, and this conversation may not last too much longer. Sometime, predicted to be in the year 2025, the radioisotopes keeping the instruments functioning will decay down to nothing. The Voyagers have already turned off their eyes, but they diligently continue to taste and listen for interesting particles, plasma, waves, magnetic fields. Recently, they tell us, that interstellar space has a faint hum, not unlike the sound of gentle rain.[623]

6.1.4. Sending messages across the universe

Both Voyager spacecraft have left our Solar System and are travelling through interstellar space, more than 155 AU (14 billion miles) from Earth.[624] These explorers, cast on a forever-and-ever mission, are now the most distant objects that we humans have created.

Long after the Voyager heart-boxes of Plutonium-238 have ceased to beat, they will continue as artifacts. Imagine a billion years from now, the once gleaming dish that comprising the high gain antennae used to communicate with Earth is a tarnished shell, a beautiful relic. The three radioisotope thermoelectric generators have long gone cold. The instrument arms that once measured and collected data–the infrared spectrometers, plasma particle detectors–are spaceship-to-Earth offline. The elongated lattice magnetometer sticking out awkwardly may in fact be detecting magnetic fields, it just can't tell anyone. But mounted on the chassis, and carefully designed to thrive in deep time travel is the Golden Record. This is the time capsule sent by Planet Earth in 1977. It has resisted blasts of radiation from Jupiter and blasts of cosmic dust from Saturn, and yet, due to a combination of engineering skill and compassionate construction, one-billion years from now it should be just as bright and shiny and playable as the day it left Earth.[625]

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[623] Rao, Rahul. "Voyager 1 discovers faint plasma 'hum' in interstellar space." *Space*, 17 May 2021, https://www.space.com/voyager-plasma-hum-interstellar-space. Accessed 27 Oct. 2021.

[624] 155 Astral Units as of October, 2021.
"Where are the Voyagers now?" *Voyager/Jet Propulsion Laboratory/NASA,* https://voyager.jpl.nasa.gov/mission/status/#where_are_they_now. Accessed 27 Oct. 2021.

[625] "'If I had to guess, I'd say it's as fresh and new as the day it was placed on the spacecraft," says David Doody, an engineer on the Voyager mission at NASA's Jet Propulsion Laboratory."'

The Golden Record is the audio/visual greeting we have sent to travel through space and time hoping for intergalactic intercept. This is not the first time we have sent messages into space. Both Pioneer spacecraft (1972, 1973) carried pictographic messages–gold-anodized aluminium plaques, engraved with a schematic diagram of the solar system and Pioneer's trajectory through it. Also engraved is a pulsar map,[626] and a line drawing of a nude man and a woman. The New Horizons spacecraft (2006) sent to explore the dwarf planet Pluto does not carry a message, but a grassroots movement is petitioning NASA to get one made and uploaded to the computer onboard. A chance to send something that far forward into time, cannot be missed.[627]

Spacecraft are a slow method of reaching out to our interstellar neighbours. Sound and light travel much faster.[628] The desire to beam messages into the night sky is a deeply felt one. We all wonder if we are alone in the universe. Michael Schirber remarks that we have a 150 year history of trying to talk to aliens–that early 19th century scientists were trying to figure out how to reach Venusians and Martians.[629] He points to British statistician Francis Galton's idea, in 1896, to beam up a light-based "Morse code," and French Astronomical Society fellow A. Mercier's plan, around the same time, for giant reflectors to be attached to the Eiffel Tower to direct sunlight to Mars. "Could aliens have seen any of these light displays?" Schirber asks, answering with SETI Institute's

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LaFrance, Adrienne. "Humanity's Moat Famous Mixtape is now 11 billion Miles from Earth." *The Atlantic*, 22 Sept. 2014, https://www.theatlantic.com/technology/archive/2014/09/humanitys-most-famous-mixtape-is-now-11-billion-miles-from-earth/380552/. Accessed Aug 3, 2021.

[626] "It shows the location of the solar system with respect to 14 pulsars, whose precise periods are given."

"The Golden Record Cover." *Voyager/Jet Propulsion Laboratory/NASA*, https://voyager.jpl.nasa.gov/golden-record/golden-record-cover/. Accessed Aug 3, 2021.

[627] Washburn, Mark "New Horizons One Earth Message." *The Planetary Society*, 24 Apr. 2015, https://www.planetary.org/articles/0424-new-horizons-one-earth-message. Accessed 31 Oct. 2021.

[628] Sagan, Carl et Al. *Murmurs of Earth: The Voyager Interstellar Record*. New York, Random House, 1978. p. 6.

[629] Shirber, Michael. "Attempts to Contact Aliens Date Back More Than 150 Years." *Space*, 29 Jan. 2009, https://www.space.com/6370-attempts-contact-aliens-date-150-years.html. Accessed 6 July 2021.

Seth Shostak's remark: "It depends on how much money you think the Martians are spending on their telescopes."[630]

Since the 1950s, radio communication is the preferred method of talking to outer space. Until it collapsed on Dec 1st, 2020, Arecibo, the massive single dish radio telescope in Puerto Rico, was actively involved in the Search for Extra Terrestrial Intelligence (SETI) both listening for and transmitting messages.[631] In 1974, Arecibo broadcast a message aiming for the M13 star cluster, 21,000 light-years away.[632] This message was as much as anything a demonstration of technical prowess, "to call attention to the tremendous power of the radar transmitter … and the ability of the telescope's 1,000-foot diameter dish antenna to project a powerful signal into space."[633] It manifested as a 3-minute long broadcast, "1,679 bits of information arranged into 73 lines of 23 characters per line … The "ones" and "zeroes" were transmitted by frequency shifting at the rate of 10 bits per second."[634] A glyph representation of the message includes a human stick-figure, a DNA helix, the solar system, and the Arecibo telescope itself[635]

No-one in the M13 cluster has yet responded. The SETI Institute points out that one important purpose of the transmission was conceptual: "the experiment was useful in getting us to think a bit about the difficulties of communicating across space, time, and a presumably wide culture gap."[636] The very process of trying to make contact mixes wonder and fear. What do we say to someone or something that is millions of light years

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[630] Ibid.

[631] "Once the world's largest single-dish radio telescope, the Arecibo facility has been the site of many key astronomical discoveries over the years, including observations of the spinning stars known as pulsars that led to the 1993 Nobel Prize in Physics"

Witze, Alexandra. "Gut-wrenching footage documents Arecibo telescope's collapse." *Nature*, 2 Dec. 2020, https://www.nature.com/articles/d41586-020-03421-y. Accessed 6 Oct. 2021.

[632] Howell, Elizabeth. "Arecibo Observatory: Watching for asteroids, waiting for E.T." *Space*, 25 Nov. 2020, https://www.space.com/20984-arecibo-observatory.html. Accessed 6 Oct. 2021.

[633] "It's the 25th anniversary of Earth's first attempt to phone E.T." Cornell News, 12 Nov. 1999, https://news.cornell.edu/stories/1999/11/25th-anniversary-first-attempt-phone-et-0. Accessed 25 Mar. 2024.

[634] "Arecibo Message." *SETI Institute,* https://www.seti.org/seti-institute/project/details/arecibo-message. Accessed 6 Oct. 2021.

[635] "It's the 25th anniversary … phone E.T." Cornell News.

[636] "Arceibo Message." *SETI Institute*.

away? (And what do we say if an answer comes back?) This exercise in far-future communication may seem useless, futile, even trivial and crazy, but we have a compulsion to keep doing it. As recently as 2008, NASA scientists beamed the Beatles' song 'Across the Universe' in the direction of Polaris, 431 light years away.[637] "Send my love to the Aliens" wished Paul McCartney.[638]

6.1.5. The Golden Portrait of Earth

Just as Carl Sagan had the intuition to have Voyager 1 take a good-bye photo, he also had the forethought to have the two spacecraft take a 'hello' into the future. The Voyagers are more than just space fossils; they carry a time capsule made by humans for the express purpose of communicating with other intelligent, spacefaring life. Sagan assembled a team, selected the repertoire, and put together a 'sampler' of Planet Earth.[639] The team justified and explained the purpose behind every selection whether image, spoken language, or music. They called their collection of natural sounds of the earth "an evolutionary audio essay."[640] It is an idealized portrait of Earth, all good things. "They contained nothing about disease, conflict, or the Cold War nuclear fears that drove the American space program," Austin Considine observes. [641] "A Hallmark card of earth,"

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[637] LaFrance. "Humanity's Moat Famous Mixtape …"

[638] "Amazing! Well done, NASA!" McCartney said in a message to the space agency. "Send my love to the aliens. All the best, Paul." The transmission of the song was through NASA's Deep Space Network.

"NASA and the Beatles Celebrate Anniversaries by Beaming Song 'Across the Universe' Into Deep Space." *Jet Propulsion Laboratory/NASA*, 31 Jan. 2008, https://www.jpl.nasa.gov/news/nasa-and-the-beatles-celebrate-anniversaries-by-beaming-song-across-the-universe-into-deep-space. Accessed 25 Mar. 2024.

[639] The contents of the record were selected for NASA by a committee chaired by Carl Sagan of Cornell University, et. al. Sagan's team: F.D Drake, Ann Druyan, Timothy Ferris, Jon Lomberg, Linda Saltzman Sagan

"What are the contents of the Golden Record?" *Voyager/Jet Propulsion Laboratory/NASA*, https://voyager.jpl.nasa.gov/golden-record/whats-on-the-record/. Accessed 3 Aug. 2021.

[640] Sagan, *Murmurs* of Earth, Preface.

[641] Considine, Austin "A Time-Capsule Lunched into Space for Aliens to Find When All the Humans Are Gone," *The Atlantic*, 30 Nov. 2012, https://www.theatlantic.com/technology/archive/2012/11/a-time-capsule-launched-into-space-for-aliens-to-find-when-all-the-humans-are-gone/265718/. Accessed 3 Aug. 2021.

the artist Trevor Paglen calls The Golden Record.[642] Or a glossy travel brochure: Come Visit Our Planet.

This portrait concentrates on the best aspects of our being. It presents the natural world in Romantic glory and the human world's most celebrated acts of civilization. It is also a deliberate 'global' project of peaceful, cooperative optimism, a multi-lingual confluence: 'Hello, we are the people of Planet Earth.'[643] Says Sagan, "The launching of this bottle into the cosmic ocean says something very hopeful about life on this planet."[644]

The Golden Record looks and plays like a 12" phonograph record. It is made gold-plated copper and comes with its own stylus already fixed in the correct playing position. It is housed inside an aluminum jacket providing an ultra-pure vacuum environment. The jacket is inscribed with symbolic instructions, on how to play the record; it explains how to visually reconstruct the black and white images (rendered down into an analogue audio form of 'zeros and ones') from the audio signals.[645] It is also etched with information glyphs on the origin of the spacecraft and our place in our solar system. It includes the Pioneer spacecraft's 'Pulsar map.' Hand-etched onto the record is the inscription, "To the makers of music – all worlds, all times."[646]

Electroplated to the Golden Record's cover is a clock. It is circular, two-centimeters in diameter, and composed of ultra-pure isotopes of Uranium-238 a radioactive element with a half-life of 4.468 billion years. It was Carl Sagan's belief that spacefaring beings would have scientific knowledge: "the first successful communications will be scientific."[647] If it is in science where we will meet, these beings

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[642] Murphy, Heather. "Do Aliens Need Photo Captions? Werner Herzog Thinks So." *Slate*, 21 Sept. 2012, http://www.slate.com/blogs/browbeat/2012/09/21/the_last_pictures_space_project_werner_herzog_responds_.html. Accessed 3 Aug. 2021.

[643] Very reminiscent of the messages left by Apollo 11 on the surface of the moon, although it was 5 years since the end of the Apollo program.

Sagan. *Murmurs of Earth*. p. 28.

[644] "What are the contents of the Golden Record?" *Voyager/JPL/NASA*,

[645] Ibid.

[646] "Making of the Golden Record." *Voyager/Jet Propulsion Laboratory/NASA*, https://voyager.jpl.nasa.gov/golden-record/making-of-the-golden-record/. Accessed 3 Aug. 2021.

[647] Sagan. *Murmurs of Earth*. p. 6.

will be able to decipher the inherent message (the ‘how far,’ ‘how long,’ and ‘from where’ questions this artifact poses) from this uranium inlay. These spacefaring strangers can tell time.

One side of the Record is the collection of 118 images. Among this myriad (and disparate) collection are photos of animal life–a crocodile, a human hand holding a frog, the scientist Jane Goodall with a group of chimps. There are scenes of human activity such as people eating food and a string quartet playing music. The mountaineer Gaston Rebuffat is shown atop a spire in the Alps. The disc has snowflakes, daffodils, seashells, and trees. To satiate any extraterrestrial interest in us, the disc has diagrams of human anatomy, a foetus, and DNA structures. It contains a collection of images pertinent to human civilization, like the Taj Mahal and an airport (Toronto Pearson). It has an image of Earth from space.

The ‘audio’ side of the Record begins with “Greetings” in 55 languages. The first is in Akkadian, a Sumerian language from six thousand years ago (“Which makes sense [starting the recording in Sumerian]: so did writing,” observes Anthony Morena).[648] It ends with a greeting in Wu, a modern Chinese dialect.[649] “Hello to the residents of far skies,” says a voice in Farsi; “Greetings from a human being of the Earth. Please contact,” says the voice speaking Gujarati; “Good health to you now and forever,” says the voice speaking Welsh.[650]

“We felt it was fitting that Voyager greet the universe as a representative of one community, albeit a complex one consisting of many parts.” writes Linda Saltzman Sagan, explaining the rationale behind the multilingual effort. “The greetings are an aural Gestalt,” she continues, “in which each culture is a contributing voice in the choir. …we are making an effort to de-provincialize, to rise above our nationalistic interests and join a commonwealth of space-faring societies, if one exists.”[651]

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[648] Morena, Anthony. *The Voyager Record: A Transmission*. Brookline, Rose Metal Press, 2016. p. 6.

[649] “What are the contents of the Golden Record?” *Voyager/JPL/NASA*.

[650] Ibid.

[651] Ibid.

In theory, all these greetings in different tongues, all with a similar message form a kind of 'Rosetta Stone' for some far-future spacefaring audio-archeologists.

