VIII

Laughing All the Way to the Cryobank

“Because the sky is blue, it makes me cry.”

In a walnutshell:

Life Buoy v Life Support System >
Conservation v Intervention >
Living on the Volcano v Living on the Volcano of Civilisation >
Reef Refugium >
Rigs to Reefs >
The Return of the Son of Monster Magnet

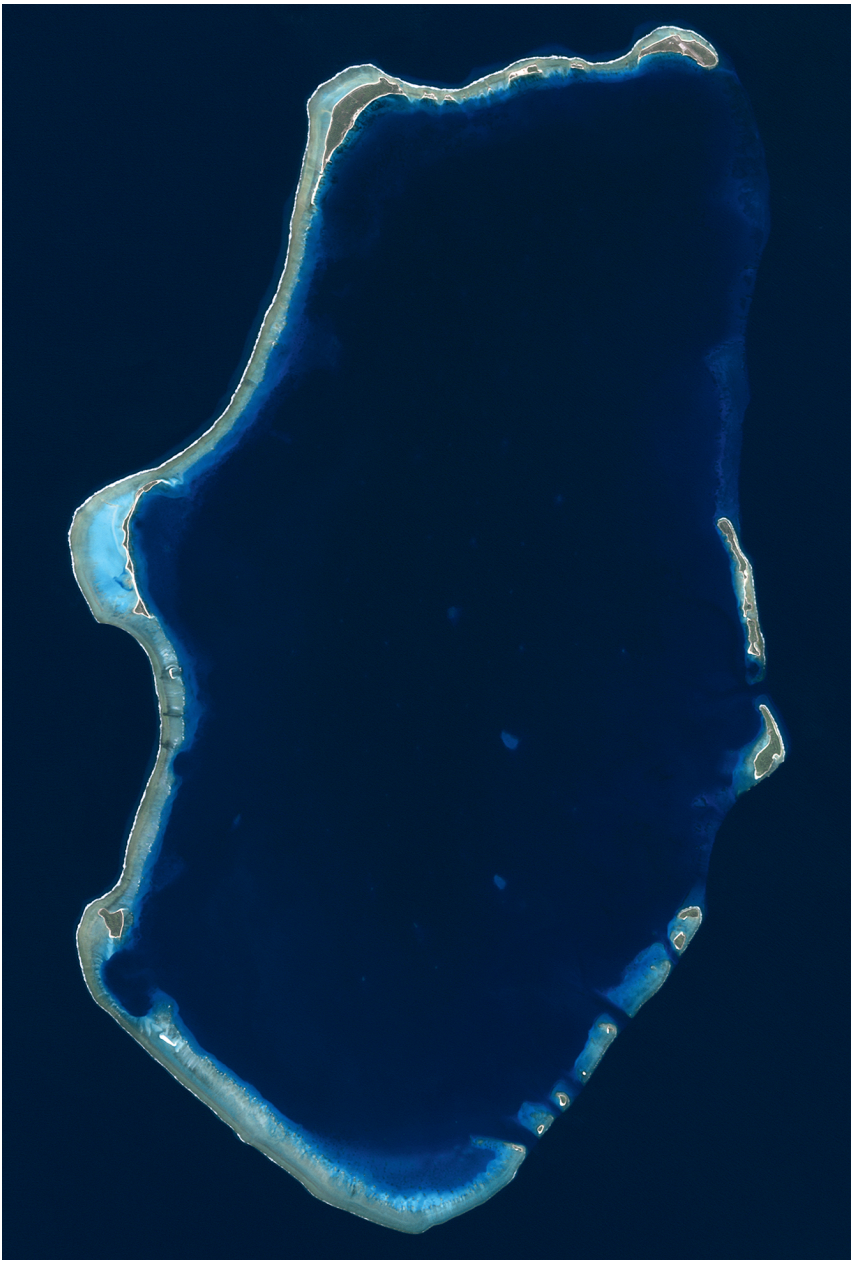

Fig. 16: The author appoints a Chernobyl Prize for Demonic Progeny: Bikini Atoll, showing the crater from Operation Crossroads nuclear test in bottom left, as featured in the finalé to *Dr. Strangelove*. Photograph from NASA Landsat 7 satellite, 705 kilometres above Earth, 14 January 2001.

When I Was a Buoyant

> I'll laugh until my head comes off
> I'll swallow till I burst.
> – Radiohead, "Idioteque" (2000)

> Comedy illustrates that survival depends upon our ability to change ourselves rather than our environment. Comedy is a strategy for living that contains ecological wisdom, and it may be one of our best guides as we try to retain a place for ourselves among the other animals that live according to the comic.
> – Joseph Meeker, *The Comedy of Survival* (1974)[364]

The yellow life buoy bobs up and down on the sea surface. A lifeline thrown to those lost at sea, in the form of a soft plastic doughnut. The device is the same as that used *en masse* for the unprecedented number of refugees risking life and limb across the seas, in search of refuge. The plastic is the same as you find in everyday items the world over. Not only shining around consumer items or wrapped around food, but in landfill, across city streets, farming fields, and beaches. Not only at the summit of the highest mountain peaks, discarded by the intrepid. Not only at the depths of the deepest ocean trenches, discarded by the insipid. Not only in disposable, reusable, or recyclable bottles, but also in the water inside the bottles itself – broken down into microplastics.

Meaning plastic is inside your body, coursing through your bloodstream, just as it is inside sea creatures, from krill to whales. The same material of the lifesaving buoy appears to be inside everybody and everything. The material deemed most apt for an emergency flotation device to save people from drowning is slowly killing both the saved and saviour alike. Death by a thousand cuts, as the petroleum derived chemical compounds course through bodies of water, and bodies of bodies.

Strapped to the sky-facing side of the life buoy is a solar panel array, and to the sea-facing side, wires extend down to a metal scaffold resting on the sea floor. The wires supply low voltage current which courses through the structure, precipitating chemical changes in the immediately surrounding water. The purpose of this electrified metal-and-plastic device is contained in juvenile and broken-off adult coral stems, attached to the scaffold with plastic ties. By altering the water chemistry, the electricity-exuding metal enables coral to grow faster and stronger.

Aided by this *Frankenstein* intervention into their biome, the attached coral enjoys a temporary reprieve from the biophysical limits to life that are decimating their kin outside the refuge of this electricity-fuelled metal. From ocean

364 Meeker, *The Comedy of Survival*, 21.

warming and ocean acidification, to nutrient density and sediment volumes – the device provides coral with more tolerable environs than the open ocean offers, so long as it functions and the coral remains attached.

Just as the life buoy is employed as an emergency measure for refugees lost at sea, the artificial reef forms a refugium for coral no longer able to survive out there in the ocean-at-large. Those who would deny deploying a life buoy for an overboard refugee, or indeed coral reef that supports an entire microcosmic ecosystem, may appear to be akin to those who would not flip a Raine Island turtle back onto its front. But the desperation shared by both situations makes such interventions the stuff of fables: good for pointing out virtue ethics on the scale of an individual human faced with a proximal existential predicament, but completely irrelevant when both turtle and coral are in fact facing far more complex distal threats. And if the fable and its human protagonist are placed faithfully into the context of the rupture currently unfolding, the refuge they offer quickly disappears beneath the waves.

Like Raine Island's triage turtle hospital, the metal-plastic-electricity-coral array offers another microcosm of how ModCon pits itself against the scale and complexity of the unfolding rupture, and what it risks in so doing. An artificial reef is a life support system that runs contrary to the nature of life itself. In a hospital for humans, a life support system enables a body to be, that would otherwise cease to be. Save for a technological system of wires, electricity, and the desire to delay death just that little bit longer. This runs contrary to Wallace's maxim that evolution is "survival of the fittest."[365] Medicine intrinsically runs against Darwinian evolution, whether it is being self-administered by humans, or administered to coral, by humans.

Once coral become dependent on such support, when the support ceases, so too does life. A wave turns the life buoy upside down. The cable length cannot extend far enough to accommodate a King Tide, causing the life buoy to sink. Cable slack gets wrapped around itself during a low tide. The cable breaks from the sustained pressure of waves constantly pushing and pulling the buoy in different directions. Sustained cloud cover reduces the volume of electricity generated. Such direct dependencies of individual artificial reefs remain proximal, their effects limited to individual or regional entities. In a walnutshell, these predicaments lie at the level of Do-or-Die or Swim-or-Sink, since such interventions mean that coral may *do* and *swim*, provided the life buoy generates electricity and remains afloat.

365 Originally attributed to Herbert Spencer, *Principles of Biology* (New York: D. Appleton and Company, 1864), 444; although it was Wallace that encouraged Darwin to adopt the term "survival of the fittest" instead of "natural selection."

Yet such seemingly limited rolls of the ModCon dice belie the wagers actually being placed, even at the scale of the buoy-solar-array life support. Nor does the gravitas of the wager simply scale up from how this is dice thrown at the level of coral, as an entire class of species distributed all around the planet along the tropics. And the gravitas of the wager also does not reach its conclusion amongst the innumerable entanglements with all manner of lifeforms and ecosystems that depend on coral.

The full nature of the wager is only truly revealed by viewing the situation through the humility of a dour demeanour. A demeanour that accepts the full scale of the existential threat (here against coral and everything that depends upon it), eviscerating the dire hubris of human intervention that rolls the dice on the basis that, at this late hour of the day, the ends justify virtually any means at all . . .

But the list of contingencies required for the means to achieve those ends, even with direct dependencies, is one without end. With each variable comes another design consideration for how to provide life support that is self-perpetuating: only the laws of entropy will never be outrun, and life, once rendered dependent on means of metal, electricity, and plastic, is the living dead.

Picture the cascading interventions that would ensue in order to make this life support as self-perpetuating as possible. From barriers around the buoy to reduce waves during storms, to catering for coral spawned from this refugia, taken by ocean currents to external sites where they receive no life support provided by an artificial reef. The list of interventions begot by the initial intervention is without end. Yet if the options boil down to experimenting with artificial reefs or watching reefs die, then a far greater uptake of such ModCons lies on the horizon.

Such responses are in line with Cranmer's resistance to his imminent death sentence. Wagering he could outrun it, such dice result from a dire mentality that favours being the living dead under the whim of Queen Mary Tudor's decision on whether to carry out her death sentence, rather than the dour demeanour of Latimer and Ridley's acquiescence to their initial verdict.

After all, Latimer and Ridley had the last laugh, embodying Meeker's notion of how "comedy illustrates that survival depends upon our ability to change ourselves rather than our environment." That is, rather than seek to the change the tyrannical social limits imposed upon their lives by changing the mind of the Queen, they took the remarkable act of changing their own tolerance thresholds to these limits. They *tolerated* the fact that such acquiescence to the state of things meant death, not survival. But in so doing, they ultimately favoured truth, rather than lying in order to have a chance to live. Truth, in this measure of desperation, is real comedy, for the bishop's ability to change themselves amounted quite liter-

ally to being able to "laugh until my head comes off," as Radiohead announced in "Idioteque", their prescient 2000 song about climate change, where the other form their last laugh takes is to "swallow till I burst."[366]

Ironically, the vast majority of ModCons will run in direct opposition to Meeker's admonishment to follow the example of comedy itself, seeking survival by trying to manipulate the biophysical environment to cope with civilisation so-called. Beyond the human scale, this uptake of ModCon has repercussions far and wide, as it responds not only to the direct nature of proximal dependencies, such as a single turtle nesting ground or a single coral reef, but also to the distal nature of the massive extrapolation of indirect dependencies that must logically result from any one intervention. Therefore, even if such ModCon were efficacious and delivered in time, it can only result in an evolutionary Red Queen, whose subjects need to run and run and run, just to stay in the same place. On the yonder side of the unfolding rupture there are either no turtles or, if a scenario manifests to hitch them onto artificial life support, then it will be turtles all the way down in the consequences that cascade from such intervention.

The buoy-solar-array life support system brings the global scale of such absurdity into stark relief, through the ModCon apparatus itself. The system, named Biorock, is a patented technology developed by an architect and a marine biologist in the 1980s, and it has since been installed in over 20 tropical countries. The seemingly innocuous Biorock offers a portal into ModCon acts of desperation, as they are currently being applied from cell to sky, and atom to atmosphere.

The utter desperation surrounding coral stems from how their existence carries the weight of all ancillary species this precocious ecosystem-engineer supports. Once they get established on some substrate, coral form reefs, whether the shallow sands that catalysed Raine, the lagoon that catalyses Teahupo'o, or rocky outcrops on Panaman volcanoes. Coral cays such as Raine island show how coral do not just create and physically uphold reefs, but how they also uphold a vast web of life dependent on them for its existence. The substrate can be *au naturelle*, say a rock, or artificial, say a metal scaffold. Either way, reefs offer refuge for smaller fish who need nooks and crannies in which to hide from larger fish. Thus, the argument for radically intervening in coral is weighted by the sheer mass of marine life that coral support.

Coral reefs then offer two kinds of life support: the marine life drawn to the refuge provide food for one another, and coral itself is a direct food source for other types of marine life. The complexity of relations grows exponentially here, to thousands upon thousands of species that all trace their core dependency to

366 Radiohead, "Idioteque."

coral. This is replicated the ocean over, to the extent that coral occupy 0.1% of the ocean floor, but support 25% of all marine life.[367] Little wonder then that those seeking to throw a lifeline to the marine world start and end with coral itself.

Pre-Intervention Is Better than Cure

> In the future, leaves will turn brown
> When we want them
> And I don't have the right
> To interfere.
> – Thom Yorke, "Interference" (2014)[368]

> Here, then, is nature today, new and fresh, being born: global, whole, and historiated before the eyes of global humanity as a whole . . . concrete and technological right now, since our means of intervention act on it and it in turn acts on us; a network of multiple bonds where all things, congruent, conspire and consent; a web tied, by a lattice of relations, to the henceforth united social and human fabric.
> – Michel Serres, *The Natural Contract* (1995 [1992])[369]

For this particular life buoy the answer as to why intentionally intervene was found in the Maldives in 1998. The Biorock experiment performed there was in response to rapidly declining coral and marine life the world over. Presciently, this experiment was not due to relatively long-standing proximal causes of coral death: overfishing, dynamite fishing, terrestrial pollution, yada yada. Rather, the experiment concerned far more pernicious distal causes: ocean warming and acidification. The Southern Hemisphere summer of 1997 to 1998 was the first recorded mass coral bleaching, putting the 1998 Biorock experiment on the cusp of reconfiguring mainstream conservation into Modern Conservation.

A staggering 92% of the heat produced by current greenhouse gas emissions into the atmosphere is being absorbed by the ocean.[370] Which only adds fuel to the fire of why the unfolding rupture is first and foremost an underwater phenomenon. It is there in the abyssal that the most rapid and abysmal biophysical change manifests. And it is there that this unfathomable repository of heat will

367 Ove Hoegh-Guldberg et al., "Coral Reef Ecosystems under Climate Change and Ocean Acidification," *Frontiers in Marine Science* 4, no. 158 (2017): 1–20.

368 Thom Yorke, "Interference," track 3 on *Tomorrow's Modern Boxes* (XL, 2014), LP.

369 Serres, *The Natural Contract*, 110.

370 Kevin Lijing Cheng et al., "Taking the Pulse of the Planet," *Eos: Transactions American Geophysical Union* 98, no. 1 (2017): 2–10.

one day catalyse correspondingly rapid change in the atmosphere, when the ocean ceases to absorb this heat, instead turning to repel it from whence it came.

"We live," as the seventeenth-century physicist and mathematician Evangelista Torricelli reminds us, "submerged at the bottom of an ocean of air."[371] Cusped, as it were, at the boundary between two oceans: between the bottom of an ocean of air above, and atop an ocean of water below. Human attention largely ignores what goes on below sea-level, our gaze instead focused from surface to sky. To do away with this woefully misdirected and myopic atmospheric gaze is to no longer stop the eye at the bottom of terrestrial well of air, but rather cast it further down, into submarine realms.