Following the Greeting is the 12-minute track 'Sounds of the Earth.' It plays such sounds as Morse code, thunder, waves, volcanoes, trains, and a mother kissing a baby. It includes the barks of both a wild and a tame dog (the wild dog being representative of "the dangers and uncertainties of our being" and the tame dog "domestication," "all traces of menace gone.")[652] The Sounds section starts with 'Music of the Spheres' (Johannes Kepler's Harmonium Mundi– "the giddy whirl of tones reflecting the motion of the Sun's planets in their orbits") and ends with the sound of a pulsar. [653]

The next sections on the Golden Record are devoted to music. For 90 minutes, extraterrestrial ears are presented with a wide array of this human art across time and cultures. Included are classical compositions by Bach and Stravinsky; the songs "Dark Was the Night" by Blind Willie Johnson, "Melancholy Blues" by Louis Armstrong, and the raga "Jaat Kahan Ho," sung by Surshri Kesar Bai Kerkar. The musical selections include the unique sounds of the Japanese shakuhachi, Peruvian panpipes, Navajo chanting. The selection committee, within the time constraints and cultural biases, sought to present a representative global sample.[654]

Timothy Ferris, on choosing the music remarks "The world's music–from the sun chants of ancient Egypt and the 'celestial orchestra' of the Buddhists to the frequency with which the words 'moon' and 'star' crop up in Western popular songs–is dotted with themes inspired by the sights of the night skies, when the sun withdraws and we are permitted to view the broader scheme of things."[655] The recording, he considers, "as a token payment against that debt of inspiration."[656]

The Golden Record also contains two printed messages–one by UN Secretary General and the other by the President of the United States. These messages are reminiscent of those left by Apollo 11 on the surface of the moon in their hopefulness

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[652] Druyan, Ann. "The Sounds of Earth." Essay in *Murmurs of Earth*. p. 156.

[653] Ibid p. 154.

[654] Ferris, Timothy. "Voyager's Music." Essay in *Murmurs of Earth*. p. 162.

[655] Ibid. p. 162.

[656] Ibid. p. 162.

and wishful thinking. Jimmy Carter wrote, “The Voyager spacecraft was constructed by the United States of America. We are a community of 240 million human beings among the more than 4 billion who inhabit the planet Earth. We humans beings are still divided into nation states, but these states are rapidly becoming a single global civilization.”[657] Carter expresses hope (perhaps prematurely) that human beings are become a single civilization. His message reveals that in 1977, when there were only four billion of us, we were already fearful of global threats. Carter tells the spacefaring strangers, “We are attempting to survive our time so we may live into yours.”[658]

The two Golden Records, Megan Garber believes, “carry the transcendent aspects of human existence: the art, the beauty, the ache, the joy.”[659] And although the Voyager probes are “technically unmanned;” she writes, “in another sense, however, they carry all of humanity with them as they speed through space.”[660] This inclusivity, this feeling of belonging and participating in the mission of this little probe is a powerful one and a great source of delight and pride. Maria Popova, writing in her popular blog ‘The Marginalian,’ remembers the intense national pride she witnessed growing up in Bulgaria when a traditional Bulgarian folk song was chosen for inclusion on the Golden Record.[661] It is a shepherdess song that speaks to the suffering and hope of the Bulgarian people under the yoke of Ottoman rule, yet it does not require an understanding of the Bulgarian language or history “to receive its message, its essence, its poetic truth….”[662] She posits that Sagan “saw the music selection as something that would say about us what no words or figures could ever say,” for its purpose was to “convey our essence as a civilization to some other civilization.”[663] Music channels human emotion.

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[657] Sagan. *Murmurs of Earth*. p. 28.

[658] Ibid.

[659] Garber, Megan. “The Message Voyager 1 Carries for Alien Civilizations.” *The Atlantic*, 13 Sept. 2013, https://www.theatlantic.com/technology/archive/2013/09/the-message-voyager-1-carries-for-alien-civilizations/279662/. Accessed 5 Nov. 2021.

[660] Ibid.

[661] Popova, Maria. ‘In Praise of the Telescopic Perspective: A reflection on living through turbulent times.” *The Marginalian* 21 Dec. 2017, https://www.themarginalian.org/2017/12/21/reflection/. Accessed 5 Nov. 2021.

[662] Ibid.

[663] Ibid.

NASA–by way of introducing the concept behind the Golden Record–asks, "If you could toss a bottle out into space, what message would you seal into it for anyone–or anything–to open someday far away from our solar system?"[664] The Golden Record is more than just another message-in-a-bottle. It tells of the hopes and glories of people from the mid-twentieth century; it is a human-made hierophantic object for deep time. Ann Druyan, who constructed the "Sounds of the Earth" section for the record, recognized her act of creation as "a sacred undertaking," even as she reflected upon the limitation of this creation, born of "half a dozen very flawed human beings."[665]

Several billion people have been born since the Voyager spaceships were launched on their journey. Many of the sounds and images and musical selection are not as relevant as they once were. This 'relevance' divide will only increase as the years move on. Far-future human beings, should they capture the craft, would find it completely alien to them just as our ancestors find us. As Anthony Morena mulls, "…a person from 500 years before Voyager's launch, someone from 1477, would not only fail to recognize certain parts of the world today, but would also fail to understand that it is the same world."[666]

The Golden Record is representative of a mid-century Golden Age–when futurity was had a utopian sheen and the new technology afforded our space-faring success promised in nothing but wonderful things. It was a time before AIDS or Ebola; before the techno-gig-economy, before social media; before a kind of dystopian popular culture took root. We cannot update the record to reflect our current condition. So the twin Voyagers sail on innocently, protected from the spectre of the climate crisis, the global SARS Covi-2 pandemic, or any of the other horrors of our age.

The Voyager spacecraft have finished their scientific mission and are now adrift on a Romantic one. They are deep into a place we will never see, never know, never in our lifetimes, and most likely never during humanity's tenure on earth. These two little

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[664] "Howdy, Strangers." *Jet Propulsion Laboratory/NASA*, 19 Aug. 2002, https://www.jpl.nasa.gov/news/howdy-strangers. Accessed 2 July 2021.

[665] Garber. "The Message Voyager 1 Carries …"

[666] Morena, p. 75.

robotic probes alone in infinite time and space are artifacts of the sublime. They are our creation sent into the deep time vacuum, the unfathomable emptiness.

How beautiful these spacecraft have become! They luminesce in our minds like loved objects. They are imbued with the nostalgia one feels with the benefit of hindsight, when past memories are potent. They echo astronaut Samantha Cristoforetti's feeling, falling back to earth aboard the Soyuz capsule, of being as resplendent and hopeful as a star: "If it were night, someone, somewhere would be wishing on us."[667] The further the Voyagers travel, the farther away they are from God's reach. Next time you send up a wish, send it on a spaceship trajectory through the stars.

[667] Cristoforetti, p. 1.

6.2. Svalbard Global Seed Vault

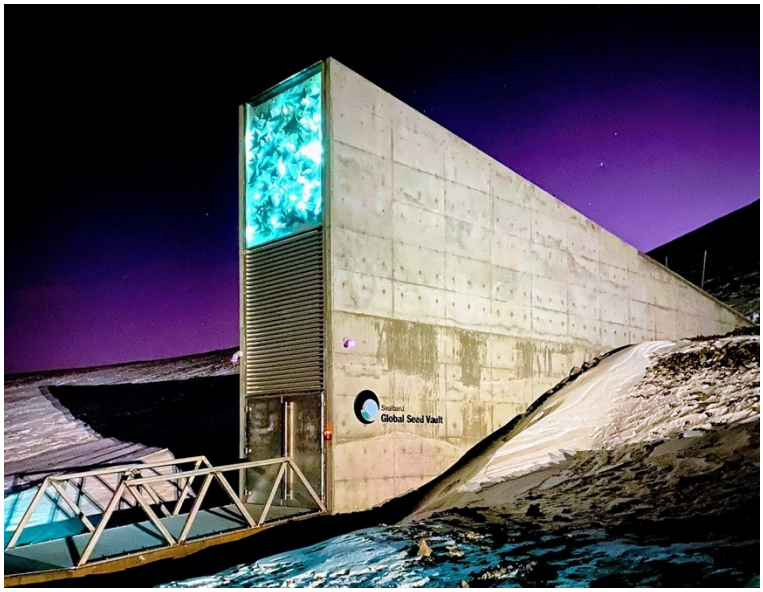

Figure 11. Entrance to the Global Seed Vault, 2019.
Photo by Subiet.
https://commons.wikimedia.org/wiki/File:Entrance_to_the_Seed_Vault.jpg.
Licensed under a CC BY-SA Creative Commons license.

"It is the Noah's Ark of today."

~Jen Stoltenberg, Prime Minister of Norway.
Svalbard Global Seed Vault Opening Ceremony, 2008.[668]

"This is supposed to last for eternity."

~Åsmund Asdal, Svalbard Global Seed Vault Coordinator,
Nordic Genetic Resource Centre
(following the permafrost melt and vault breach, 2016).[669]

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[668] "Svalbard Globale frøhvelv: Åpningssermoni." *Regjeringen.No,* (Government of Norway), Video 32:20, 26 Feb. 2008, https://www.regjeringen.no/no/tema/mat-fiske-og-landbruk/svalbard_global_frohvelv/film-og-bilde/filmer/svalbard-globale-frohvelv-apningssermoni/id547329/. Accessed 27 Dec. 2021. (07:43)

[669] Carrington, Damian. "Arctic stronghold of world's seeds flooded after permafrost melts." *The Guardian*, 19 May 2017, https://www.theguardian.com/environment/2017/may/19/arctic-stronghold-of-worlds-seeds-flooded-after-permafrost-melts. Accessed 3 Sept. 2021.

6.2.1. A survivors' time capsule

The Svalbard Global Seed Vault is the survivors' time capsule. Here, cut horizontally, 130 meters above sea level into the base of Platåberget (the Plateau Mountain), on Svalbard Island, is a repository for the world's plant life.[670] This is future food for us to eat. Here, seeds are stored lest the day ever arrive that we need to replant our planet. For this resurrection purpose, the repository is often referred to as "The Doomsday Vault." In theory, it is a time capsule that never needs to be opened unless disaster befalls. It exists for the post-catastrophic event, for the post-apocalypse world, for the people left behind.

A vault, to use Robert Macfarland's expression, is an "underland" repository.[671] The practice of deliberately placing objects under the ground is an ancient human intention. "The same three tasks recur across cultures and epochs," Macfarlane explains of the underland location, "to shelter what is precious, to yield what is valuable, and to dispose of what is harmful."[672] The Svalbard vault shelters what is precious. In essence, it is the most valuable time capsule ever created–this gene bank housing the genetic material of the living world. "Into the underland," writes Macfarlane, "we have long placed that which we fear and wish to lose, and that which we love and wish to save."[673] Into the Svalbard vault we hide our fear of extinction with a fail-safe.

Conceptually, the idea of a 'global seed vault' has been long in the making in the minds of plant scientists as a 'back-up' to the myriad seedbanks that already operate around the world but mostly serve national interests. Inaugurated in 2008, the Svalbard Global Seed Vault aims to be a self-sustaining, ultra-safe repository free from political pressure, mismanagement, and instability ("Norway is a quiet, safe corner at the top of the world").[674] The vault construction is designed to withstand the gravest of challenges from natural disasters to nuclear war. Three parties provide the infrastructure necessary

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[670] Pre-1925, Svalbard Island was known as Spitzbergen Island.

[671] Macfarland, Robert. *Underland: A Deep Time Journey*. New York, W.W. Norton & Co. 2019.

[672] Macfarlane, p. 8.

[673] Ibid, p. 8.

[674] "Purpose, Operations and Organization." *Svalbard Global Seed Vault,* Helene Grethe Evjen, site editor, https://www.seedvault.no/about/purpose-operations-and-organisation/. Accessed 3 Nov. 2020.

to operate the vault: the Norwegian government affords the funding, the Norwegian Ministry of Food and Agriculture in cooperation with NordGen (Nordic Genetic Resource Centre) provides the management, and Crop Trust, an international organization devoted to bio-diversity and food security, oversees the seed acquisition from donor nations.

There is wide global recognition for the importance of the Svalbard vault at a time when, as evidenced by such global conferences as COP 26 climate summit, nations are giving heed to planetary survival.[675] Svalbard taps into this 'overview perspective,' acknowledging the interconnections between living systems and the necessity of preserving natural diversity on a planet where monoculture agriculture, an increasing human population (and migration), and climate change leave species vulnerable. "The loss of a crop variety," explains Crop Trust, "is as irreversible as the extinction of a dinosaur, animal or any form of life."[676]

6.2.2. William Beal's seed time capsule

As a time capsule, the Svalbard vault is informed by the work of botanist William Beal, who in 1879, had the prescience to save seeds for the future. His inquiry was into long-term viability of the seeds of food crops: how long can a seed lie dormant and still germinate? Beal buried 21 bottles each containing 50 seeds of 21 different species on the grounds of Michigan State University. Although he designed this time capsule to be opened every five years, subsequent gatekeepers of his project have extended the duration of the opening cycles to every twenty years. For the first few cycles, every species readily germinated, then, as Cara Giaimo examines, "most species dropped of one by one." Now a century later, "only one reliable sprouter is left."[677]

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[675] COP 26: 2021 United Nations Climate Change Conference. Oct 31, 2021 – Nov 12, 2021, Glasgow UK.

[676] "Svalbard Global Seed Vault." *Crop Trust*, https://www.croptrust.org/our-work/svalbard-global-seed-vault/. Accessed 28 Nov. 2020.

[677] Verbascum blattaria is a herb with a yellow flower. In 2000, half of the Verbascum blatteria seeds retrieved sprouted, despite being buried in topsoil since 1879.

Giaimo, Cara. "One of the World's Oldest Science Experiments Comes Up From the Dirt." *New York Times*, 21 Apr. 2021. https://www.nytimes.com/2021/04/21/science/beal-seeds-experiment.html. Accessed 21 Apr. 2021.

Over the years, Beal's time capsule has become cloaked in great secrecy. The locations of the remaining bottles are guarded. A map is handed down professor to professor, "a botanist's version of buried treasure."[678] The bottles are only opened under darkness. Beal's long horizon experiment has now been going for 142 years and counting. The most recent bottle was dug up and opened in April, 2021. Beal's capsule is dependent on the compassionate succession of botanists to shepherd it into the future. It highlights the tenuousness in preserving the seeds of life.

6.2.3. Svalbard Island is a Thin Place

For Beal's purposes, the humid and seasonal Michigan soils were not an optimal medium. By contrast, Svalbard Island's icy constancy is promising. Located 1,300 kilometers from the North Pole, 78º North 15º East, the Svalbard vault site is remote, atmospherically dry, seismically stable, and very cold: "This location [is] in many ways a perfect location for the worlds' seed backup."[679]

The vault is served by Longyearbyen, first established as a coal-mining town. Its current population is 2,400. It is the world's northernmost settlement. As cites Crop Trust, which delivers seeds to the vault, "Svalbard is the farthest north a person can fly on a scheduled flight, offering a remote location that is nevertheless accessible."[680]

The small airport notwithstanding, Svalbard remains a challenging place. The "Visit Svalbard" website underlines Longyearbyen's population as being in flux, people rarely staying for more than seven years.[681] The community has few families or inter-generations, "Consequently, it has been harder for the people to take advantage of the accumulated experience of the harsh and extreme living conditions."[682] People are

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[678] Ibid.