At the sea surface the rapid increases in heatwave intensity and frequency are rendered into stark relief through coral bleaching, the result of a breakdown in the symbiotic relationship between coral polyps and the zooxanthellae algae they host in their tissues. Coral outsource nearly all their energy requirements to zooxanthellae, who supply photosynthesized solar radiation in return for refuge through living in the polyp tissues. Without them, coral cannot gain sufficient nutrients or energy to live.

Yet in desperation at dealing with sustained elevated temperatures, coral expel their zooxanthellae symbionts, and in so doing deprive themselves of their energy source. As symbionts in this zero-sum game, coral effectively commit suicide by expelling the zooxanthellae algae, since coral are animals and cannot photosynthesize. Unlike Biorock, coral and zooxanthellae are a two-way street of co-dependency. Likewise, when coral are rendered dependent on artificial life support, so too are zooxanthellae, whose survival depends on safe refuge within coral tissue.

One reason the ocean absorbs so much excess heat from the atmosphere is its relatively dark colour. Consequently, sea water absorbs more heat relative to the global average for the planet. In contrast, light surfaces like snow reflect more radiation than they absorb. One can scale down planetary energy imbalance by taking any square metre of surface and measuring the ratio of absorbed to reflected radiation in watts per square metre.

When earth is net energy negative, the average ratio of solar radiant energy will be <1:1. When earth is net energy positive, the average will be >1:1. Currently, the global average is around 1.14:1. Which means that on average 14% more heat is being absorbed on any square metre of surface than is being radiated back out to space. This is what makes distal causes so pernicious: everywhere at once, all the time, without linear cause-and-effect chains that allow us to track and trace proximal causes. Distal phenomena also show up the hollowness of notional boundaries, say of a marine reserve: such boundaries are just invisible lines

371 Torricelli, quoted in Walker, *An Ocean of Air*, 24.

completely porous and pervious to the movement of underwater heatwaves around the planet.

This distal-proximal relationship brings the rough square metre of the solar panel into even sharper relief. Wherein, its technoscientific function for local coral is also a scaled-down proxy of planetary energy imbalance. As the photovoltaic panels absorb radiant heat and shade the water, they stop solar radiation being absorbed into the ocean underneath. This life support system thus appears to offer a bulwark against both proximal and distal forces, in the form of shielding the ocean from excess solar radiance.

Yet its sphere of influence is solely proximal. It acts only on the tail end of climate change consequences, namely warming and acidification in the immediate vicinity of the artificial reef. It does not treat the cause of the warming ocean, nor does its protection extend further than a few square metres. It is not as if all tropical water surfaces can be covered in sun-reflecting film, to lend coral below a lifeline. At least, not yet . . .

Addressing the distal causes and the distal predicament would require manipulating the ratio of incoming:outgoing solar radiation to be not just 1:1, but actually <1:1. It would require coaxing the demon back into containment by dissipating all excess heat accumulated in the atmosphere and hydrosphere since earth went into net positive energy balance in 1971, and then some. Yet the abiotic barriers to so doing recall the biotic barriers underpinning the catastrophic sex ratio of Raine's green turtles.

It is therefore unsurprising that Modern Conservation proposals for intervening in such energy imbalance operate at the planetary scale, through climate engineering. Using Carbon Dioxide Removal or Solar Radiation Management, such interventions would hitch the biosphere to a ModCon life support system, much like Raine and its fenced, flipped, and shade-cloth-swathed turtles as microcosm of earth's original genesis, subsequent biogenesis, and current anthro-genesis. Yet climate engineering is orders of magnitude more uncertain, complex, and contingent than all the variables that threaten the life-buoy-electrified-reef or Raine's turtles.

The most pursued proposal is to spray sulphur particles into the stratosphere, mimicking what volcanoes do when they snort forth a planetary sunshade that can slow global heating. Again, this does not address the cause of the warming, and it remains a proximal alleviation, because what it offers is more in the order of a band-aid than a cure. Above all, it offers dependency on the continuation of the ModCon fix. A scaled down version, like the solar panel array, would be to go to the beach during summer, without suncream but with a rented beach umbrella instead. As long as the umbrella is there, those under shade have little sunburn. Conversely, should the umbrella blow away or your ability to pay the rental fee fail, you would quickly burn up. Especially because of how rapidly the umbrella apparatus was removed. In the case of Solar Radiation Management this is

known as the Termination Effect: global temperatures suddenly spiking after we cease to continuously inject sulphur particles into the atmosphere.

Like the life-buoy-electrified-reef, once the biosphere is rendered dependent on this life support system, it can only be unplugged with disastrous consequences. A cost-benefit-analysis mindset would then tabulate Column A ('Disasters ensuring if climate change not curbed through climate engineering') versus Column B ('Disasters ensuing if climate change is notionally curbed through climate engineering, subject to interruption and/or termination, as per Clause Z: Shift Happens').

These are wagers that vastly transcend the seeming simplicity of Do-or-Die, or Swim-or-Sink. They reside in the realm of Now-or-Never, though the abhorrent horror of the *never* makes for a false attraction to a *now* whose appeal stems from the idea that something is better than nothing. Though the question remains as to whether that something is a *Blade Runner* world, born of biophysical limits to life made plastic by *Frankensteinian* ModCon?

Even before such *Dr. Strangelove*-like decisions get made behind closed doors, there are more technological barriers between lifeforms and oblivion than we generally let on. On the flip side, there is also more technological toxicity brought about by these barriers than we generally let on. The suncream shielding human skin from solar radiation seeps into the sea and kills proximate coral, as they cannot cope with the chemical changes that so many sunscreen-smeared human bodies bring about in their surrounding waters. We block out the sun on our skin so we can cross the threshold from living "submerged at the bottom of an ocean of air" to being immersed atop an ocean of water. Killing coral in the process, then fostering the hypocrisy of extending our sunblock to all the organisms absorbing all the excess heat trapped in the planet.

What on earth, on Earth?

Between a Rock and a Hard Place

I have seen too much
I haven't seen enough
You haven't seen it
– Radiohead, "Idioteque" (2000)

The weeping philosopher too often impairs his eyesight by his woe, and becomes unable from his tears to see the remedies for the evils which he deplores. Thus it will often be

> found that the man of no tears is the truest philanthropist, as he is the best physician who wears a cheerful face, even in the worst of cases.
> – Charles Mackay, *Extraordinary Popular Delusions and the Madness of Crowds* (1841)[372]

To sink my own sun-creamed body into this quagmire, I visited the largest and longest running Biorock site in the world: Pemuteran, on the Indonesian island of Bali. By then it was 2018 and three successive global coral bleaching events had occurred since the formative 1998 Maldives experiment. The global mass coral bleaching event of 2016 was unprecedented in both severity and extent. When a similar event occurred in 2017, making this the first ever back-to-back global bleaching event in recorded history, it brought into sharp relief how the velocity of biophysical change was already exceeding rates predicted for the middle of the twenty-first century at the earliest. Little wonder then, that ModCon such as Biorock is of such growing interest among scientists, environmentalists, conservationists, and bioengineers.

However, the growing interest in such experimental ModCon is not necessarily born of attraction toward such dice throwing, but rather due to repulsion against the notional alternatives, of dominant ModCon. For such alternatives show how empty the gestures, hitching coral and the biosphere to equally ephemeral life support systems made up of words, thoughts, and non-interventionist deeds.

The alternatives to Biorock were brought to the fore on the opposite side of Bali in the wake of the 2016 bleaching, and in the midst of the unfolding 2017 bleaching, when an NGO called *50 Reefs* was launched. Their stark proposal was unveiled at *The Economist World Ocean Summit*, held at the Sofitel Beach Resort in Kuta in February 2017. There Ove Hoegh-Guldberg, a coral reef biologist and director of the University of Queensland's Global Change Institute, gave a ten-minute presentation titled *Climate Change and The Ocean: What the Science Says*. Immediately following this presentation Hoegh-Guldberg was allotted a mere five minutes for his "Announcement of the *50 Reefs* Initiative."[373]

Hoegh-Guldberg is one of the leading marine biologists who have been consistently outspoken about the scale of biodiversity loss and extinction. For more than 30 years his publications have been outspoken, arguing that events unfolding are far worse than the normative boundaries for worst-case scenarios as defined by orthodox bodies such as the UNFCC and IPCC. In 1999 he was one of the first scientists to argue that the 1997 coral bleaching was caused by anthropogenic climate change, and to predict that such events would become more frequent and

372 Mackay, *Extraordinary Popular Delusions*, 140.
373 Ove Hoegh-Guldberg, "Announcement of the 50 Reefs Initiative," *World Ocean Summit 2017: Financing the Sustainable Ocean Economy*, 22–24 February 2017, Bali, Indonesia.

destructive in the coming decades, rather than coming centuries.[374] Even though subsequent mass bleaching events have been in line with his predictions, Hoegh-Guldberg faced considerable professional and personal backlash, as did other scientists (notably James Hansen and Kevin Anderson) who prioritised fidelity to the rupture unfolding around them over the kind of Public Relations nursery rhyme renditions that make for better headlines, and a more harmonious politico-economic song.

Hoegh-Guldberg and his colleagues established *50 Reefs* based on their modelling that "only 10% of reefs can survive past 2050 – even if the target limits set by the Paris climate agreement are met."[375] That is, the vast majority of coral are already consigned to extinction by 2050, due to the inertia between emissions and their effects. It is self-defeating to castigate modelling of 90% coral loss by mid-century, especially when this is no longer based on future variables (such as Delusional-Imagined-Community-aka-country-X doing Y with its emissions, or another country doing Z), but rather because of historical emissions that are already out of the genie's bottle and in the atmosphere.

In response, *50 Reefs* aims to identify and conserve the 50 most resilient and biologically diverse reefs, commandeering these as veritable Noah's arks which will then effectively become seed banks for future coral evolution. This act is premised on the idea that the Earth System, and anthropogenic forcings, will stabilise after the middle of this century, allowing these 50 wild seed banks to become the future stems from which coral repopulate and thus all future descendants evolve.

Even though this response to a Now-or-Never dilemma appears breathtakingly limited in its peering into the future, relying as it does on the hypothesis that the velocity of global heating can be stabilised within the next few decades, it is one that is far more attuned to the pacts with the devil that must get made in the present tense, if global heating is not to completely extinguish coral by mid-century. These pacts come to the fore when such a dire pronouncement about the future prospects for coral is immediately followed by a presentation by the Portuguese Minister of Sea, and the World Bank's Vice-President for Sustainable Development on "COP This: The Ocean and Climate-Change Policy."[376] The notion that the national and global governance of resource extraction should share the stage

374 Ove Hoegh-Guldberg, "Climate Change, Coral Bleaching and the Future of the World's Coral Reefs," *Marine and Freshwater Research* 50, no. 8 (1999): 839–866.

375 "A Global Plan to Save Coral Reefs," *50 Reefs – The Ocean Agency*, accessed 11 September 2017, http://www.50reefs.org.

376 Ana Paula Vitorino and Laura Tuck, "COP this – The Ocean and Climate-Change Policy," *World Ocean Summit 2017: Financing the Sustainable Ocean Economy*, 22–24 February 2017, Bali, Indonesia.

with the *50 Reefs* launch makes it patently clear that the dominant dice are being thrown by players who have zero fidelity to the field on which they play, or the sinking sand on which they stand.

These are, after all, words, thoughts and deeds from a summit run by *The Economist*, titled *Financing the Sustainable Ocean Economy*. In the present tense, neoliberal approaches to conservation enjoy the best currency, banking on the *terra firma* of 'Sustainable Development.' Even though it amounts to no more than an oxymoron for those who believe stasis (sustaining something) can be reconciled with flux (something being developed), and that *never* can be reconciled with *now*. And all this despite the incontrovertible fact that something which is being genuinely sustained cannot also be developed is a truth as self-evident as the ceaseless transition from water to vapour and back to water in Hans Haake's *Condensation Cube* or David Latimer's terrarium, or the earth on which they reside.

50 Reefs was launched in the context of *Financing the Sustainable Ocean Economy*, rather than 'financing the triage of coral for their intrinsic value', as such conservation depends on a World Bank worldview. Which is to say that the Portuguese Minister of Sea and the World Bank's Vice-President for Sustainable Development promote coral conservation on the grounds of the 500 million people who depend directly on coral reefs for their subsistence and sustenance. Whether *50 Reefs* is truly beholden to this worldview can only be a matter of speculation for those not privy to the internal monologues of such conservationists. Though the fact that even conservationists of a *50 Reefs* ilk are beholden to the tyranny of the court is as incontrovertible as the fact that 'Sustainable Development' is moronic. Namely, the scale of the proposed conservation requires private financing that bypasses the strictures of meagre governmental provisions.

The budget sought was initially 100 million USD, following some much more modest seed funding from the Paul G. Allen Philanthropies and The Tiffany & Co. Foundation. For those who want to have their cake and eat it too, sugar-coated mass extinction is more palatable if coral reef arcs are to be bankrolled by US diamond mining, investment banking, and computer companies. Yet the *50 Reefs* scientists' blunt predictions for coral mass extinction by mid-century fell out of favour with the funding agencies. Wherein, the gravity of their pronouncements was progressively self-censored on their website, 50reefs.org, following its launch in January 2017. Although such dominant conservation ethos is in counterpoint to Biorock, it still presents an utterly unpalatable alternative, even to its supporters and patrons.

By late 2018, the scientists, conservationists, and philanthropists finally found some middle ground, with Bloomberg Philanthropies announcing 86 million USD for *50 Reefs*. Like the ongoing Raine Island Recovery Project, these projects, and

their controversies, are yet to fully flower. Now that the sites have been identified, will these refugia be somehow guarded against both proximal and distal threats? Hitched to life support systems, like a giant globally interconnected Biorock? Guarded year-in-year-out until the dust supposedly settles in the latter half of the twenty-first-and-last century? And what of the radical contingency and radical asymmetry, not just between coral and cosmic vicissitudes, but between conservation experiments and the same vicissitudes? Who throws dice in an all-stakes-or-lose game blindfold, on a crooked floor, without even knowing the form of the dice they toss? After all, the flowers of such ModCon are just budding and are somewhat too easily glanced over when reduced to a five-minute announcement slot at *The Economist World Ocean Summit* in Bali.

Numb and Number

> The modern masters promise very little; they know that metals cannot be transmuted and that the elixir of life is a chimera but these philosophers . . . have indeed performed miracles. They penetrate into the recesses of nature and show how she works in her hiding-places. They ascend into the heavens; they have discovered how the blood circulates, and the nature of the air we breathe. They have acquired new and almost unlimited powers; they can command the thunders of heaven, mimic the earthquake, and even mock the invisible world with its own shadows.
> – Mary Shelley, *Frankenstein* (1818)[377]

Two centuries ago, Shelley wrote of how "the modern masters promise very little," even though they "have indeed performed miracles." Two centuries later, they may promise the world, but it amounts to "very little" in terms of what ModCon can do in the face of the unfolding rupture. So, following Victor Frankenstein, I instead sought to "mock the invisible world with its own shadows" by facing up, up close and personal, to the emptiness of any and all gestures. These are the forces that rapidly diminish the claims by Shelley's "modern masters" to "have acquired new and almost unlimited powers."

Amidst the conceit of believing us to be agents able to "command the thunders of heaven, [or] mimic the earthquake," earth possesses its own thundering and quaking that dwarfs human delusions of being able to intentionally exert planetary-scale agency. And in the undertones of that thunder, the Dour clears its throat to begin rebutting any desperate measures of ModCon and its dice.

These forces take the form of a volcano that comes between me and getting to Pemuteran. A few weeks before I am due to depart for Bali, Mount Agung

377 Shelley, *Frankenstein*, 73.

erupts and my trip looks to be off. For tourists such as myself this is a matter of inconvenience and insurance. Airports closed due to ash clouds, and travel insurance companies voiding any coverage under the clause of *force majeure*.