[679] "Purpose, Operations and Organization." *Svalbard Global Seed Vault*.

[680] The Crop Trust is an international organization devoted to preserving the biodiversity of the world's food crops and food security.
"Svalbard Global Seed Vault." Crop Trust.

[681]According to Statistics Norway.
"Longyearbyen." *Visit Svalbard*, https://en.visitsvalbard.com/visitor-information/destinations/longyearbyen. Accessed 1 Dec. 2021.

[682] Ibid.

drawn to Svalbard's ascetic but perish for it too. "The history of Svalbard is rich in tragic events, and graves are the most common relics of culture."[683]

The High Arctic landscape of Svalbard Island is one of deep fjords, glaciers and icy seas. It presents true Thin Place drama with its in-between state of climactic opacity and transparency. The "never ending" days of the midnight sun (late spring through to the autumn), contrast with the sun-less polar nights (November to near February) leaving just slivers of twilight at either end.[684] On some clear evenings the sun colours the sky pink, and the mountains, dusted with snow between their black ridges, turn blue. Sometimes in the middle of the day, the northern lights cover the sky in bright green undulations. Here, in the clean sky and pristine darkness the Milky Way is pure astonishment. Here is the Svalbard Thin Place. It is the kingdom of polar bears.

6.2.4. Svalbard's "Timefulness"

A Thin Place, by definition, is an isolated, elemental environment. Reaching a Thin Place often involves physical hardship and to supplicate this arduous endeavour is a gift of transcendence. The veil parts, and a feeling of 'deeper understanding,' of both incredulity and annihilation, of sublimity, shines.

Svalbard Island is less a Thin Place landscape than it is a *timescape*. The Norwegian Polar Institute records its geological diversity as being unlike any other landscape in northern Europe. Moreover, nowhere else on the globe are so many geological periods conserved in rock.[685] Svalbard has no soil: the rocks are exposed, wearing beautiful layers of geologic processes just for the looking. For this, Svalbard is a geologist's dream. And for this, Svalbard is temporally bewildering. During fieldwork in the mid 1980s, geologist Marcia Bjornerud lived on Svalbard Island. She had been contemplating the possibility of "pockets where time remained undefined, amorphous– where one might even travel between past and present with equal freedom," and found

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[683] Ibid.

[684] "Svalbard." *Norway Lights,* https://www.norway-lights.com/destinations/svalbard/6149495421ac0b50ec43a66c/. Accessed 1 Dec. 2021.

[685] "The geology of Svalbard" *Norwegian Polar Institute*. https://www.npolar.no/en/themes/the-geology-of-svalbard/#toggle-id-1. Accessed 22 Oct. 2023.

such a pocket in Svalbard.[686] Here, her perception of time became "unmoored from the normal measures."[687] Svalbard's timescape exhibits "the single-minded focus on the natural history of an austere world that has so little memory of humans."[688] Any human-made flotsam that washes ashore–Bjornerud points to fishing nets and weather balloons–"appear older and shabbier than the ancient mountains which are robust and vital."[689] She is mindful of how the fuselage of a Luftwaffe bomber, whale bones from a seventeenth-century rendering operation, and Catherine the Great era Russian graves, are chronologically indistinguishable among the four million-year-old rocks in which they are found: "All past times were equally close."[690]

Not "timelessness," rather "timefulness" is the word Bjornerud uses to describe the feeling of "an acute consciousness of how the world is made–indeed, made of–time."[691] Timefulness imbues a feeling of "living in geologic time," of being a part of the deep time continuum of planets and stars. Here is where the Thin Place veil lifts, not between worlds but between layers of time. Here is where the Svalbard time capsule is hidden.

6.2.5. The Vault

The Svalbard vault is tunnelled into the flesh of Platåberget mountain. Above ground all that is visible is the entranceway–a concrete construction that juts out like an embedded wing of a spaceship that would not be out of place on a set designed by H.R. Giger. It is wholly unlike the human-made relics that Bjornerud found. Instead, this entranceway is distinguished by an impression of futurity. Adorning the entranceway is a reflective steel and prismatic glass creation called "Perpetual Repurcussion" by Dyveke Sanne. This artwork adds to the futuristic feel mirroring the changing light in the northern

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[686] Bjornerud, Marcia. *Timefulness*. Princeton, Princeton University Press, 2018. p. 3.

[687] Ibid p. 4.

[688] Ibid.

[689] Ibid.

[690] "Marcia Bjornerud/Timefulness." *The Long Now Foundation*, 22 July 2019, https://longnow.org/seminars/02019/jul/22/timefulness/. Accessed 12 June 2020.

[691] Bjornerud. *Timefulness*. p. 5.

sky like a mass of crystals.[692] Sanne's façade acts as a beacon, increasing the visibility of the vault's entrance, lending a cinematic iridescence, a glinting messaging system, a code of light. Like an artifact left behind by aliens, it is the door into the mountain that survivor explorers will stumble upon when they are looking for something else.

From the entrance, a 120-meter-long tunnel leads to the 1,000-square-meter vault. The vault is split into three halls. Although the permafrost affords a natural frozen environment of -6º C, the halls are further chilled down to -18º C, a temperature that stops the seeds from developing and delays aging.[693] Each hall can accommodate 1.5 million samples. The vault has a capacity of 4.5 million samples, with each sample consisting of roughly 500 seeds. As of December, 2021, 1,081,026 seed samples are safe inside. Through the international "Black Box System," each individual nation owns their donation and only they can withdraw them.

6.2.6. The first withdrawal

As a time capsule, the Svalbard Vault is designed for a long time journey. It is a defensive move against future adversity–whether from natural catastrophe or human-made aggressions. Unlike the instructions William Beal gave the keepers of his buried seeds, the Svalbard capsule has no prescribed 'open' date. It is a capsule actively in the process of accumulating new acquisitions of seeds. Thus, it was not without some consternation that seeds were withdrawn just seven years after the vault's creation. However, the debilitating effects of wars–especially those where the climactic degradation of living environments is also a source of suffering–are happening right now.

The year 2015 saw the vault's first withdrawal to replenish seeds destroyed by conflict. The Syrian civil war forced the abandonment of the ICARDA's (International Center for Agricultural Research in Dry Areas) seed bank, in Tel Hadia, just south of Aleppo. This was no ordinary seedbank, rather, it was "a historic collection," of seeds

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[692]"The artwork ['Perpetual Repercussion' by Dyveke Sanne] was funded by The Norwegian State agency overseeing art in public spaces. The artwork was honored with the Norwegian light award for best outdoor light project in 2009."

Haugerud, Anci. "Svalbard Global Seed Vault." *Visit Svalbard*, https://en.visitsvalbard.com/inspiration/various/svalbard-global-seed-vault. Accessed 7 Nov. 2021.

[693] Ibid.

from the Fertile Crescent, the so-called 'cradle of civilization,' that included barley, durum wheat, faba bean, chickpea and lentil.[694] It was also here that the ICARDA team conducted the critical science into drought resistance varietals to ensure the resiliency and adaptation of food crops to a warming, desertifying planet.[695] This team is, in science journalist Matt Simon's estimation, "the stewards of humanity's future food supply."[696] That the Tel Hadia seed bank had been backed up at Svalbard, not once but three times, even as the war converged on Aleppo, meant that all was not lost. In all, the ICARDA team–despite considerable risk–shipped 14,363 accessions to Svalbard, with the vault opening specially to receive these precious shipments.[697]

Here, is a concrete example of the Svalbard time capsule fulfilling its humanitarian purpose, being an insurance policy, returning crucial seeds to donor nations to restore vital research. In this case, the Tel Hadia scientists were able to continue their work in donor fields in Morocco and Lebanon, successfully growing "more than 100,000 of their original accessions [and] shipping 81,000 newly grown samples back to Svalbard to bolster their deposit."[698] Says Charlotte Lusty, Genebank Platform Coordinator at the Crop Trust, "This is an important, positive story of different countries and institutes working together to save a unique global resource that we could not possibly have replaced if it had been lost."[699]

The Tel Hadia team were not the first human beings put their lives on the line to save seeds. In the bitter winter of 1941-42, as the Nazis' lay siege to Leningrad, botanists Abraham Kameraz and Olga Voskresenskaia and others of the Vavilov

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[694] Fertile Crescent: a crescent shaped parcel of land around the Nile, The Euphrates and the Tigris rivers, where the practice of agriculture is believed to have started. Many of these once fertile lands are now deserts. Current nation states of the Fertile Crescent include Iraq, Israel, Syria, Lebanon, Jordan, Palestine, Egypt, Turkey and Iran.

"Fertile Crescent." *National Geographic Encyclopedia*, Last updated 25 Apr. 2019, https://www.nationalgeographic.org/encyclopedia/fertile-crescent/. Accessed 7 Nov. 2021.

[695] "An International Rescue Mission from Syria to Svalbard." *Crop Trust*, 13 Nov. 2020. https://www.croptrust.org/blog/an-international-rescue-mission-from-syria-to-svalbard/. Accessed 3 Nov. 2021.

[696] Simon, Matt "These Rare Seeds Escaped Syria's War—to Help Feed the World." *Wired*, 11 Nov. 2020, https://www.wired.com/story/these-rare-seeds-escaped-syrias-war-to-help-feed-the-world/. Accessed 3 Nov. 2021.

[697] "An International Rescue Mission … Svalbard." *Crop Trust*.

[698] Simon. "These Rare Seeds…"

[699] "An International Rescue Mission … Svalbard." *Crop Trust*.

Research Institute of Plant Industry, barricaded themselves in the basement of the institute to save precious seeds. “For weeks, they worked in shifts, shielding the collection from intruders, rodents, and the beasts of their own hunger,” Simram Sethi recounts, “They eventually starved, choosing to die rather than eat the species they’d sworn to preserve.”[700] In all, thirty scientists perished. Former Crop Trust director Cary Fowler relates, “The curator of the rice collection died surrounded by bags of rice. Kameraz and Voskrensenskaia succumbed, protecting their potatoes in the cellar to the very end.”[701]

Most of us alive today, having grown up in a post-nuclear world, are fully aware of our capacity to destroy ourselves. The living world–already in the throes of an extinction event–is imbued with a deep well of sadness which manifests within us as we watch the lists of endangered and extinct species lengthen. The Svalbard vault acts like a release valve dissipating some of this emotional burden. It does this as it offers hope, redemption, even rebirth. Yet, we cannot help but wonder if, like the Vavilov scientists, we would be willing to stake our life on some seeds. The existence of the Svalbard vault forces us to contemplate the hunger of our future selves if the living world is lost and there is nothing to eat.

6.2.7. A Time capsule is a great healer

The idiom ‘time is a great healer’ suggests that the passage of time alleviates sorrowful and difficult situations. A time capsule, that has at the core of its creation the wish to alleviate future sorrows, is a most prescient and generous act. By sending a ‘healing’ prescription forward for future generations we refuse to succumb to the selfish demands of everyday existence.

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[700] Sethi, Simram. “Pandemics aren’t limited to people: How the world’s most famous seed vault defends plants against their next big outbreak.” *The Counter,* 21 May 2020, https://thecounter.org/international-biodiversity-day-idb-svalbard-plant-pandemics/. Accessed 3 June 2020.

[701] Fowler, Cary. “The Second Siege: Saving Seeds Revisited.” *Huff Post,* Blog, Updated 25 May 2011, https://www.huffpost.com/entry/the-second-siege-saving-s_b_685867. Accessed 6 Dec. 2021.

Also see: Sethi “Pandemics aren’t limited to people…”

Human conflict is only one of the many destructive forces from which Svalbard offers a defence. The insidious possibility of a plant pandemic that could wipe out the world's crops is a genuine concern. We know full well, from the ongoing experience of the SARS-CoV-2 virus–its rapid spread and powers of mutation just how much mayhem (panic, stock piling, suffering) and how difficult it is to mount a defence (lockdowns, closing borders, vaccines) to keep up with it let alone get ahead of it. Plants are living organisms and equally susceptible to viruses and infectious diseases.

In re-engineering the biosphere, we have favoured the establishment of agricultural monocultures–field after field of high yield, high economic return strains of seeds, displacing the wild and ancient varietals that provided the strengthening powers of genetic diversity and disease resistance. Monocrops are genetically vulnerable. Sethi gives the example of the fungal disease 'wheat rust,' also known as 'the polio of agriculture.' This is not a new disease, but "in 1999," she writes, a "'super- race' of wheat rust surfaced in Uganda." It proved such a virulent danger, says Sethi, quoting CIMMYT[702] scientist Dave Hodson, "[It] had the ability to take out most of the resistance that was being used in wheat throughout the world… It was capable of complete crop loss in just a few weeks."[703] Resistant genes found in CIMMYT's geneplasm bank in El Batán, Mexico, came to the rescue.

Despite the best efforts to preserve the viability of all seeds in its collection, Svalbard will lose some along the way. Some seeds will not survive a long time journey. However, even if they do not germinate, they may still be of value. This is the lesson from William Beal's time capsule. Despite germination failures, the seeds are not inert. "Planting a seed is like asking a yes or no question: the seed either sprouts or it doesn't," writes Giaimo, "But often a seed that doesn't grow isn't fully dead."[704] Useful DNA and RNA can be extracted from these seeds. Dr. Beal's capsules benefit from scientific methods he could never have imagined. This is why the current scientist-stewards of his experiment hope to extend it for another eighty years–to take advantage of advancements yet unknown.

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[702] CIMMYT (Centro International de Mejoramiento de Maiz y Trigo, International Maize and Wheat Improvement Center) El Batán, Mexico

[703] Sethi. "Pandemics aren't limited to people…"

[704] Giaimo. "One of the World's Oldest Science Experiments…"

This long time horizon is an underlying principle of Svalbard vault's creation–that it be of benefit to those future beings who may need to harvest its organic potential. Thus, even if Svalbard's stash of seeds fails to grow, remnants of genetic code may still be viable for evolving technologies to synthesize. A recent example of seed regeneration is the success of Russian scientists in 2012 in germinating whole fertile plants from Pleistocene era fruit tissue buried in the Siberian permafrost.[705] *Silene stenophylla* is a flowering plant native to the Siberian tundra. Although this plant is still common today, a cache of 32,000-year-old seeds was found inside an ancient squirrel's frozen burrow. Clonal micropropagation techniques together with in-vitro tissue cultures allowed researchers to germinate the seeds, but with some surprising differences. Biologist Matt Candeias draws attention to the Pleistocene-era seeds unique phenotype–distinct from extant populations, an indication of "different environmental parameters faced by this species through time."[706] The Russian scientists write of their discovery, of the "phenotypic plasticity, and the opportunities provided by permafrost environments for preserving ancient and modern germplasm of higher plants."[707]

It is likely the Svalbard cache of seeds, frozen in time, will also exhibit phenotypic differences depending on the length of the time journey, and these micro differences may very well have significant implications for species health and diversity. For future human beings, the vault's time journey heads back to the past to both feed and heal.