For locals, this is a matter of life and death – and not just in terms of volcanic eruptions raining down from above. 150,000 Balinese are relocated to shelters outside of the anticipated eruption zone, leaving their animals and farms to fallow in an overwhelmingly subsistence-based economy. This is just one example, but it demonstrates that on the balance of probabilities, correlation does equal causality. It is no coincidence that there is an unprecedented number of humans on the move, seeking refuge from intolerable conditions owing to calamities political, religious, military, economic – and/or climatic.

Indonesia has the largest concentration of active volcanoes on earth, some 120. Of these, Agung is one of only seven in the world whose eruption potential is rated at the top of the explosivity scale. In the lead up to its November 2017 eruption, scientists the world over devoted close attention to Agung as they sought to model how much a full-scale eruption would lower global temperatures. The wisdom to be gained was twofold: Agung could provide a planetary-scale and present tense taste of how earth induces ruptures of its own accord. But, in seeking to respond to the desperation of current climate change with desperate measures, there was also the question of how much any planetary-scale release of sulphur into the atmosphere could temper the human-caused rupture. Such eruptions thus offer surrogate experiments for researching the efficacy of climate engineering, by way of spraying sulphur particles into the atmosphere. More locally, soil scientists modelled how much fertility the ash would provide, anticipating that Agung's fallout zone would be gifted with the most fertile soil in the world a decade after the eruption.[378]

After so much anticipation, Mount Agung pulled back from the brink of another imminent eruption, the global tourism industry reopened, and I boarded a flight from Sydney to Bali. By then it was the first week of the new year, 2018: The International Year of the Reef. In addition to the more local situation of Agung threatening to erupt, 2018 is a year that started with a bang, not a whimper. In August 2017 two geophysicists published a paper demonstrating the correlation between periods of infinitesimally slower rotation of the earth and marked increases in earthquake frequency.[379] Their modelling showed 2018 was the next year in which this correlation would reach its periodic peak. Here again, correlation = causality.

378 Dian Fiantis et al., "Volcanic Ash: Insecurity for the People but Securing Fertile Soil for the Future," *Sustainability* 11, no. 11 (2019): 1–19.

379 Rebecca Bendick and Roger Bilham, "Do Weak Global Stresses Synchronize Earthquakes?", *Geophysical Research Letters* 44 (2017): 8320–8327.

Yet another ex-externality: what was previously discounted as being of no consequence to a system's behaviour, now revealed to no longer be an externality.

On the way to Pemuteran, I climb Mount Batur, Agung's neighbouring active volcano. Due to fears around Agung erupting, Bali is relatively empty of tourists, all the more so in the volcano's vicinity. It is also the middle of the monsoon, meaning tourism numbers would already have been relatively low. I make for the trailhead on a trusty scooter that now doubles as an off-road all-terrain vehicle. Being next to Agung, and as close as I can go to the exclusion zone, all tea shops and snack stalls are closed. I hike toward the crater, passing only a trio of locals who quiz me on my I am walking alone up the volcano in the rain.

Our actions need not always have a rationale. For that to be the case presupposes that human actions can be rational, and further, that there is such a thing as rationality in the first place. Amidst this non-sense, my individual actions were intended to chase the ever-elusive confluence between being and becoming petrified. To experience the dynamism of Batur, the volcano that has devastated the region twice in the past century alone, to get as close as possible to Agung, with its possibility of imminent eruption, and to glimpse around the bend to the next *New World Coming*. The one we wait upon in every waking nightmare that is the present tense.

Inside the present tense, and inside the Batur volcano crater I sit, feeling warmth radiating out from the earth as steam rising through vents. Agung is completely covered in cloud, which would obscure an eruption until it became visible, having reached the wider area surrounding. My (human) solitude on the mountain is shared with monkeys that have too been drawn inside the crater, peering over the vents for a steam bath. Swallows fly in all manner of twists and turns within the crater, chasing insects. The setting is idyllic, in the sense of dwelling on an earth that may radically transform itself at any time, come what may for those who "build their homes upon" it, whether monkey, swallow, Stegosaurus, or me.

Though any naive romantic longing is quickly called out for the bluff that it actually is, when a thunderstorm rolls up the mountain valley and visibility rapidly disappears into clouds appearing out of darkening skies. I scuttle out of the cloud that consumes the volcano caldera, trying to avoid the gathering darkness of being cast adrift into the elements as actuality not fantasy.

Timing is everything only if you have all the time in the world. Six days later Agung issues a strombolian eruption, throwing lava bombs a kilometre from the crater, though this barely registers against its ever-imminent and always-unpredictable major eruption.

In the midst of the unfolding rupture, it is difficult to imagine a force that could actually throw a spanner in the works of the tyranny conducting ecocide

on the very systems which support life on earth. Earthquakes and their associated forces of tsunamis and fires are unequivocally destructive – yielding cities buried in strewn pieces of the same materials used in Biorock – plastic, metal, and glass – mixed with sludge rolled in from the ocean, or the charred remains of same.

On the other hand, the indiscriminate effluence of volcanoes is as close to a *tabula rasa* as one can get from sources intrinsic to earth (rather than extrinsic, such as asteroids). Volcanoes destroy much local life, even at the scale of an entire bioregion, only to sometimes provide it with markedly more fertile soils that cause an even greater abundance of life to return decades later. They are the ultimate ambassador for the dour demeanour and its acquiescence to the vicissitudes of the cosmos, indiscriminately giving and taking.

These absurdities percolate within my body when I sink into the Biorock site at Pemuteran, body and ocean both coursing with microplastic, and my fragile membrane of skin shiny with the grease of an 'eco-friendly organic' suncream. To fathom even the shallowest depths here at play, it is necessary to get out of your head.[380] So 'down the rabbit hole', and like Alice confronted with a world in which all law, scale and logic she thought she knew was upturned, this wonderland makes a mockery of my comprehension of the universal sigh. The Dour's portent of the volatility and scale of the real forces at play restates its presence in Pemuteran's sand, already black from Agung's last significant eruption in 1963, a mere 50 kilometres away. After all, this is a bioregion whose marine and terrestrial biomes boast dynamism of the highest order on earth.

At the time, the bay received no net benefit from the eruption – instead the coral was decimated by sediment raining down, blocking light and therefore the zooxanthellae's ability to photosynthesise. Following its recovery, this same coral then faced the marked increase in local fishing, following a marked increase in the local population of people. Fishing methods changed too – from rod to net to dynamite. Then, with the rise of tourism based around snorkelling and scuba diving, the local economy changed yet again. This time, however, to favour interest in conserving marine ecosystems. This combination of proximal pressures prompted Biorock to make Pemuteran their main experimentation site. Before the catastrophic global bleaching of 2016, Biorock offered the longest running baseline for comparing artificial coral reefs to their notionally natural neighbours.

While the dozens of metallic structures source their power from one solar array and a micro wind turbine, the vast majority of electricity is supplied from the mainland grid by three local businesses – two hotels and one scuba diving shop. The power, while low voltage, adds to their bills, and during the 2016 global

380 Iain McCalman, *The Reef: A Passionate History* (London: Scribe Publications, 2014).

bleaching peak, they interrupted their supply to the reefs to reduce their bills. Without the assistance of altered ocean chemistry, the scale of the underwater heatwave was greater than the tolerance threshold for much of the Biorock reefs. While many became sick or died, their mortality levels were still much lower than the decimated *au naturelle* reefs around.

As I swim through these contraptions I see the chalk-versus-cheese difference between ecosystems on artificial life support and those fending for themselves. The former offer a brilliant iridescent kaleidoscope of coral colours and their ancillary sea creatures, but these are surrounded by dull and muddied unaided coral, of relatively little interest for marine life which usually make their living off it. The artificial reefs come in shapes of strict cubes, distorted prisms and spheres, and more recently, shapes like sea creatures to make them more visually appealing: after all, this has become the town's main tourist attraction.

I follow the network of criss-crossing pipes, going along the beach under the parasails, across the wading area and out into the bay. Back to the boxed-in inverters and converters humming away with flashing lights. Out to the floating pontoon with its solar array, and the other with its micro wind turbine. I follow fish back and forth between so-called artificial and so-called natural ecosystems. I follow the bubbles that emanate from the metallic structures – an oxygen concoction catalysed by the electricity-metal-mineral interaction. Confronted with flourishing yet completely intervention-dependent coral, I bathe in the cold comfort of a dour demeanour and recall *Frankenstein*, Shelley's haunting caution against *The Modern Prometheus*, even here, watching how it has mutated in the two centuries since.

Boarding a boat, I follow the line of underwater mountains a kilometre out to a nearby offshore reef, and a further 20 kilometres away to the most protected reef in all of Bali, within the island's sole National Park. I interview Biorock co-inventor Thomas Ghoreau and the local staff at their Pemuteran headquarters that house all the batteries and inverters. I read through technical reports, patents, and scholarly articles by the scientists behind Biorock, with their unsubtle call to arms with capital letter headings: "BIOROCK ARKS: THE LAST HOPE FOR CORAL REEFS."[381] I read through blog posts and forums of fellow obsessional lay citizens. And promotional websites of local businesses with a vested stake in the continuance and success of Biorock. And impassioned websites hailing it as the future of marine conservation.

381 Thomas Goreau, "Biorock Arks: The Last Hope for Coral Reefs," *Global Coral Reef Alliance*, accessed 5 January 2018, http://www.globalcoral.org/_oldgcra/biorock%20arks.htm.

The only song that can make sense of the absurdity, as well as my response to it, is again Radiohead's "Idioteque." Only contradictory statements of having "seen too much" while not having "seen enough" provide the means of countering the non-sense that floods in when trying to negotiate the repercussions of an interventionist ModCon like Biorock. On one hand *how on earth* is there a compelling case to be made for such interventions, so palpably fragile and vulnerable to the thousandfold vicissitudes that this planet offers on a daily basis? On the other hand, how can a case be made for the consequences of holding some arbitrary moral high ground against such interventions when you see with your own eyes the peculiar but (relatively) flourishing reefs they are capable of supporting?

If Attenborough standing atop Raine Island's re-profiled beach promoting the turtle fences and sand height raising does not make a compelling case for intervening, then neither would a soap box sermon of someone standing atop the un-raised and eroded beach condemning the hubris of such interventions – and surrounded by drowned turtle eggs. Palpable tensions fuel the discord between intervening by doing, and intervening by 'not-doing', making our options amount to both an empty gesture and ecocide at the same self-contradicting time.

In a walnutshell: we cannot Biorock the world's reefs, and even if we could, we would be rendering the marine ecosystem existentially dependent upon the precarious web of economics. Moreover, such technofixes allow for unconscionable excuses to further delay treating the causes of mass bleaching. This is not a truthful encounter with our world, lacking as it does in fidelity to both the causes of the problem, and the volatility of what we are trying to fix.

At stake here is our fidelity to both the world and the World Turtle. The dour demeanour tells us truthfully that the chalk-versus-cheese difference between artificial coral reefs and their *au naturelle* neighbours does not and cannot be scaled up to the entirety of earth. Nor should it. Nor does it scale up to the *longue durée* of the long emergency that is the twenty-first-and-last century. Nor should it. So be it for whatever lifelines we attempt to extend to life forms that are otherwise denied any refuge.

The Genie Is out of the Bottleneck

> The word *politics* must now be considered inaccurate, because it refers only to the *polis*, the city-state, the spaces of publicity, the administrative organization of groups. Yet those who live in cities, once known as bourgeois, know nothing of the world.
> – Michel Serres, *The Natural Contract* (1995 [1992])[382]

> Constant revolutionising of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish the bourgeois epoch from all earlier ones. All fixed, fast-frozen relations, with their train of ancient and venerable prejudices and opinions, are swept away, all new-formed ones become antiquated before they can ossify. All that is solid melts into air, all that is holy is profaned, and man is at last compelled to face with sober senses his real conditions of life, and his relations with his kind.
> – Karl Marx and Friedrich Engels, *Manifesto of the Communist Party* (1906 [1848])[383]

While the spatial and temporal scale of the unfolding rupture is readily apparent in the life buoy feeding the Biorock structure, how can the scale of the unfolding rupture be brought into the mass of concrete, steel, plastic, and electricity that is the city? It is there that sheltered worldviews are still sung. Thus it must be there that the rupture is made apparent too.

The two domains of coral and city share more in common than it would first appear. As geologist and palaeontologist Jan Zalasiewicz remarks, "both skyscrapers and coral reefs are basically large masses of biologically constructed rock, worthy monuments to our respective phyla,"[384] although our "worthy" monument amounts to Raine's beacon poking above the risen sea waters, surrounded by an open and empty ocean.

It was in one such city, namely Paris, that the foremost attempt has been made to showcase how dominant worldviews attempt to acknowledge the true extent of the rupture, only to fail to truly comprehend it. In 2015 the UN convened the Twenty-First Conference of Parties (COP) in Paris, and its resultant Paris Agreement set the "target limits" that *50 Reefs* refer to when they lament that even if the limits were not breached, "only 10% of reefs can survive past 2050."[385]

Yet this is an 'if' that wagers not merely upon the fall of the dice, but upon the actual scale of the dice being thrown. Writing the month after the conference finished, Kevin Anderson lamented the scale of this 'if', commenting that the Paris Agreement "has just gambled its future on the appearance in a puff of

382 Serres, *The Natural Contract*, 43.
383 Marx and Engels, *Manifesto*, 18.
384 Jan Zalasiewicz, *The Earth After Us: What Legacy Will Humans Leave in the Rocks?* (Oxford: Oxford University Press, 2008), 172.
385 The Ocean Agency, *Global Plan to Save Coral Reefs*.

smoke of a carbon-sucking fairy godmother." Where the gamble "rests on the assumption that the world will successfully suck the carbon pollution it produces back from the atmosphere in the longer term."[386]

The Paris Agreement rolls the dice over so-called Negative Emissions Technologies (NETS), which include climate engineering, though it specifically hinges on Biomass Energy Carbon Capture and Storage (BECCS). Wherein, crops specifically grown for generating energy are thermally combusted in power stations, with their emitted carbon dioxide compressed into a transportable form, to wind up in underground storage, including fossil fuel mines.

Such energy generation is the "carbon-sucking fairy godmother" because it draws carbon dioxide out of the atmosphere and sequesters it under the earth for an epoch or two. BECCS brings back the horrifically humorous images from the *Dr. Strangelove* finalé wherein American military men opt to rebuild their civilisation from abandoned mine sites: avoiding runaway climate change through NETS is premised on pulling gigatons of existing emissions from the atmosphere, to store in these same mine sites.

Furthermore, the 'if' looms large, as the technologies do not yet exist, but the Paris Agreement is premised on NETS being ready, at efficacy, scale, and cost, for mid-century deployment. Anderson could not help but see the parallels between the standing ovation that greeted the COP21 finalé and Kubrick's sycophantic warmongers who pretend their US President is not the naked Emperor: "A few years ago, these exotic *Dr. Strangelove* options were discussed only as last-ditch contingencies. Now they are Plan A."[387]

A few years ago, such critical commentary was restricted to blogs, websites, or fringe journals, where anyone, irrespective of expertise or knowledge on the subject can say unsubstantiated anythings. Here, Anderson is writing in the journal *Nature*, arguably the second most coveted science journal in all fields, save for *Science*. Anderson lamented this particular COP because many had held it to be the long-awaited breakthrough, following the twenty prior failures. Though this critique precedes even the IPCC and UNFCCC formation – recall Serres' prescient *Natural Contract* in 1992.

While Anderson was in attendance at the official proceedings in Le Bourget in the Paris suburbs, Australian artist Janet Laurence was also in attendance, though as the Australian representative for ArtCOP21. This parallel city-wide art and culture event consisted of exhibitions, performances, and installations, running over the weeks leading up to and during the COP event itself.

386 Anderson, "Talks in the City of Light."
387 Anderson, "Talks in the City of Light."

If the COP event relates to the premise of this song, in that it highlights the lack of an exacting fidelity to knowledge *on Earth* itself, then ArtCOP21 relates to the tenor of the song, for it represents creative expression about *what on earth* is going on. The festival brought the rupture out of closed-room boardrooms and into "the *polis*, the city-state, the spaces of publicity," namely, the *polis* that makes up "the word *politics*."