6.2.8. Launching the Svalbard time capsule

The Svalbard Global Seed Vault was inaugurated on 26 February 2008.[708] A red carpet was laid out from the entranceway down to the vault and guests in pairs, carried inside the tubs of seeds with Norway's then Prime Minister, Jens Stoltenberg and President of the European Commission, José Manuel Barroso, leading the way. To an

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[705] Yashina, Svetlana, et al. "Regeneration of whole fertile plants from 30,000-y-old fruit tissue buried in Siberian permafrost." *Proceedings of the National Academy of Sciences of the United States of America*, 21 Feb. 2012, https://www.pnas.org/content/109/10/4008. Accessed 29 Dec. 2021.

[706] Candeias, Matt. "Germinating a seed after 3200 years." *In Defense of Plants*, Blog, 4 Nov. 2015, https://www.indefenseofplants.com/blog/2015/11/4/germinating-a-seed-after-32000-years. Accessed 26 Mar. 2024.

[707] Yashina. "Regeneration of whole fertile plants…"

[708] "Svalbard Globale frøhvelv: Åpningssermoni." *Regjeringen.no,* Video.

audience of dignitaries and agricultural experts from donor nations, Stoltenberg gave a speech, outlining Norway's commitment to this "Noah's Arc of today."[709] Barroso also gave words of praise for the vault, "This is a frozen garden of Eden."[710] A boy soprano sang, "Sleep, My Little Seedling." Sámi artist Mari Boine sang, followed by Cameroon artist Coco Mbassi, as Stoltenberg and Nobel Laureate Wangari Maathai[711] symbolically unlocked the vault and together placed the first tub of seeds on waiting shelves. As the guests filed outside, the kids of *Polargospel* choir sang–all dressed in snowsuits, their cheeks red from the wind. In all, 268,000 seed samples from around the world were secured inside the time capsule on inauguration day, and human beings gathered with heartfelt speeches, songs, hopes, to bless seeds' time journey.

This celebratory atmosphere is repeated whenever the vault welcomes more seed samples into the time capsule. In March, 2020, the vault received its second largest deposit of seeds since its opening. Representatives from 36 genebanks were on hand with their donations; many were first time depositors including Cherokee Nation, (USA) the University of Haifa, (Israel), and the Baekdudaegan National Arboretum (South Korea).[712] Simram Sethi documented the joy on display at the seed handover ceremony: "As the day turned to dusk, a choir sang and Erna Solberg, the prime minister of Norway, began to call collectors forward to hand over plastic tubs and cardboard boxes of seeds."[713] Seed biologist Stephanie Greene from the USDA (United States Department of Agriculture), was among the contributors. Standing in the bitter cold, she beamed as she accepted a seed deposit certificate from the prime minister. "To be surrounded by colleagues from all over the world who understand the importance of

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[709] Ibid. Video (07:34).

[710] Ibid. Video (09:32).

[711] Wangari Maathai, "The woman of trees," is a Kenyan environmentalist, human rights activist, and Nobel Prize winner (2004). Maathai initiated the Green Belt Movement in Kenya in 1977, mobilizing Kenyans, mostly women, to plant 30 million trees.
Says the Nigerian activist, Nnimmo Bassey: "If no one applauds this great woman of Africa, the trees will clap."

Ighobor, Kingsley "African Renewal Wangari Maathai, the woman of the trees, dies." *The United Nations*. n/d. https://www.un.org/africarenewal/web-features/wangari-maathai-woman-trees-dies. Accessed Dec 27, 2021.

[712] "The Seed Vault inspires world leaders to champion the safeguarding of the world's seeds." *Svalbard Global Seed Vault,* 26 Mar. 2020, https://www.seedvault.no/news/safeguarding-of-the-worlds-seeds-zero-hunger/. Accessed Dec 27, 2021.

[713] Sethi. "Pandemics aren't limited to people…"

securing our genetic resources," Greene recounted, "was a highlight of my life."[714] Her emotion echoed that of Ann Druyan; she considered the assembly of 'Sounds of Earth' for the Golden Record as a "sacred undertaking." Greene also described her participation as "sacred," and, writes Sethi, "one that reminded her why she fights so hard to preserve and sustain plant species that might otherwise be lost."[715]

6.2.9. Breaching the vault

In 2016, in a first test for climate endurance, the vault failed. That year, the Arctic regions experienced a record breaking (and since rebroken) rise in temperature. The permafrost began to liquify. "A skeleton, "explains geologist Santosh Panda, "is to the human body what permafrost is to Arctic land."[716] The lands of Arctic are held together by frozen ground that (currently) covers one-quarter of the Northern Hemisphere. Jon Waterman, former US national park ranger, describes the geological process behind the formation of this icy organic and carbon-rich substance: "Eons of crustal earth movement, glacial scraping and soil deposition stirred and pushed ancient masses of plant life underground and flash-froze everything into permafrost before it could rot."[717] And to solidify a more graphic image in our minds he says, "Global warming has taken the permafrost out of the proverbial freezer… Now, it's as if frozen spinach was left out on the kitchen counter."[718]

During the Arctic heatwave of 2016, the permafrost on Svalbard Island defrosted, flooding the entranceway to the vault. "A lot of water went into the start of the tunnel and then it froze to ice, so it was like a glacier when you went in," recounts Hege Njaa Aschim a Norwegian government official who surveyed the damage.[719] Although none of the seed chambers were in danger, this *underland* stronghold was corrupted. A major upgrade of the vault immediately followed this breach with "precautionary measures" put

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[714] Ibid.

[715] Ibid.

[716] Panda, Santosh K. et Al. "The Fate of Permafrost." *National Park Service*, https://www.nps.gov/articles/aps-16-1-9.htm. Accessed 7 Dec. 2021.

[717] Waterman, Jon. "36 Years Later, the Climate Changes at This National Park Stunned Me." *New York Times*, 7 Dec. 2021, https://www.nytimes.com/2021/12/07/opinion/climate-change-alaska.html. Accessed 7 Dec. 2021.

[718] Ibid.

[719] Carrington. "Arctic stronghold… after permafrost melts."

in place to mitigate a "wetter and warmer climate."[720] Technology, developed by the Norwegian oil and gas industry, offered a solution: waterproof legs anchored to the seabed, as per oil and gas sea rigs in the North Sea, to hold the access tunnel steady in the softening permafrost.[721]

The 2016 meltwater flood lay bare the vulnerabilities of human-made constructions against the forces of nature. Permafrost 'change of state'–from solid to liquid, was never in the vault's original design plans, but it is now. The vault was meant to be self-sustaining, yet now it has permanent staff looking after it, shoring it up, digging tunnels to siphon off water. Says Aschim, "It was supposed to [operate] without the help of humans, but now we are watching the seed vault 24 hours a day."[722]

6.2.10. Threats Unknown

Svalbard Global Seed Vault's reliance on human beings for maintenance poses security concerns. The seeds samples are vulnerable to human interference (both well and ill-intentioned). "The number of seed samples stored in the Seed Vault has now reached over one million, representing an invaluable resource for global food and agriculture, and our main priority is to keep this legacy safe for the global community."[723] As part of this safety–save for select authorized individuals–no media, no guests, and no tourists are allowed inside.

The shelves of the Seed Vault are lined with something far more precious than gold. In a hypothetical world of critical resources depletion and environment degradation, the seeds could easily be commodified or ransomed. Wars could be fought for control of the vault.

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[720] "Purpose, Operations and Organization." *Svalbard Global Seed Vault*.

[721] "The construction team turned to technology that had long been used by Norway's oil and gas industry. Oil platforms in the North Sea have waterproof legs anchored to the seabed, so the team used the same materials and technology to build and seal the new access tunnel."

"FAQ, Svalbard Global Seed Vault." *Svalbard Global Seed Vault*, https://seedvault.nordgen.org/Information/Faq. Accessed 27 Dec. 2021

[722] Ibid.

[723] "FAQ, Svalbard Global Seed Vault." *Svalbard Global Seed Vault*.

Through the Treaty of Svalbard, 1920, the Svalbard archipelago is a demilitarized zone. In theory, Svalbard will remain free of warfare. Norway which holds sovereignty over the islands is an intent steward of the vault's "library of life."[724] As Olaug Bollestad, Minister of the Norwegian Ministry of Agriculture and Food, emphasizes, "Norway greatly values the trust shown to us by all the genebanks… We are strongly committed to managing the Seed Vault in accordance with the highest agreed international standards."[725]

Norway is a stable nation state, but circumstances change. The institutions put in place to care for the vault–whether the Norwegian government or Crop Trust or NordGen are fallible human structures. Just as toxic time capsules–like those sequestering nuclear waste–require signage and identifiers to warn of the dangers of opening, so does the Seed Vault require signage to identify and protect its precious purpose.

So what kind of time ambitions does the Vault have? There is no set answer although many scientists hope the seeds will remain safe for 2000 years.[726] The Svalbard cavern is chiseled into anaerobic permafrost; the seeds stored inside triple-foil vacuum packs. Other safeguards may still be needed to augment time travel.

The Svalbard Global Seed Vault has no deep-time assurances. Through geological churn, the town of Longyearbyen may fold like a shipwreck into rising seas. The Vault itself may rise to crown Platåberget like Noah's Ark atop Mount Ararat. Svalbard is remote now, but everything on the globe is undergoing a transmutation as the rogue climatic forces both displace and create different features in the landscape.

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[724] Sethi's phrase: "library of life"

NordGen (Nordic Genetic Resource Centre) is responsible for operating the Seed Vault in cooperation with the Norwegian Ministry of Food and Agriculture and the international organization Crop Trust.

"Svalbard Global Seed Vault." *NordGen*, https://www.nordgen.org/en/our-work/svalbard-global-seed-vault/. Accessed 27 Dec. 2021.

[725] "The Seed Vault inspires … world's seeds." Svalbard Global Seed Vault.

[726] A carbon-dated "Jesus-era" date palm seed found in 2008, buried in the dry sands surrounding the Masada Fortress in Israel, grew into leafy plant, sets a precedent.

Brahic, Catherine. "Jesus-era seed is the oldest to germinate." *The New Scientist*, 12 June 2008, https://www.newscientist.com/article/dn14125-jesus-era-seed-is-the-oldest-to-germinate/. Accessed 27 Dec. 2021.

It inside this transmutation process–the loss of our world as it changes into something else–where the Svalbard Vault's sublime melancholia lives. There is hope, but sadness too. It seems unlikely, despite best intentions of many nations, that global warming will be kept to the 1.5º climate deal agreed upon at COP 26. We are forced to imagine humanity itself as one of the many casualties of this inaction. So then the question must be asked, if we go extinct, who is the Svalbard time capsule for? Will the passage of time render the vault's caverns into a twenty-first century version of the 'prehistoric cave?' The 'alien wing' entranceway may collapse in on itself, lichens and mosses covering the broken cement blocks like a long abandoned jungle temple that plant life has chosen to hide. The seeds, entombed within their underland world as the greenery of a new world takes shape above, lie in wait.

6.3. Future Library

"I am sending a manuscript into time.
Will any human beings be there to receive it?

~Margaret Atwood

(inaugural author, Future Library)[727]

Figure 12. **Katie Paterson, Future Library 2014-2014.**
Image courtesy the artist/ Bjørvika Utvikling, Oslo/ Ingleby, Edinburgh
Future Library is commissioned and produced by Bjørvika Utvikling, and managed by the Future Library Trust. Supported by the City of Oslo, Agency for Cultural Affairs and Agency for Urban Environment.

6.3.1. Growing a time capsule

In 2014, in the Nordmarka forest just outside of the city of Oslo, a space was cleared and replanted with 1000 spruce saplings. These trees are growing the paper

[727] Flood, Alison. "Into the woods: Margaret Atwood reveals her Future Library book, Scribbler Moon," *The Guardian*, 27 May 2015, https://www.theguardian.com/books/2015/may/27/margaret-atwood-scribbler-moon-future-library-norway-katie-paterson. Accessed 11 July 2017.

for Future Library, “a living, breathing, organic artwork unfolding over 100 years.”[728] Each year an author contributes a manuscript to be held in trust, unread and unpublished until the year 2114. These manuscripts can be of any length, in any language. The authors cannot keep a copy, digital or otherwise, and other than revealing the title, they cannot speak of the contents. This library is the preserve of twenty-second century readers. Thus, each year as the spruce grow by a ring of wood, the anthology grows by a book. At the artwork’s completion, the forest will be cut down, pulped, and all 100 manuscripts of this time capsule will be assembled and printed.

The Golden Record exists for the pleasure of extraterrestrial life; the Svalbard Vault is a failsafe against dystopian end times. Future Library exists in a zone that is just beyond our fingertips. It is close enough for us to imagine the delight on the faces of those who will open it. We can imagine our descendants walking through the forest. Paper making and book-binding might be relegated to an artisanal skill practised by only a few, but surely the art of reading– such a quintessential human behavior since the earliest Sumerian cuneiforms–will still be a valued human skill. We will never know if the contents of the Golden Record are received; every withdrawal of seeds from the Svalbard Vault implies righting a loss, an existential crisis. Future Library, by contrast, is such a gift.

6.3.2. Time capsule creation as artistic practice

Future Library springs from the artistic practice of Scottish conceptual artist Katie Paterson. By her own definition she states: “I am an artist often working with scientists in my exploration of time, the evolution of nature and the cosmos by way of moonlight,

[728] Future Library was envisioned by Katie Paterson for Oslo’s public art program Slow Space. It is a ‘100-year commission,’ consisting of three parts: the 100-tome anthology, the 1000 trees of the Future Library forest, and the ‘Silent Room’ in the Oslo Public Library. The participating authors are chosen by Paterson and the Future Library Trust, an advisory group that manages the project. Due to the temporal span of the project, the Trust renews its membership every ten years. Anne-Beate Hovid is the current commissioner/curator of Future Library (Framstidsbiblioteket).