Though, what Laurence brought into the city centre was a confrontation with Serres' manifesto for restoring politics to its actual meaning:

> From now on, those who govern must go outside of the human sciences, outside the streets and walls of the city, become physicists, emerge from the social contract, invent a new natural contract by giving back to the word nature, its original meaning of our natal and native conditions.[388]

Substituting 'become biologists' for "become physicists," Laurence's installation *Deep Breathing: Resuscitation for the Reef* presented a stark vision of the Great Barrier Reef as a fictitious coral hospital within the National Museum of Natural History in Paris.[389] Hundreds of pieces of wet specimens, coral, medical equipment, and scientific equipment were assembled together, evoking a kind of Bio-rock artificial reef, with the deceased organisms hitched to a life support system made up of wires, beakers, and cabinets.

It was as if the seemingly remote great outdoors had been installed in a city centre, showing "those who live in cities" who "know nothing of the world" what Mod-Con actually constitutes. If this is "giving back to the word nature, its original meaning," then for Serres this demands a return to "the conditions in which we are born – or ought to be reborn tomorrow."[390] Instead of returning to this condition, however, "those who govern" were simultaneously in the COP boardrooms, feeding the consensual delusion that the demon can be coaxed back into bottles of containment.

Not that *Resuscitation for the Reef* offered any answers for what conservation should or could become. Instead, Laurence's installation reaffirms Nina Simone's philosophy of "an artist's duty," which "is to reflect the times." When Simone remarked in 1969 on "this crucial time in our lives" she referred to the civil rights movement in the US, "when everything is so desperate, [and] when every day is a matter of survival."[391] Now the predicament is planetary, functioning at the scale of species and superfamily, never mind arbitrary fantasies of ethnicity, or skin-colour.

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388 Serres, *The Natural Contract*, 44.

389 Janet Laurence, *Deep Breathing: Resuscitation for the Reef*, 2015, https://www.janetlaurence.com/natural-history.

390 Serres, *The Natural Contract*, 44.

391 Simone, "An Artist's Duty."

Yet now that this matter of survival extends to the Sixth Extinction Event, it is art, ironically, that offers the truest language for making non-sense of sense, and sense of non-sense, amidst the sheer absurdity both of the dilemma as well as of proposals for responding to it. Just as Raine Island cannot be turned into a hospital triage through shade cloths, or worldwide coral reefs hitched to Biorock life support systems, Laurence's stark vision explicitly referred to notions of conserving the Great Barrier Reef, the largest living organism on earth, as if it were a hospital. Yet, while her coral hospital is as fictitious as NETS, her vision is anything but. And the bleached Great Barrier Reef coral samples she brought to this COP sideshow demonstrate the consequences of the gap between fable and fidelity.

Ironically, *Resuscitation for the Reef* could not be presented *in situ* on the actual reef in 2015, because the Great Barrier Reef Marine Park Authority (GBRMPA) had a moratorium on artificial reefs within the park, as part of upholding the illusion that it is *au naturelle*. The straw that broke this camel's back and demonstrated the change in GBRMPA's policies was another artist, Jason de Cares Taylor, who was commissioned in 2017 to make a series of (now permitted) artificial reef sculptures within the greater park area, to form the Museum of Underwater Art.[392] The Great Barrier Reef, further decimated in 2024 by the fifth mass bleaching event in the past eight years, is now becoming a scenic playground for snorkelers and scuba divers among artificially coral-infused sculptures. *Blade Runner* and *Frankenstein* are already well at home in this *New World Coming*.

Truth though is talk and talk is still cheap. Art has always suffered from its sheer absence of applicable usefulness. Daring to express, let alone comprehend, where we stand and how we got here was a luxury we could ill afford at the opening of this book, with Nina Simone's 1969 statement of "an artist's duty," or even with the deaths of Latimer and Ridley in 1555. Now, the contrast between art and the world it professes to covet is demonstrated by other experiments that prove how conservation on the actual reef has become a deadly affair, in stark contrast to the empathy and tender care evoked by *Resuscitation for the Reef*.

In 2016, a robot named COTSBOT started patrolling for *Acanthaster pianci*, commonly known as the Crown of Thorns Starfish (COTS). This species has been the subject of much controversy, but in short, the starfish preys on certain kinds of coral polyps. Below a certain population threshold it is simply one part of the complex reef ecosystem. However, due to overfishing of various species that prey on COTS, and increased ocean temperature favouring the starfishes' larval development, there have been massive population explosions of this coral predator for well over four decades now, resulting in a further threat to coral reef integrity,

392 Jason de Cares Taylor, *Museum of Underwater Art*, 2017, https://www.moua.com.au.

especially in the case of the Great Barrier Reef. The COTSBOT uses machine learning and artificial intelligence to identify friendly coral from COTS foe. Once identified, it kills COTS by injecting them with vinegar. With the prototype robot proving effective, the makers now aim to scale up production and send their minions offshore to neighbouring countries.[393]

In 2020, four years after COTSBOT was first launched, the first *in situ* Marine Cloud Brightening experiments were conducted on the Great Barrier Reef, to explore the efficacy of shading coral by spraying ocean droplets into the sky in order to catalyse clouds. Such technologies are but the tip of the melting iceberg of the ModCon being explored to try and salvage the largest living organism on earth.[394]

While these experiments take place largely out of sight and out of mind for "those who live in cities" and "know nothing of the world," *Resuscitation for the Reef* brought them to the fore in 2016, when it was exhibited at the Australian Museum in Sydney. There I stood before the coral hospital, under the same skeleton of a full-sized blue whale hanging from the cavernous ceiling where childhood-me had come face to face with species extinction by way of individual mortality, confronted with Lucy the skeleton versus Lucy the song. In such a moment one can remotely fathom the Anthropocene's "collapsing of multiple chronologies – of species history and geological times into our very own lifetimes," which Chakrabarty likens to the effect of "falling into 'deep' history."[395]

Why the Prolonged Face?

> There is no way out,
> You can scream and you can shout,
> It is too late now . . .
> Oh go up to the king, and the sky is falling in.
> – Radiohead, "2+2=5" (2003)[396]

Falling into 'deep history' via a Lucy-like encounter indeed carries, as Chakrabarty puts it "a certain shock of recognition – recognition of the otherness of the

393 Justin Donhauser, "Environmental Robots and Climate Action," in *Handbook of Philosophy of Climate Change*, eds. Pellegrino Gianfranco and Marcello Di Paola (London: Springer Nature, 2023), 151–161.

394 Benjamin Sovacool et al., "Coral Reefs, Cloud Forests and Radical Climate Interventions in Australia's Wet Tropics and Great Barrier Reef," *PLOS Climate* 2 no. 10 (2023): 1–32.

395 Chakrabarty, "The Human Condition in the Anthropocene," 180.

396 Radiohead, "2+2=5," track 1 on *Hail to the Thief* (EMI, 2003), LP.

planet and its very large-scale spatial and temporal processes of which we have, unintentionally, become a part."[397] Whereas a *Resuscitation for the Reef*-like encounter carries the shock of recognising how we are now *intentionally* trying to become a part of "very large-scale spatial and temporal processes." Once again, coral makes for means by which to see the fall from grace to disgrace, side by side with the fall from unintentional to intentional human involvement in 'spatial' and 'temporal' processes.

One of the foremost *spatial* expressions of this intention is found in the Gulf of Mexico, which has the largest array of oil rigs in the world. Decommissioned rigs are refashioned as catalysts for artificial reefs through the US Government Rigs to Reef program, initiated in 1985. The premise being that rigs provide the skeleton for unintentional artificial reefs during their active lifespan, and that once they have exhausted their oil extraction, the above ground metallic structure may be cut up and strategically placed underwater where it will support a larger (and now intentional) artificial reef.