Paterson, Katie. “The Artwork.” *Future Library*, https://www.futurelibrary.no/#/the-artwork. Accessed 14 Sept. 2018.

melting glaciers, and dead stars."[729] Her projects include inserting a live telephone line into an thawing Icelandic glacier to call up the sound of climate change; carving a Saharan grain of sand down to a nanoparticle and hiding it back in the desert; bouncing Beethoven's 'Moonlight Sonata' off the surface of the moon back down to earth; mapping all the known dead stars in the universe, and with the help of the European Space Agency, recasting a 4.5 billion-year-old meteorite and sending it back into space.[730] "Katie Paterson's position results in a trans-human ethic: she [is] the first to define the Anthropocene," observes curator Nicholas Bourriand.[731] "In addition to the signals emitted by human beings," he writes, "she records, decodes, and translates visually the infinite number of available physical languages: the language of minerals, plants, fossils and light."[732]

From Tree Mountain to the Future Library Forest

If anyone could readily decode Paterson's myriad languages surely it would be Agnes Denes.[733] Denes is also a conceptual artist that has long worked with similar themes of space and time. Her practice combines her prodigious knowledge of science, geography, philosophy, and ecology to realize an exceptional body of work that ranges from mathematically precise drawings to land art. And, like Paterson, she works with living trees.

"I want to change humanity a little bit," she explained back in 1996, at the site of Tree Mountain, her living time capsule of 11,000 trees.[734] "We live in nature, we are

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[729] "Graduation Profile: Katie Paterson," *Edinburgh College of Art*, 2004, https://www.eca.ed.ac.uk/about/alumni/graduate-profiles/graduate-profile-katie-paterson. Accessed 15 Mar. 2020.

[730] *Vatnajökull (the sound of)*, 2007-08; *Inside this desert lies the tiniest grain of sand*, 2010; *Earth-Moon-Earth (Moonlight Sonata Reflected from the Surface of the Moon*), 2007; *All the Dead Stars*, 2009; *Campo del Cielo*, 2012-14.

[731] Bourriand, Nicholas. "Forward." *Katie Paterson*. Newcastle upon Tyne, Locus+ and Kerber Verlag, 2016. p. 6.

[732] Bourriand, *Katie Paterson*, p. 5.

[733] Agnes Denes, artist, born 1931, Budapest, Hungary. Based in New York City.

[734] "A Gift to the Future: Tree Mountain by Agnes Denes | in the Works | the Shed." YouTube, *YouTube*, 11 Oct. 2019, https://www.youtube.com/watch?v=nmVFGwNeWcc. Accessed 16 Jul. 2024.

nature," she continued, noting human affection for trees, for planting trees in our back gardens. "But planting trees is not replanting a forest. So I decided to plant a forest."[735]

Denes' forest took 14 years for her to realize. Although she mapped out the concept in 1982, she needed the resources and land provided by the government of Finland in 1992 to begin.[736] Tree Mountain, Denes emphasizes, is not only the first virgin forest planted by humans, but it also a rehabilitation, taking the devastated site of an abandoned gravel mine near the town of Ylöjärvi and returning it to the natural world, albeit one intricately designed to manifest her vision. Denes first had to construct a perfectly symmetrical pointed hill.[737] Then each pine tree was placed with mathematical precision in a coiled pattern incorporating elements of the golden ratio, as well as the pattern of pineapple scales and sunflower seeds in the flower head that naturally form a Fibonacci sequence.[738]

As Tree Mountain is a time capsule, Denes had to consider how she would send it forth into time. She estimates that it will take four centuries for the forest ecosystem to properly establish itself. To engender a sense of stewardship, she invited people from the world over to plant the pines, giving each a certificate of ownership. Each tree planter becomes responsible for their tree and must shepherd it to their descendants. It is not always easy to look after a tree. The Finnish winters can be brutal and some of the trees have died. Denes herself laments the lack of funding she would like to help ensure its survival, "Of course, anything you put into the world you become responsible for, and I try very hard to maintain the mountain."[739] All she can do is hope that her vision will

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[735] Ibid.

[736] Denes' project was announced during the 1992 Earth Summit in Rio de Janeiro, Brazil. Commissioned by the Government of Finland and sponsored by the United Nations Environment Program.

[737] Tree Mountain is a man-made mountain, 420 metres long, 270 meters wide, 28 meters tall. It consists of 11,000 trees planted by 11,000 people.

Denes, Agnes. *Agnes Denes*, http://www.agnesdenesstudio.com/works4.html. Accessed 19 July, 2024.

[738] "Tree Mountain." *Visit Finland*, https://www.visitfinland.com/en/product/7c4e3be8-c54d-4f54-beb4-a1b5ed26417e/tree-mountain/. Accessed 18 Jul. 2024.

[739] "A Gift to the Future: Tree Mountain…"

succeed, “It would be incredible to walk in a virgin forest that’s made by humanity. It’s an achievement, a human achievement.”[740]

This achievement is also emblematic of the symbiotic relationship between the living world and human civilization. Both Paterson and Denes understand this relationship and bring it to the forefront of their living time capsules. While Denes’ forest emphasizes the need to re-establish lost ecosystems and wildlife habitat, Paterson’s accentuates how trees have contributed to human civilization. Trees rendered into paper and books support the dissemination of our culture. Trees themselves are natural archives; the art of reading sylvan rings for past environmental secrets is well studied. Although Future Library trees have but a short time to accumulate climactic clues, they are still imbued with much narrative.[741] Paterson imagines “the tree rings as chapters in a book, the unwritten words, year by year, activated, materialized;” she visualizes the experience of walking through the developing forest, of “being aware of the slow growth of the trees containing the writer’s ideas like an unseen energy.”[742]

6.3.3. Sending manuscripts into time

This collection of unseen energy is not trapped in a hermetic capsule; the authors contributing manuscripts in the early decades of Future Library recognize the expansive, evolving character of the work and the unfathomable nature of time travel. Inaugural author Margaret Atwood (2014) says of her contribution Scribbler Moon, “I am sending a manuscript into time. Will any human beings be there to receive it? Will there be a Norway? Will there be a forest? Will there be a library? How strange it is to think of my own voice, silent by then for a long time, suddenly being awakened after 100 years.”[743]

This transmission into the future affords the authors no feedback, no financial reward, no review. Modes of communication and language may be quite different: will the work even be understood? Despite the lack of guarantee, the ever prescient Atwood is confident the anthology will be received as a salutatory gesture. She considers the

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[740] Ibid.

[741] In ideal conditions Norway spruce live for several centuries.

[742] Paterson, “The Artwork.”

[743] Flood, “Into the woods…”

"not-yet-embodied hand," and the "so-far nonexistent reader" that will one day turn the pages of her work; she likens it to her encounter with a "red-painted handprint" on the wall of a cave in Mexico, sealed for over three centuries. "Who can decipher its meaning," she asks of the handprint, answering, "Its general meaning was universal: Any human being could read it. It said: Greetings. I was here."[744]

This gesture of greetings is predicated on survival. A room in Oslo's Deichmanske Bibliotek serves as the 'sealed cave' to harbour the manuscripts.[745] However, the Nordmarka forest has no such protection. As forester Gary Gilmore reflects, "planting a tree is easy; getting it to grow is a challenge."[746] Climate change can easily consume whole forests. At a similar latitude in British Columbia, rising temperatures facilitate the mountain pine beetles' decimation of the interior forests and enable pathogenic fungi to strike down the coastal arbutus. Although Norway spruce are remarkably hardy, resisting drought, shade and insects, they are not immune to climate stress.

The more pressing issue the foot-high Nordmarka sprucelings face is one of 'trampling.' Thus, coloured ribbons tied around their stems give visibility to help prevent them perishing underfoot. However resplendent, these ribbons will not save them from encroaching urbanization, vandalism, poaching, pollution and other vagaries of time. Of course, in 100 years, if these trees are tall and healthy, they may succumb as a 'cash crop.' Moreover, depending on the ecological state of the world, a thriving, living forest may be far too precious to be sacrificed for paper. This is the argument Merve Emre makes in her critique of the project, "There is something more straightforwardly

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[744] Ibid.

[745] The futuristic 'Silent Room' in Deichmanske Bibliotek, the new city library on the Oslo waterfront is constructed of wood cleared from the Nordmarka forest to make room for the 1000 spruce trees. The design of this wooden room incorporates 100 drawers to house each manuscript.

[746] Gilmore, Gary. "Why I plant Norway Spruce." *Center for Private Forests. Pennsylvania State University*, 19 Mar. 2017, https://ecosystems.psu.edu/research/centers/private-forests/news/2014/why-i-plant-norway-spruce. Accessed 7 Mar. 2018.

unbearable about planting trees knowing, in a time of mass deforestation and consumer waste, they will be cut down to make paper."[747]

Future Library is also predicated not just on the survival of the spruce forest but also the survival of human culture: libraries, books, authors, readers. Libraries serve to house our collective human heritage. While in the future humanity may have no use for a bricks and mortar archive, the desire for such a repository will endure. Paterson herself is not worried about the demise of the 'paper' book despite our current obsession with virtual knowledge: "I think it was Umberto Eco who described the book as being like the wheel. It's so perfect in its being that it can't be improved upon."[748] Nevertheless, in case twenty-second century humans don't know how to make paper or bind a book, Paterson includes a printing press with a visual 'how-to' manual with the archive.

This 'how-to' is reminiscent of the diagrammatic instructions carried by the two Voyager spacecraft, now sailing beyond our solar system, to enable the playing of the gold-plated phonographic record, 'The Sounds of Earth.' "The spacecraft will be encountered and the record played only if there are advanced spacefaring civilizations in interstellar space," wrote Carl Sagan, one of the architects of the record's idealized collection of multilingual greetings and natural soundscapes of Earth circa 1977, "but the launching of this bottle into the cosmic ocean says something very hopeful about life on this planet."[749] Indeed, Paterson's project has a creative resonance with the Voyager probes. Both are time travelers aspiring to reach a yet undiscovered audience.

The manuscripts, not the authors, nor the trees of Future Library are the true time travellers. As the years creep nearer to the end date 2114 the voyage shortens. The last author's work has only a year to travel; Margaret Atwood's book undertakes the longest voyage of all.

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[747] Emre, Merve. "This Library Has New Books by Major Authors, but They Can't Be Read Until 2114," *New York Times*, 1 Nov. 2018, https://www.nytimes.com/2018/11/01/t-magazine/future-library-books.html. Accessed 1 Nov. 2018.

[748] Street, Julie. "Margaret Atwood wrote a book for the Future Library, but you won't be able to read it until 2114," *ABC News*, Updated 15 Dec. 2019, https://www.abc.net.au/news/2019-12-17/the-future-library-norway-wood-margaret-artwood/11783438. Accessed 15 Mar. 2020.

[749] Carl Sagan, quoted in "What are the contents of the Golden Record?" *Voyager/Jet Propulsion Laboratory/NASA*.

This spatiotemporal voyage is undoubtedly part of the project's appeal. "Contributing and belonging to a narrative arc longer than your own lifespan," reasons David Mitchell (*From Me Flows What You Call Time*, 2015), "is good for your soul."[750] Although, he acknowledges a loss in letting go: it is "as gone from me as a coin dropped in a river."[751]

Elif Shafak (*The Last Taboo*, 2017) compares her experience to "writing a letter now and leaving it in a river… you just believe in the flow of time."[752] "I would like to pray for the fates of both humans and books," says Han Kang (*Dear Son, My Beloved*, 2018), "May they survive and embrace each other, in and after one hundred years, even if they couldn't reach eternity…"[753] Karl Ove Knausgård (*Blind Book*) thinks of his book as a ship: "I very much like the thought [of] readers who are still not born–it's like sending a little ship from our time to them."[754]

The appeal of this literary time capsule is also one of legacy. Few of us will ever transcend our own lifetimes to be remembered. "Chances are, no copies of *Cloud Atlas* will be around 100 years from now," muses David Mitchel of his best-seller, "In a weird way, this work is safer than all my other books put together."[755]

Future Library also offers an act of preservation. Sjón (*As My Brow Brushes on the Tunic of Angels*, 2016) incorporates an archaic form of Icelandic dialect in his work.

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[750] Locke, Charley. "Margaret Atwood and David Mitchell Have Written New Fiction—If You Can Wait 98 Years to Read It," *Wired*, 31 Oct. 2016, https://www.wired.com/2016/10/future-library-david-mitchell-margaret-atwood/. Accessed 15 Mar. 2020.

[751] Flood, Alison. "David Mitchell buries latest manuscript for a hundred years," *The Guardian*, 30 May 2016, https://www.theguardian.com/books/2016/may/30/david-mitchell-buries-latest-manuscript-for-a-hundred-years. Accessed: Nov 15, 2018.

[752] Flood, Alison. "Elif Shafak joins Future Library, writing piece to be unveiled in 2114." *The Guardi*an, 27 Oct. 2017, https://www.theguardian.com/books/2017/oct/27/elif-shafak-joins-future-library-writing-piece-to-be-unveiled-in-2114. Accessed 15 Nov. 2018.

[753] "Walk into the Future Forest with Hang Kan" *Ingleby Gallery*, 17 May 2019, https://www.inglebygallery.com/news/7194-katie-paterson-future-library-walk-into-the-future-library-forest-with-han/. Accessed 19 Mar. 2020.

[754] Flood, Alison. "Karl Ove Knausgaard's latest work to remain unseen until 2114," *The Guardian*, 20 Oct. 2019, https://www.theguardian.com/books/2019/oct/20/karl-ove-knausgaard-latest-work-to-remain-unseen-until-2114-future-library. Accessed 20 Mar. 2020.

[755] Locke, "Margaret Atwood and David Mitchell."

He is cognisant that the Icelandic language–already a preserve of just 300,000 people–may well be extinct or exist only for the pursuit of scholars.

The weight of this endeavour is not lost on the authors. Knausgård feels a "moral and ethical responsibility" to his audience-in-waiting.[756] However, Emre considers the exercise as "unbearably precious," suggesting that "writing novels that cannot be read [is] an act of delayed gratification that can have no real payoff because it has no real stakes, only symbolic ones."[757]

Still, the symbolic significance of Future Library draws attention to the pressing concerns of our current age where a sense of immediate entitlement and need to be continually entertained cripples forward thinking. The temporal space of Future Library is just a blip in cosmic time, but it exists at the edge of a human lifetime, "a relentless fact," notes Han Kang, "that has made me reflect on the essential part of life."[758]

6.3.4. Future Library's Timespace

Much of Paterson's work highlights human temporal insignificance as measured against the continuum of the universe. Here is an artist who has made clocks that tell the time on other planets, and constructed a record player that turns in time with the earth's rotation.[759] It is no surprise that Paterson cast Future Library into a timespace beyond her lifetime, although art historian Lars Bang Larson considers it "fairly human-scaled, according to Paterson's normal standards."[760]

This timespace of Future Library present a conundrum in our age when anthropocentric creation is acknowledged to be behind some of the worst biospheric atrocities committed against planet Earth. The human-caused climate crisis will be read

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[756] Flood, "Karl Ove Knausgaard."

[757] Emre, "This Library…."

[758] Flood, Alison. "Han Kang to bury next book for almost 100 years in Norwegian forest," *The Guardian*, 28 Aug. 2018, https://www.theguardian.com/books/2018/aug/31/han-kang-bury-book-100-years-norwegian-forest-future-library. Accessed 31 Aug. 2018.

[759] Artwork titles: *Timepieces*, *Solar System*, 2014, in Katie Paterson, 111, and *As the World Turns*, 2010, in Katie Paterson, p. 95. Paterson notes that the movement of the turntable playing Vivaldi's Four Seasons is so slow it is not visible to the human eye.

[760] Larson, Lars Bang. "Astronomy Domine: The Anthropological – Cosmological Squeeze in Katie Paterson's Work," in *Katie Paterson*, p. 223.

in the geologic record of our planet alongside the asteroids impacts and volcanic explosions that heralded other mass extinction cycles. Paterson's art addresses "such a negative anthropology," Larson asserts.[761] Moreover, Paterson is no dispassionate observer. Her end intention may seem to grow a forest only to destroy it to produce a consumable product, but her focus is firmly on the living and the growing. Unlike an analogous time capsule, the Svalbard Global Seed Vault which is a safeguard against extinction, Paterson's anthology does not aim to be an archeological artifact from a terminal civilization.

Too often the speculative images of future culture are riddled with ruin. Future Library demands that we cut through the apocalyptic pessimism and have faith in the unknown. "The project is a vote of confidence," writes Mitchell, "that despite the catastrophic shadows under which we live, the future will still be a brightish place willing and able to complete an artistic endeavour begun by long-dead people a century ago."[762]

Mired in the climactic dystopias that spin from the news feeds and screens that anchor our daily lives, the promise of something hopeful, even something that will not be realized until the twenty-second century, is no small gift. Future Library is such a gift: it is an time capsule predicated on a hopeful, even utopian, vision of human flourishing: that we will successfully navigate the ecological breakdown of this century, that trees will still grow and that some variant of us will be happily living and happily reading books.

[761] Larson, "Astronomy Domine," p. 221.

[762] Flood, "Into the woods."

Chapter 7.

In Conclusion

7.1. The Melancholia of Favourite Trees

I walked this project into being on the trails of a remnant old-growth forest close to my home. For a good ten years I sought for patterns to emerge from my nebulous ideas, one foot in front of the other. Human language is truly, wholly insufficient, for *reimaging sublimity*, for *reimagining time*. If only I could have composed with bird song! Every time I got 'stuck' in muddy ideas I would hit the trails. Jean-Jacques Rousseau had already figured out this trick, "I only meditate when I am walking, when I stop, I cease to think; my mind only works with my legs."[763]

Both "the sublime" and "deep time" are abstract concepts, and both in my walking mind are magnetically combined. Still, I was searching for some kind of physical manifestation of this union, not a symbol, not an elusiveness. And then there it was, all around me as it had been all the time: it was in the trees; it was the *trees*.

The dynamic presence of a centuries-old tree is living sublimity. Although it is not on the same scale as cosmic deep time, a human timespace is a mere dendrochronological centimeter of growth or less. The grand Douglas firs of my neighbouring forest started life generations before me and have the potential to live on long after I am gone and forgotten.

The forest home to these strands of deeply living sublimity is also where climate truth is made manifest. When something so powerful as a mighty Douglas fir is made vulnerable to the predation of violent wind and drought; when these trees fall, their roots lifting out of the earth in a complex interwoven snarl, roots that once held these giants aloft, then anxiety takes hold and grows. It mixes with the dust kicked up from the chainsaws clearing the trails of fallen trees–climate truth's loamy invisible cloak.

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[763] Rousseau, Jean-Jacques. The Confessions of Jean Jacques Rousseau, Fourth book, 1782. *The Project Gutenberg EBook of The Confessions of Jean Jacques Rousseau*. Release date 15 Sept 2015. https://www.gutenberg.org/files/3913/3913-h/3913-h.htm. Accessed 30 Mar, 2024.

In concluding this written endeavor, I offer a final meditation on the melancholia of special trees. Not just my own favourite, but other stories from around the world that I have kept close, tree stories that embody cojoined sublimity and deep(er) time with climate truths.

7.1.1. Venus of Lighthouse Park

Figure 13. Venus of Lighthouse Park.
Photo: S. Lockwood, March 2024, West Vancouver.

I call her Venus as her 'body' is a stand-in for the paleolithic sculpture, "Venus of Willendorf."[764] However this Venus is not a small figurine of a Paleolithic woman but

[764] Venus of Willendorf: Upper Paleolithic; Female figurine of oolite limestone, circa 28,000-25,000 BCE., 11.1 cm in height. Found in 1908 at Willendorf Austria. A portable touchstone. Kathleen Kuiper writes this description: "Its arms, though visible, are negligible and crudely depicted. Though a head is present, the only detail to be seen is a pattern representing a braid or cap; there are no facial features. Feet too are missing and were probably never part of the overall design.… It has been suggested that she is a fertility figure, a good-luck totem, a mother goddess symbol, or an aphrodisiac made by men for the appreciation of men."

rather a Douglas Fir stump about two meters in height and hundreds of years in girth. Her bark is not the elephant-skin of an ancient Douglas fir; she is skinned in scaley whorls that paper over large bulbous protrusions suggesting buttocks, breasts, and pregnancy. And why not project an anthropomorphic kinship with this tree?

Venus is my special tree and it lives in a remnant old-growth forest on the skirt of a mountain walking distance from my home. Venus was 'harvested' once, a hundred or more years ago, but did not die. Instead, the forest family gathered around in a rescue mission and grafted roots to feed the injury through the 'wood-wide-web' of mycorrhizal fungal connections. Although Venus has no branches, no chlorophyll rich needles, it is healthy and adds an annual growth ring.

Venus started as a feathery seed finding purchase in mossy soil of the Pacific Northwest Rainforest on the coast of North America; even as a seed, it possessing all the dynamic knowledge needed to soar into a millennial giant, although this was not its fate. All the giants of the tree world, as notes John Vaillant, could once be found in an unbroken ecosystem stretching for 3,000 miles, from the Mendocino, California to Kodiak Island, Alaska. Here, thousand year-old sequoias, red cedars, Sitka spruce, Douglas firs, and Western hemlocks all thrived in "a giant terrarium" of temperate rainforest.[765] A fraction of these ancient stands remains.

Just as we negotiate a difference between animals we eat and animals we love, so to between living trees and timber, as Venus, found in a 75 hectare enclave on the shores of Burrard Inlet across from the city of Vancouver, can attest. Stump Venus is a survival story, a tale of perseverance. Just as Venus of Willendorf was a human deep-time talisman, so too "Venus of Lighthouse Park" is a hopeful touchstone for those of us who are fearful for the future of the forest. I watch fellow walkers run their fingers over her as they pass. Such a tree as Venus engenders real biophilia, and, as Oliver Sachs

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Kuiper, Kathleen. "Venus of Willendorf." *Encyclopedia Britannica*, Updated 4 Mar. 2023, https://www.britannica.com/topic/Venus-of-Willendorf. Accessed 5 Apr. 2023.

[765] Valliant, John. *The Golden Spruce: A True Story of Myth, Madness and Greed*. Toronto, Vintage, 2005. p. 8.

reflects, “biophilia, the love of nature and living things, is an essential part of the human condition.”[766]

Human kinship with trees is an affinity that is more than a love of nature. Trees live, grow, grow old if we let them, propagate if they can. They have a life beyond being just “wood.” We cast trees to play many major roles in our stories across centuries and cultures. Consider the Classic Greek spell–Peneus turning Daphne into a living laurel, unfurling myriad arms, myriad fingers into leaves.[767] Or ponder Japan’s Heian era tale of *kaguya hime*, the moon princess, discovered in the incandescent hollow of a stalk of bamboo.[768] Or “The Green Man,” that hybrid creature that haunts English churchyards, leaves and stalks streaming from his mouth drawn into a scream, a memento-mori of human elementality.

Trees are easily anthropomorphic: they have limbs, and trunks, and stand upright. Our poetry styles the autumnal alders as ‘gold-crowned’ and the maples as ‘red-headed.’ Remarkably, we can even compare blood. Tree sap and human blood share a molecular similarity: four nitrogen atoms ring a central metal molecule–magnesium in the chlorophyll, hemoglobin in blood. And both these molecules performing aerobic transfers–oxygen in animal tissues; carbon inside chlorophyll sacs. Thus, of red and green, and gas, trees bleed and breath as we understand the life in them. And, in the patterned relay of electrochemical messages between neuron dendrons in the human brain, we ‘think’ in the shape of trees.

Trees, organic and vulnerable, share human history. “Trees, it could be said,” writes John Valliant, “represent the bones of our collective body,”[769] Our dependence on the light and fuel and shelter from the burning and building of wood is tied to the spread

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[766] Sachs, Oliver. “The Healing Power of Gardens.” *New York Times*, 18 Apr. 2019, https://www.nytimes.com/2019/04/18/opinion/sunday/oliver-sacks-gardens.html. Accessed 2 Feb. 2023.

[767] “Apollo and Daphne.” *Greek Gods and Goddesses*, 30 Nov. 2016, https://greekgodsandgoddesses.net/myths/apollo-and-daphne/. Accessed 2 Feb. 2023.

[768] *Kaguya-hime no Monogatari,* The earliest known Japanese prose narrative, circa 9th century.

Fisher, Sally, adaptation; Donald Keene trans. *The Tale of the Shining Princess*. New York, The Metropolitan Museum of Art and A Studio Book/The Viking Press, 1980.

[769] Vaillant. p. 83.

of human migrations across the globe, and can be mapped as retreating forests.[770] Venus of Lighthouse exists in-between tree and timber, a living ghost of the great forests that once blanketed the pre-colonial landscape of metropolitan Vancouver. Venus lives as a residual, romantic memory of a lost world, a residual ecosystem. It is a protective gesture–this grazing our fingertips over this tree as we pass. From stump Venus we build a hierophantic touchstone, a sacred melancholia for the forest, a place to go to feel ourselves recede. Or not. I ask myself, passing another romantic gesture–is the young person, arms gathering this malformed fir in an embrace, really performing an act of compassion? After all, the hiker is having a picture taken. Venus, the living stump, is one of the park's "selfie hotspots."

7.1.2. Tree Hugging

Amrita Devi and the Khejri tree

As I walk past stump Venus, I cannot help but recall the pejorative "tree hugger," a common riposte lobbed at environmentalists taking a stand against old-growth logging. Arguably, the world's first tree hugger was Amrita Devi, who back in 1730, folded her arms around a *khejri* tree to shield it from the axemen of the Maharajah of Jodhpur seeking wood to build a palace. This Bishnoi woman of Northern Rajasthan knew the *khejri* as a miracle tree. *Khejri* are extremophiles, able to withstand both freezing and temperatures upwards of 50 degrees Celsius. They yield an edible high-protein fruit.[771] The Royal axemen cut through Devi and her two daughters who joined her protest. In all, 363 Bishnoi were slaughtered that day hugging trees, and the Maharajah could not bring himself to build a palace with blood-soaked wood.[772]

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[770] Ibid. p. 83.

[771] Vital for Bishnoi livelihood. Khejri roots are excellent at sequestering carbon and its fallen leaves provide nourishment and improve the milk yield of dairy cows. Moreover, Bishnoi religious tenet–that compassion for all living things extends to living trees–forbade the cutting of green wood. Today, Khejri trees are in serious decline.

[772] The Bishnoi Massacre, Rajasthan 1730. The Bishnoi were unsuccessful in saving the Khejri forest that day but the legacy of the Bishnoi massacre lives on. It is a famous story, taught in school, and it beget the Chipko Movement in the 1970s: lots of women hugged trees.
"The Chipko Movement was a Gandhian non-violent, eco-feminist movement that occurred in various parts of rural India aimed at forest conservation. Chipko means "to hug" or "to cling to" and reflects the demonstrators' primary tactic of embracing the trees to impede the loggers."

Julia Butterfly Hill and Luna

Amrita Devi lost her life to save a *khejri*. Rarely is the act of placing one's own body in harm's way to protect a tree so grievous, but this risk endures along with the compassionate act of hugging trees. As I continue along the trail, I contemplate the solo protest of Julia Butterfly Hill, in the redwood forests of California. On December 10, 1997, she climbed up barefoot 180 feet (55 metres) up a giant redwood she had named 'Luna' and did not come down for 738 days.[773]

For just over two years Butterfly Hill lived on a 6'x 8' platform with only a couple of blue tarps for shelter. Her food and supplies were hoisted by to her by a support crew on the ground. She had a sleeping bag, a one-burner propane stove, a primitive solar-powered phone. She endured extreme loneliness and a brutal La Niña winter.

Butterfly Hill belonged to the protest group Earth First whose *modus operandi* was to build platforms in the redwoods to sit in and harass the logging crews of the Pacific Lumber Company from above.[774] Pacific Lumber, who held the timber licence for Humboldt County had a particularly aggressive approach to this forest: after each section was clear cut, the company prepared the emptied site for replanting with the one-two punch of napalm and herbicide, thus destroying all organic matter and rendering the soil unable to support life.[775] Despite forceful attempts to dislodge her–helicopter buzz and a 'siege' designed to starve her out–she was resolute. Reporters and photographers from all over the world donned harnesses and roped up to interview her and take pictures. With her health in jeopardy, and her protest becoming a PR nightmare, Pacific Lumber negotiated: Luna would be saved along with a buffer zone (a

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Petruzzello, Melissa. "Chipko Movement." *Saving Earth: Encyclopedia Britannica*, https://www.britannica.com/explore/savingearth/chipko-movement. Accessed 1 Jan. 2019.

[773] Julia was born in rural Arkansas in 1974, the daughter of an itinerant evangelical preacher. Her early life was spent living in a camper van when her father took his ministry on the road. When she was 22, she was hit by a drunk driver and suffered a serious brain injury. As part of her personal recovery process, she took herself out west where she found her God in the redwood forests of California.

[774] Redwoods are big trees to log, but it has only taken just over 100 years to decimate them down to a mere 3 percent from their historical habitat.

[775] Hill, Julia Butterfly. *Legacy of Luna: The Story of a Tree, a Woman and the Struggle to Save the Redwoods*. San Francisco, Harper/San Francisco, 2001. p. 216.

small ‘parkified’ enclave), and Earth First would pay 50,000 USD to the company for lost revenue. Only then did Butterfly Hill climb back down.