Due to its floor of loose sediment, the Gulf has almost no natural substrate for the first 400 metres down from sea level and thus reefs cannot start in this marine area. There is only one natural reef in the Gulf proper, with one other at the periphery. Thereby, an extensive marine ecosystem has become reliant on a network of 4,500 oil production platforms, 500 of which have been decommissioned and converted into intentional artificial reefs, collectively constituting what the US Department of the Interior declares is "the world's largest artificial reef complex."[398]

Ironically the substrate that oil infrastructure provides has been framed, even by marine biologists, as a kind of massively scaled up Biorock or *Resuscitation for the Reef*. Wherein, marine biologists Paul Sammarco, Amy Atchison, and Gregory Boland argue that "once a rig is moved in any way, an entire ecosystem is gone." By this rationale, they maintain that since "we've created these ecosystems, now it's up to us to keep them alive. Removing old oil rigs is 'pulling the plug' on many of the Gulf of Mexico's rare and important marine species."[399] Therein, the marine ecosystems' unintentional reliance on oil infrastructure creates a responsibility to scale up rigs to reef conversion, with the program since adopted across the globe.

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397 Chakrabarty, "The Human Condition in the Anthropocene," 181.

398 Les Dauterive, "Rigs-To-Reef Policy, Progress, and Perspective OCS Report" (Washington D.C: US Department of the Interior, 2000), 4.

399 Paul Sammarco, Amy Atchison, and Gregory Boland, "Expansion of Coral Communities within the Northern Gulf of Mexico via Offshore Oil and Gas Platforms," *Marine Ecology Progress Series* 280 (2004): 132.

One of the foremost *temporal* expressions of this intention to become a part of "very large-scale spatial and temporal processes" is found, once again, on the Great Barrier Reef. While *Resuscitation for the Reef* was on exhibition in Sydney, the city zoo's Taronga Conservation Society set up the Great Barrier Reef Coral Cryodiversity Bank. This included retrieving coral sperm, ova, and gametes from the reef, for cryopreservation at Taronga Western Plains Zoo in the semi-arid rural city of Dubbo. Following five Great Barrier Reef collection expeditions, the world's largest cryobank of frozen coral gametes is now held in a zoo 400 kilometres inland, more or less due west of Sydney.

The Cryodiversity Bank's aims are akin to those of *50 Reefs*, except that the refugia are not guarded *in situ*, but rather preserved in deep freeze. Billions of coral spawn are plucked from their birth sites and kept in suspended animation, with the intention to reseed them back onto reefs in the future as replacement for the reefs dying in the wild, which cannot be kept on life support amidst the greatness of the great outdoors.

50 Reefs aims to preserve a sample of reefs *in situ* to use as seed banks for future reefs, whereas the cryobank aims to preserve samples of coral sperm, gametes, and ova *in vitro* to re-seed future reefs. Both aim to preserve microcosms that can beget a macrocosm, though it remains to be seen how or when, and also who will preserve the hundreds of thousands of marine species who rely on coral *in situ* and make it the backbone of marine ecology that it is.

Somewhere between the *in situ* of *50 Reefs* and the *in vitro* of the cryobank lies the hybrid of assisted evolution. The aim therein is to breed so-called supercorals by combining traits from multiple species to increase their tolerance threshold in step with rates of ocean warming and acidification. The most renowned scientist in this discipline, Madeleine van Oppen from the University of Melbourne, draws analogies with the directed evolution humans have imposed upon most domesticated species of fauna and flora – from canines to corn.

Van Oppen's main laboratory is at the Australian Institute of Marine Science in Townsville, the North Queensland city which is also home to the headquarters of the Museum of Underwater Art. Visiting her team there, as well as their conjoined laboratory at the University of Melbourne, I come face to face with "falling into 'deep' history" – in this case, it is a direct confrontation with the evolutionary timescales that are being compressed through directed evolution. There in the laboratories, the biophysical limits to life are probed at the genetic level. The planetary scale of the unfolding rupture is registered and uploaded into the assemblage of concrete, steel, plastic, and electricity which make for a real-world coral hospital, as a counterpoint to *Resuscitation for the Reef*.

This confrontation throws into sharp relief the monstrous choice between doing-something, where *something* amounts to throwing dice, blindfold and ignorant,

at the table of gods. And doing nothing, where *nothing* amounts to standing on that ethical soapbox on Raine's unprofiled beach, surrounded by drowned turtles, or on a bleached segment of the world's largest living organism. Why *on earth* wouldn't we throw the dice? But *how on earth* can we throw them, when they now lay claim to the unimaginable force of millennia upon millennia of evolution, compressed into mere decades?

And this is but the tip of the melting iceberg, for while coral is the focus of assisted evolution for conservation, the intention to become a part of "very large-scale spatial and temporal processes" extends a lot further. Synthetic biology is the umbrella term for such intentional human interventions into evolutionary processes, all aiming to wield magic in the order of Anderson's "carbon-sucking fairy godmother."

The official title of the conflagration between unintentional and intentional evolution reads like the "absurd" summation with which Kubrick surmised the present tense: *The Joint Task Force & Technical Working Group of the International Union for the Conservation of Nature*, who first convened at Jesus College in Cambridge, England, in April 2018.[400] Assembled to kick off their first meeting for the Synthetic Biology and Biodiversity Conservation project, this peak international body for the "Conservation of Nature" was tasked with researching the efficacy of synthetic biology amidst the unfolding Sixth Extinction Event. It has come to this: an International Union for Evolution by committee.

Despite the grand titles, the fact remains that the limits of life will always outpace our attempts to control one another, and to control life itself. The social or biophysical life that we attempt to control will time and time again, show how hollow our hubris. If this sounds more far-fetched and fantastical than a nursery rhyme about *Three Blind Mice*, consider how the vast majority of a person's health care in prosperous countries like the US is spent on the last six months of their life. The desire to delay the inevitable runs deep within us.

Just as Bishop Cranmer eked out another half a year of life, rather than accept his comeuppance to burn at the stake. The difference is that nowadays the price of delaying the inevitable is more dire than death. Imagine diverting those colossal resources used to extend human lives by a few months and using them instead to reduce the destruction of more-than-human lives by humans? If the relatively wealthy minority from one species were to accept six months less of life, thousands of other species could live for decades longer.

400 *The Joint Task Force & Technical Working Group of the International Union for the Conservation of Nature* conference, Cambridge University, England, 12–15 April 2018, accessed 1 July 2019, https://www.iucn.org/files/tors-iucn-task-force-synthetic-biology.

Medicine, is, by definition, anti-Darwinian evolution. And ModCon is a type of medicine, though it is a disease at the same time. Whether a tyrannical Tyrell living a life shuttered away from the street, or an insurrectionist bishop trying to take the message of believers to the Royal Court, or a Queen who executes said bishop for challenging her own worldview, the games we play with one another are the same as those we play with life itself.

Whether or not you "have seen too much" or "haven't seen enough," or prefer Mama Cass' version of *New World Coming* to Nina Simone's, we have all fallen into Chakrabarty's 'deep' history, into "deep, geological time." When Batty breaches Tyrell's inner sanctum, declaring to his maker that "I want more life, fucker!," he meets rebuttal after rebuttal about how the biophysical limits to life cannot be breached. Tyrell declares the limits as meaning that

> to make an alteration in the evolvement of an organic life system is fatal. A coding sequence cannot be revised once it's been established . . . because by the second day of incubation, any cells that have undergone reversion mutations give rise to revertant colonies like rats leaving a sinking ship. Then the ship sinks.[401]

In this vein, the idea that there is some kind of choice between sinking and swimming appears to be just that: an idea. Rather than a choice, it appears there is only ever the option of swimming, followed, when life gives way, to the obligation to sink. Tyrell rubs salt into Batty's wounds, announcing that an Ethyl Methane Sulfonate recombination or a "repressive protein that blocks the operating cells" cannot circumvent his imminent mortality.

Resigned to his fate, Batty clasps Tyrell's head, staring his maker in the face as he gouges out his eyes, crushing his skull while declaring that Tyrell's sins of playing with the limits to life are "nothing the god of biomechanics wouldn't let you in heaven for."[402] The tyrant is dead. Long live tyranny.

401 Scott, *Blade Runner*.
402 Scott, *Blade Runner*.

Fig.17: John Foxe, "A Table Describing the Burning of Bishop Ridley and Father Latimer at Oxford," *Book of Martyrs* (London: John Day, 1563).