Christian Mayer and the Johnson Olympic Oak

Sometimes “tree hugging” happens long distance. Consider German artist Christian Mayer, a leading preservationist advocating for the Johnson Olympic Oak. Trees can be time travellers and time keepers and the Johnson oak is both. It is an artifact from a dark time of repression and bigotry, a survivor tree in the concrete forests of Los Angeles. Mayer became aware of this oak on a visit to L.A., and it became vital to his artistic practice. In 2021, from his Vienna studio thousands of miles away, Mayer learned that the land on which the oak lives was slated for development. He orchestrated a campaign to save it; “This tree has given me a lot of insight into my own relationship to life, to the past, to history.”[776]

Reaching back to the 1936 Berlin Olympics, this oak celebrates the high jump victory of American Cornelius Johnson. Karen Rosen recalls, “a famous story that Adolf Hitler snubbed Jesse Owens at the 1936 Olympics, refusing to shake his hand. However,” she explains, “Johnson was actually the athlete whom the German dictator refused to meet.”[777] He was “insulted a second time by a head of state,” as Mayer recounts, when Franklin D. Roosevelt denied him and other Black athletes on the US Olympic team to a White House reception upon their return.[778] Nonetheless, there exists a patriotic photo of Johnson on the Olympic podium. He is wearing his gold metal; his right arm salutes his country and his left cradles an oak sapling in a pot.

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[776] “Los Angeles Oak Tree Carries Legacy of Forgotten 1936 Olympic Athlete.” *CBS News*, 18 Feb. 2023, https://www.cbsnews.com/video/los-angeles-oak-tree-carries-legacy-of-forgotten-1936-olympic-athlete/. Accessed 12 June 2023.

[777] Rosen, Karen. “Efforts to save famous 1936 Olympic Oak continue in Los Angeles.” *Around the Rings*, 3 Aug. 2022, https://www.infobae.com/aroundtherings/articles/2022/08/03/efforts-to-save-famous-1936-olympic-oak-continue-in-los-angeles/. Accessed 27 Apr. 2023.

[778] Mayer, Christian Kosmas. “The Life Story of Cornelius Johnson’s Olympic Oak and Other Matters of Survival.” *Christian Kosmas Mayer*, Blog, 2017, https://christiankosmasmayer.tumblr.com/post/166784304810/the-life-story-of-cornelius-johnsons-olympic-oak. Accessed 21 Oct. 2023.

Oak saplings–a friendship symbol from the German Olympic Committee–were given to the victors.[779] Johnson planted it in his backyard of his family house and it has since grown into a magnificent tree, 14 meters high. “The oak, in a changing LA neighbourhood,” as CBS reporter John Blackstone describes, “is all that remains of a largely forgotten story of victory, race and national pride.”[780] Mayer and “the preservationists fighting to save it,” writes Tim Arango, “see it as a living link to historical events, from the rise of Nazi Germany to the achievements of the Black American athletes at the Berlin Games that many historians now regard as precursors to the civil rights movement.”[781] The tree must be saved.

Joseph Beuys and 7000 Oaks

The Johnson Oak is a solitary *cri de coeur* in the sunbaked concrete of L.A. One can only hope Cornelius Johnson somehow imbued his oak namesake with Olympian courage to fight against the unforgiving environment. Not all urban trees have to fight so hard. Starting in 1982, the German artist Joseph Beuys over a five-year period with the help of volunteers, planted 7,000 oak trees with an accompanying four-foot basalt column in Kassel, Germany.[782] This project, *7000 Eichen*, has some dark echoes with the Johnson Oak harking back to Nazi Germany. The city of Kassel was badly damaged in the Second World War; over 90 percent of the downtown core was completely obliterated; the city also saw some of the worst house-to-house fighting with the Allied advance in April 1945.[783] Although Kassel has since been rebuilt, Beuys felt a need to stage “an ecological intervention” to counterbalance the rapid re-urbanization.

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[779] “Of the 129 saplings presented to gold medalists by the German Olympic Committee, only 25 are known to still be alive worldwide.” “The significance of the Johnson Olympic Oak is that there are so few remaining today,” Rich Perelman told *Around the Rings*, “and that it was a symbol of friendship from the German Olympic Committee and the 1936 Games organizing committee and not the German (Nazi) government.”

Rosen, Karen. “Efforts to save famous….”

[780] “Los Angeles Oak Tree Carries Legacy ….” *CBS News*.

[781] Arango, Tim. “In Los Angeles, a Tree With Stories to Tell.” *New York Times*, 28 May 2022, “https://www.nytimes.com/2022/05/28/us/in-los-angeles-a-tree-with-stories-to-tell.html. Accessed 3 Apr. 2023.

[782] *7000 Eichen*. https://www.7000eichen.de. Accessed 21 July 2024.

[783] “Kassel.” *Wikipedia*, https://en.wikipedia.org/wiki/Kassel. Accessed 21 July 2024.

One of the few historical buildings standing after the war was the Fridericianum Museum. It was here Beuys assembled the pile of black basalt slabs to be used in the artwork, the slabs removed one by one with each tree planted. For many of the townsfolk, the black stone pile had an uncanny resemblance to the ruined landscape of 1945, to a bomb site. At first the slabs dwarfed the oak saplings, which did little to alleviate the unease, although now the trees have grown to a splendid size and the slab "markers" have lost their melancholic symbolism. The oaks are a symbolic "healing," a gesture of life over darkness. In the greening of once grey, treeless streets, birds have returned to sing and pedestrians walk under the canopy of filtered light and song. Beuys died before he could see the last tree planted, but his vision was clear:

> Imagine how many birds will flock to Kassel, once these trees are here. … Once the tree has established itself, it's just nature. A tree full of chirping birds with the wind blowing through it… music! This is Sculpture that reaches far into the future.[784]

7.1.3. Failing to see the forest for the trees

The wonder and sadness of loss, drove the protest and the protective stance of Amrita Devi and Julia Butterfly Hill, the advocacy work of Christian Mayer, and the creative vision of Joseph Beuys. How marvelous if this kind of *melancholia* has such a result: compassion and protection. Both navigate us back into the natural and the suffering world. However, such *sublime melancholia* does not always manifest as compassionate protection. There is no doubt that the former logger-turned tree hugger Grant Hadwin was in awe of the golden-hued needles of a 300 year-old Sitka spruce that grew in Haida Gwaii.[785] He knew it was powerful even as he taunted the logging company that had once employed him: "Re: The Falling of your 'Pet Plant,'" he faxed to various media outlets in a lecture intended for MacMillan Bloedel executives: "I didn't enjoy butchering this magnificent old plant, but you apparently need a message and a

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[784]Jacobs, Bel. "Why planting a tree is a radical act." *BBC*. 20 June 2021. https://www.bbc.com/culture/article/20210618-joseph-beuys-the-original-eco-activist. Accessed 22 Jul. 2024.

[785] Island archipelago on the west coast of North America. Formerly known as the Queen Charlotte Islands.

wake-up call."[786] In his mind, downing the spruce was an act of *compassionate vandalism* for the sake of the forest at large.

This singular spruce, *Kiid K'iiyas,* was revered by the Haida. The wider world became aware of the "The Golden Spruce"–not least in thanks to John Vaillant's careful examination in his book of the same name–after it fell.[787] It was a source of astonishment, standing so stately, beautiful in the dark forest surround. Due to a genetic mutation, the needles lacked the requisite chlorophyll, thus giving it a lemony aspect. When the sun hit the branches, it glowed.

In Grant Hadwin's erroneous logic, his action forced attention onto the bigger picture of industrial-scale clear cutting of the coastal rain forest. He was taken aback when his violent performance was interpreted as *ecoterrorism*. For the Haida people, to whom the tree was a sacred part of their cultural history, it was murder.

The spruce lived in one of MacMillan Bloedel's 'set asides,' a symbolic three hectare region on the bank of the Yakoun river. To reach it Hadwin had to swim across the Yakoun somehow keeping his chainsaw out of water. The butchered tree took two days to fall by which time he was back on the mainland and busy faxing copies of an explanatory letter to various news outlets and environmental organizations: "When society places so much value on one mutant tree it ignores the rest of the forest."[788] He had not anticipated the extent of real mourning for the tree. Heather Colpitts, who interviewed Hadwin for the Prince Rupert News, remarked on how the collective reaction to the felling of the spruce–one that united both loggers, environmentalists in grief–proved his point, "that people failed to see the forest for the trees."[789]

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[786] Varty, Alexander. "The Golden Spruce, by John Vaillant." *The Georgia Straight*, 12 May 2005, https://www.straight.com/article/the-golden-spruce-by-john-vaillant. Accessed 19 June 2023.

[787] "The Story of the Golden Spruce." *Haida Tourism,* https://www.haidatourism.ca/news/golden-spruce-story. Accessed 23 June 2023.

[788] Vaillant, p. 26. (Heather Colpitts, *Prince Rupert Daily News*. 2/12/97)

[789] Ibid.

7.1.4. Protect, protest, or destroy

Figure 14. **O, Pardon me thou bleeding piece of Earth that I am meek and gentle with these butchers. ~ William Shakespeare, *Julius Caesar.***
Poster by Vicky Husband and Patrick Pothier.
Reproduced with permission.[790]

An experience of *sublime melancholia* can be painful and can also manifest in seemingly contradictory ways. The instinct to protect clashes with that of inflicting harm– by injuring the hierophantic object, attention is drawn to it. It has already passed into legend now–that the Golden Spruce was a preternaturally beautiful tree, its needles as bright as gold in a shaft of sunlight. Its loss is still keenly felt. Although few people

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[790] Protest poster circa "The War in the Woods," Clayoquot Sound, 1993. Vicky Husband relates that these words were spoken by Mark Anthony over corpse of Julius Caesar. The photo was taken along the highway to Port Alberni from the west coast and Clayoquot.

Brown, Lindsay. "Some may remember this poster by BC conservationist Vicky Husband many decades ago: 'O, pardon me thou bleeding piece of earth, that I am meek and gentle with these butchers." Twitter, 8 June 2021, https://twitter.com/Lidsville/status/1402287976768438275.

Shakespeare, William. *Julius Caesar,* Act III, Scene I
https://poets.org/poem/julius-caesar-act-iii-scene-i-o-pardon-me-thou-bleeding-piece-earth

outside of Haida Gwaii had ever seen the Golden Spruce, in death, it became a memory of a special 'place-that-once-was,' awash with the wonder and sadness of loss.

Hadwin's action may be an outlier in performative *sublime melancholia*, but it does reveal another facet of the experience of loss: anger. It is easy when people are angry to mount a protest that turns violent, and anger travels with fear.

And there are, of course, smaller acts of blood-letting that cannot be confused with anger. Special trees can really suffer the brunt of these desecrations–the sharp stick type of territorial markings by which we human seem compelled to mar our natural monuments as if to extend the reach of our puny lives. Although the park benches are scarred with graffiti, Venus of Lighthouse has so far avoided this scrawl–although not the territorial markings of the park's dogs.

Venus is a 'survivor' tree that should *not be*, but yet, *is*. The stump amazes with essential, organic *beingness* and longevity. I am reminded of another park and another such special tree that embodies a remarkable living sublimity. Methuselah, is a bristlecone pine found in Inyo National Forest on the Californian-Nevada border. Bristlecones are small and alien, stunted and twisted. Coloured striations in their bark resemble geological formations. And they are exceptionally old. Methuselah's age could be as much as 5,000 years making it, arguably, the world's oldest tree.[791]

Somehow bristlecones possess a 'secret of longevity,' inexplicable in the desiccated, barren environment of the high Sierra Nevada. That they are even alive, attracts attention and exploitation not just from scientists but also souvenir hunters and fetishists seeking longevity tokens, elixirs of immortality, a sylvan holy grail. Says David Clancey in his study of extremophile like Methuselah, "The crucial point to realise is that organisms didn't evolve to die. They evolved to survive…."[792]

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[791] "According to research released last week, this ancient bristlecone pine will be 4,851 years old this year."

McKie, Robin. "The Methuselah tree and the secrets of Earth's oldest organisms." *The Guardian*, 2 Aug. 2020, https://www.theguardian.com/environment/2020/aug/02/the-methuselah-tree-and-the-secrets-of-earths-oldest-organisms. Accessed 20 June 2023.

[792] Ibid.

To protect Methuselah, the Inyo park rangers have pulled up all the signposts and closed trails to thwart the flesh hunters. Methuselah's exact location has been erased from the maps to save its life. Despite its wood being stone hard, it is highly vulnerable, not just to vandalism but the ever worsening droughts. Butterfly Hill's tree Luna, has also been a magnet for vandals, mostly out of malice for Butterfly Hill, and it too faces the stresses of a climate change. And the roots of the Johnson Oak "are screaming" says arborist Tim Thibault, in the hardened, nutrient-depleted Los Angeles soil.[793] Still, Luna is held alive with steel brackets; the Johnson oak has just achieved protective status.[794] And Methuselah, the park service hopes, will melt into obscurity.

There is always a dance between protect, protest, and destroy. As I walk through the park, I am aware of the ongoing protests in my part of the world trying to save old growth forest. The ongoing Fairy Creek watershed blockage started in August 2020 to protect a stand of old-growth on southern Vancouver Island–trees that seeded in Pacheedaht Territory, well before Captain Vancouver sailed up the coast. This protest now far eclipses that of Clayoquot Sound–a months-long environmental protest over old-growth logging on Meares Island back in the summer of 1993.[795] The Clayoquot protest is known as the 'War in the Woods,' and set the template for eco-rebellion.[796] To date, a

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[793] Arango. "In Los Angeles, a Tree With Stories to Tell."

[794] Protected status approved by Los Angeles Cultural Heritage Commission as a Cultural-Historical monument on 5 August 2022. See:
Cornelius Johnson Residence and Olympic Oak, City of Los Angeles Online Documents CHC-2022-3207-HCM, https://clkrep.lacity.org/onlinedocs/2022/22-0899_misc_08-08-22.pdf. Accessed 3 Apr. 2023.

[795] Fairy Creek. Environmental protest over old growth logging on Vancouver Island.
On 1 April 2021, Teal Jones, the company with logging rights granted an injunction against the protesters blocking access roads, which the RCMP enforced that May. On 2 June 2023, the B.C. government deferred logging to 1 Feb 2025, as requested by the Pacheedaht First Nation on whose territory the watershed is found.

The Canadian Press, Sohrab Sandhu and Karin Larsen. "Fairy Creek old-growth protesters celebrate as a slew of contempt charges are withdrawn." *CBC News*, Updated 18 Apr. 2023, https://www.cbc.ca/news/canada/british-columbia/contempt-charges-withdrawn-fairy-creek-1.6814807. Accessed 18 Apr. 2023.

Also see: The Sierra Club BC, Sierra Life Monthly News. E-newsletter, June 13, 2023.

[796] 'The War in the Woods' refers to the environmental protests over the logging of old growth forest in Clayoquot Sound that reached its peak of intensity in the summer of 1993. 856 arrests were made. In 2000, it was designated a UNESCO Biosphere Reserve. In 2014, a provincial government review reduced clear-cut areas to a maximum of four hectares.

staggering 1,200 arrests have been made making in Fairy Creek, making it the largest act of civil disobedience in Canadian history.[797]

I walk past the remnant firs and cedars with fresh images of defiant protesters blocking a logging road being levered into RCMP vans, and I wonder if protest despair can ever force change. “I hate being here, I don’t know who to be angry at, and I just — yeah, I hate that they won,” laments Fairy Creek protester Will O’Connell, as he surveys the massive cut-block he was unable to save.[798] “We believed that we would save these places. We didn’t just think, ‘Oh, maybe we’ll make a stand symbolically.’ We believed that this old growth valley would be protected by our actions.”[799]

It may be cold comfort to Will O’Connell, but I am reminded of Margaret Mead’s assertion, “Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it is the only thing that ever has.”[800] Political scientist Erica Chenoweth, in her study of non-violent grassroots movements emphasizes that “civil-disobedience is not only the moral choice; it is also the most powerful way of shaping world politics.”[801] Echoing Mead, she adds that although the “exact dynamics depend on many factors,” it actually does only take a small minority of the population to effect change. Chenoweth pegs this number to 3.5 percent: “No government can withstand a challenge of 3.5 percent of its population without either accommodating the movement, or (in extreme case) disintegrating.”[802] That’s about 1.4 million Canadians with a dose of angry melancholia.

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[797] Larson, Karen. “Fairy Creek protest on Vancouver Island now considered largest act of civil disobedience in Canadian history.” CBC News, 9 Sept. 2021. https://www.cbc.ca/news/canada/british-columbia/fairy-creek-protest-largest-act-of-civil-disobedience-1.6168210. Accessed 18 Apr. 2023.

[798] Oudshoorn, Kieran. “The Fallout of Fairy Creek.” *CBC Radio One*, 21 June 2023, https://www.cbc.ca/radiointeractives/features/the-fallout-of-fairy-creek. Accessed 21 June 2023.

[799] Ibid.

[800] “Collections.” National Museum of American History, https://americanhistory.si.edu/collections/nmah_1285394. Accessed 27 Aug. 2024.

[801] Robson, David. “The ‘3.5% rule’: How a small minority can change the world.” *BBC: Future*, 13 May 2019, https://www.bbc.com/future/article/20190513-it-only-takes-35-of-people-to-change-the-world. Accessed 5 June 2023.

[802] In terms of Canada, with a population of 40 million, that translates to just under 1.3 million people.

There are ways to channel angry melancholia. I am struck by the frequency and intensity of today's climate change demonstrations. As old trees are the prominent feature of the landscape in my part of the world, they are where I see the effects of global warming firsthand. Up against the stress of the forest industry and lucrative clear cut practices, forest ecosystems also endure seasonal drought and fire–the natural disasters begotten of the climate crisis.

Great stumps of trees have long been used to forecast the apocalypse. The debris-field of a clear cut or the charred spines of burnt trees exists as emblematic places of no life, spent battlefields. A fresh clear-cut evokes a visceral reaction in many people as a 'place of butchery.' In its intermediate state before anything green has begun again, the sun bleaches the stumps as gray as gravestones. Still, the prevailing strategy of B.C. politicians remains 'talk and log;' talk about deferrals and protections while stalling and allowing the ancient trees to fall.

7.1.5. Pilgrimage trees

Cutblock 7190 is twelve hectares along the north bank of the Gordon River near Port Renfrew, British Columbia. In the winter of 2011, forester Dennis Cronin started preparing the site to be clear cut. Some of the trees were as high as twenty-story buildings.[803] One tree he assessed as having enough timber to fill four logging trucks–and he took an orange 'do not cut' ribbon and wrapped it protectively around the trunk.[804] And so, the clear cut happened around 'Big Lonely Doug' but he was spared. "His career was dedicated to levelling forests," explained Harley Rustad of Cronin's action, "and yet by saving this one tree, he created a symbol that is doing more to raise awareness about the cutting of old growth on Vancouver Island than any protest, march, or barricade."[805] This one-thousand year-old Douglas fire, stands like "an obelisk in a desert."[806] "The loneliness tree in Canada," wrote the Globe and Mail.[807] For the advocacy group Ancient

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[803] Rustad, Harley. "Big Lonely Doug." *The Walrus,* Published 19 Sept. 2016, Updated. 30 June 2022, https://thewalrus.ca/big-lonely-doug/. Accessed 11 Sept. 2022.

[804] Ibid.

[805] Ibid.

[806] Ibid.

[807] Hume, Gary. "Big Lonely Doug: Canada's loneliest tree still waiting on help." *Globe and Mail*, Published 8 June 2014, https://www.theglobeandmail.com/news/british-columbia/canadas-

Forest Alliance "This single tree provided … an image that could symbolize its cause. Heroic life persevering amid destruction."[808]

It is almost a reversal of the tale of Hadwin and the Golden Spruce: here the tree is saved but the forest is obliterated; it is also an example of 'not seeing the forest for the tree.' The Ancient Forest Alliance has set up a boardwalk through the cut blocks to Big Lonely Doug, the lone survivor, now a pilgrimage tree.

Lonely Doug's soaring crown is the spire of the forest. It is not unlike another spire, another pilgrimage site: The Cathedral of Notre-Dame de Paris–a building that is, in all essence, a forest itself. On April 15, 2019, the roof and spire of this medieval cathedral caught fire. [809] At the very core of the cathedral is *la charpente*, 'la forêt,' as the roof framing was known. In the ancient construction, each beam was a single log, in all 21 hectares of old-growth oak.[810] Over the course of a single night, the forest of Notre-Dame all went up in smoke. In the aftermath of the fire, people came to understand the organic, irreplaceable heart of Notre-Dame: A cathedral, in its architectural sublimity, made from beautiful old trees. France has few such trees left to rebuild *la charpente*.[811]

Perhaps it is not a fantasy to imagine the medieval architects of Notre-Dame taking inspiration from the ancient forests of France. Great stands of towering trees are cathedrals in themselves; numinous, meditative places where people go to practice *shinrin-yoku*, "forest bathing," to heal, to reconnect the divine with the natural world. The forest is *spiritual ecotherapy*; the forest air is saturated with phytoncides–restorative

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loneliest-tree-around-1000-years-old-still-waiting-on-help/article19064507/. Accessed 19 June 2021.

[808] AFA is a Victoria BC-based non-profit.

[809] On 15 April 2019, the roof and spire of landmark medieval cathedral caught fire.

Henley, John. "Notre-Dame Cathedral fire–a visual guide and timeline." *The Guardian*. 16 Apr. 2019. https://www.theguardian.com/world/2019/apr/16/notre-dame-cathedral-fire-a-visual-guide-and-timeline. Accessed 22 June, 2023.

[810]"La charpente de Notre-Dame, ou "la forêt", date du XIIIe siècle. Avant son effondrement lors de l'incendie de 2019, elle est l'une des plus anciennes charpentes de Paris."

"La Charpente" *Notre Dame de Paris,* https://www.notredamedeparis.fr/decouvrir/architecture/la-charpente/. Accessed 22 June, 2023.

[811] "Incendie à Notre-Dame de Paris. La « forêt », un joyau de l'architecture médiévale parti en fumée." *Ouest-France* avec AFP, 16 Apr. 2019, https://www.ouest-france.fr/faits-divers/incendie/incendie-de-notre-dame-de-paris/incendie-notre-dame-de-paris-la-foret-un-joyau-de-l-architecture-medievale-parti-en-fumee-6311889. Accessed June 22, 2023.

aromatic aerosols, boosting the immune system and decreasing levels of cortisol in ways even the most uplifting church service at Notre Dame just cannot do.[812]

7.1.6. "No tree hugging allowed"

Living close to a forest is not just uplifting but also good fortune. For the majority of the world's human population, a forest is an escape, a holiday, not part of their everyday landscape. Big trees are a luxury few can afford. But one man has the fortune–and a sizable one at that–to build his own forest. To create a personal forest of the best and most beautiful trees, billionaire oligarch Bidzina Ivanishvili, scours the villages and countryside of his native Georgia.[813] Once an exceptional tree is located, it is dug out of the landscape with massive earth-moving machinery. The chosen tree is then loaded onto a big-wheeled flatbed, and driven them to the edge of the Black Sea. From there, it is floated–standing upright, branches waving–on a barge to his private property. It is a "surreal spectacle" writes Ivan Nechepurenko, "Imposing magnolias, tulip trees and other magnificent species glided by on the water's surface, their mighty boughs spread wide in a procession that looked both poetic and delirious."[814]

Ivanishvili's actions are the anathema of compassion. He does not want to protect these trees. He just *wants*, "Like a sad, greedy king in some fairy tale or parable," as writes Peter Bradshaw.[815] And this indeed may one day be his Shakespearian downfall, "a Birnam Wood coming to Ivanishvili's exclusive Dunsinane."[816]

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[812] Fitzgerald, Sunny. "The secret to mindful travel? A walk in the woods." *National Geographic*, 18 Oct. 2019, https://www.nationalgeographic.com/travel/article/forest-bathing-nature-walk-health. Accessed 10 June 2023.

[813] Bidzina Ivanishvili is the former Prime Minister of Georgia, 2012-2013. He made his fortune (4.9 billion in 2023) in metals and banking in Russia.

"Bidzina Ivanishvili." *Forbes*, https://www.forbes.com/profile/bidzina-ivanishvili/?sh=12c277fc4598. Accessed 26 Mar. 2024.

[814] Nechepurenko, Ivan. "A Love of Trees or a Display of Power? The Odd Park of an Oligarch." *New York Times*, Updated 18 Jan. 2022, https://www.nytimes.com/2022/01/17/world/europe/bidzina-ivanishvili-georgia-trees.html. Accessed 15 Jan. 2022.

[815] Bradshaw, Peter. "Taming the Garden review–fascinating study of a billionaire's destructive folly." *The Guardian*, 25 Jan. 2022, https://www.theguardian.com/film/2022/jan/25/taming-the-garden-review-fascinating-study-of-a-billionaires-destructive-folly. Accessed 25 Jan. 2022.

[816] Ibid.

Ivanishvili's folly may well indeed be inspired by the wonder and awe of trees but it leaves behind sadness. Uprooting these mature organisms–some are hundreds of years in age–is hard on the trees, but heartbreaking for the people. Many of Ivanishvili's chosen are the special, favourite trees of the people whose lives unfolded beneath their canopy. They are the centers of community life, the touchstones, the ancestral landmarks of the village. It is truly, a "Faustian bargain," writes Peter Bradshaw, of these villagers, often paid handsomely for their trees. They are bereft when "the huge, ugly haulage trucks come to take their trees away in giant 'pots' of earth, as if part of their natural soul is being confiscated."[817] Herein lies the pain of *sublime melancholia*, in the very performative act of supplanting a tree with its spectral absence. "Whole villages are clearly in the throes of emotions they cannot understand: angry, upset, yet also weirdly elated at the undoubtedly extraordinary spectacle that they have facilitated."[818] Valentina Slobodenyuk watched as a giant sequoia and a gingko-biloba–resplendent trees that had graced her life–were spirited away to Ivanishvili's garden: "I miss them very much."[819]

The feelings of loss are not easily remedied. Ivanishvili's tree museum is open to the public. Villagers do go to visit their special trees but they are now tethered to, in Bradshaw's words, "the tamed sterility of private property."[820] Each tree has its own motion detector, and CCTV cameras and loudspeakers ensure everyone stays on the paths. Even the lawn is out of bounds.[821] Here you cannot even graze a fingertip across a leaf. Absolutely no tree hugging is allowed.

7.1.7. The Melancholia of my favourite tree

Venus of Lighthouse Park survived a logger's axe, yet she is surrounded by the fallen. This once reliably sodden coastal rainforest is suffering the consequences of carbon-based climate change. All the mid-sized cedars in the park are dying. Their shallow roots weaken in the summer droughts. Groves of skeleton cedars stand waiting

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[817] Ibid.

[818] Ibid

[819] Nechepurenko. "A Love of Trees or a Display of Power?…"

[820] Bradshaw. "Taming the Garden review…"

[821] Ibid.

to be blown down in the winter storms. The park ranger I see in my walks gives me a tally after every storm: 28 trees down last November, eight in February. The arbutus trees are dying too, stressed out from fungal leaf blights moving north along the coast with climate change, their vibrant red bark turning grey.[822]

Trees are not the only calamity. Two years ago, the same heatwave that consumed the town of Lytton, also cooked the mussels, clams, sea stars, urchins, and barnacles that thrived in the shore rocks.[823] An estimated one billion animals died.[824] The shore rocks are littered with mollusk shells that crunch underfoot.

On a summer day the park gets so full; police come to control the traffic entering the parking lot. Rangers stop every car to caution against lighting cigarettes or using barbeques. Couples and family groups head to the lookouts to marvel at the Vancouver skyline across the water. They picnic and take pictures. They watch the container-laden tankers on their way to and from China and the multi-story cruise ships headed to Alaska. Some stay for the moonrise; it is brilliant to watch from the lighthouse. Yet, none of the pleasures of Lighthouse Park hide the reality of this urban forest, now fighting every summer to survive extraordinary heat, smoky air, and, despite being a "rainforest," a fearful lack of water.

Still, I find the park a marvellous place. Bald eagles amaze with their *keer*, *keer*, *keer*. In the dusk, owls swoop far too close to those of us remaining on the trails as if to remind us to go home. I have had a raven walk alongside me; an eye fixed on my stride. And once, a black bear, a bright yellow tag in its ear, silently crossed my path not even giving me a glance. This park is still full of natural patterns and rhythms, like the spring

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[822] Kloster, Darron. "Island's stately arbutus trees wither in seasons of change." *Times Colonist,* 27 Mar. 2021, https://www.timescolonist.com/local-news/islands-stately-arbutus-trees-wither-in-seasons-of-change-4688336. Accessed 3 June 2023.

[823] Migdal, Alex. "More than a billion seashore animals may have cooked to death in B.C. heat wave, says UBC researcher." *CBC News*, Updated 6 July 2021, https://www.cbc.ca/news/canada/british-columbia/intertidal-animals-ubc-research-1.6090774. Accessed 3 June 2023.

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[824] Ibid.

unfurling of thousands of fiddleheads and the transformative yellow brick road of fallen maple leaves after a frost.

I may well have failed in this inquiry to transpose *sublime melancholia*, but it has given me a proper meditation, meshing wonder and sadness together. The gravity, complexity, and the scale of the climate crisis is beyond my full comprehension, but I do understand the miracle of stump Venus, a tree seemingly thriving in a stressed-out patch of forest, thriving despite the accumulating skeletal cedars and mollusk husks. This park was once saturated in deep time, but my experience is only of real time, accelerating time. Each footstep is a step of *nothingness*, but a journey nonetheless, for which I am grateful.

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Chapter 6. Sublime Artifacts

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Chapter 7. In Conclusion

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