

DE GRUYTER
OLDENBOURG

Joshua Wodak

PETRIFIED

LIVING DURING A RUPTURE OF
LIFE ON EARTH

APOCALYPTIC AND
POST-APOCALYPTIC STUDIES

DE
G

Joshua Wodak

Petrified

Apocalyptic and Post-Apocalyptic Studies



Edited by
Käte Hamburger Centre for Apocalyptic and
Post-Apocalyptic Studies

Volume 3

Joshua Wodak

Petrified



Living During a Rupture of Life on Earth

DE GRUYTER
OLDENBOURG

ISBN 978-3-11-138173-2
e-ISBN (PDF) 978-3-11-138293-7
e-ISBN (EPUB) 978-3-11-138336-1
ISSN 2752-1370



This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. For details go to <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

Creative Commons license terms for re-use do not apply to any content (such as graphs, figures, photos, excerpts, etc.) not original to the Open Access publication and further permission may be required from the rights holder. The obligation to research and clear permission lies solely with the party re-using the material.

Library of Congress Control Number: 2024951497

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the internet at <http://dnb.dnb.de>.

© 2025 the author(s), published by Walter de Gruyter GmbH, Berlin/Boston, Genthiner Straße 13, 10785 Berlin

This book is published open access at www.degruyter.com.

Cover image: Mount Yasur volcano, Vanuatu, 25 January 2020 (Photograph by Joshua Wodak)

Typesetting: Integra Software Services Pvt. Ltd.

Printing and binding: CPI books GmbH, Leck

www.degruyter.com

Questions about General Product Safety Regulation:
productsafety@degruyterbrill.com

If desperate times
call for desperate measures,
how can the response be measured
against its only true correlate
– the cosmos?



Dedicated to my parents, Jo & Alex

Acknowledgements

I would like to thank the following people for helping make this book a reality:

For offering their time and expert input on different specialist topics: Dr Thomas Goreau; Prof. Madeleine van Oppen and the Australian Institute for Marine Science, Townsville; Dr Owain Edwards, Dr Justine Lacey and the staff of the Commonwealth Scientific and Industrial Research Organisation, Australia; Heron Island Research Station at the University of Queensland; Prof Ian Paulsen, J-L Heylen, and the Australian Research Council Centre of Excellence in Synthetic Biology; and Synthetic Biology Australasia.

For their feedback on the manuscript: Prof Iain McCalman, Prof Nigel Clark, Prof Steve Mentz, Prof Jan Zalasiewicz, Prof Mark Williams, Prof Kate Rigby, Prof Libby Robin, Prof Paul James, Dr James Gourley, James Bradley, Dr Tom Bristow, Dr Christian Wicke, Dr Guy Emerson, Dr Julie Louise Bacon, Dr Kirsten Wehner, Dr Jenny Newell, Dr Cameron Muir, Dr Prue Gibson, Prof Marie Sierra, Prof Alison Bashford, Prof Matthew Kearnes and the Environment and Society reading group at the University of New South Wales. To my colleagues from Western Sydney University: Prof Ned Rossiter, Prof Gregory Noble, Prof Ien Ang, Prof Katherine Gibson, Prof Fiona Cameron, Prof Jessica Weir, Dr Daniele Fulvi, Dr Henry Dixson, and Dr Yasmin Tambiah.

For their insight into the world of publishing, and where – if anywhere – *Petrified* could be placed: Lane Heymont (The Tobias Literary Agency); Chris Rogers (Dunow, Carlson & Lerner Literary Agency); Jeremy Lewis (Oxford University Press); Eileen Joy and Vincent van Gerven Oei (punctum books); and Terri-ann White (Upswell Publishing).

For their support throughout the publishing process, I would like to thank all the staff at the Centre for Apocalyptic and Post-Apocalyptic Studies, Heidelberg University, especially Prof Robert Folger, Dr Jenny Stümer, Michael Dunn, and Dr Rolf Scheuermann; and the staff of De Gruyter, especially Rabea Rittgerodt-Burke, Jana Fritsche, Ian Copestake, and Purva Ashokkumar.

I would like to especially thank my editor, Rubymaya Jaeck-Woodgate, for her inimitable ability to shape the manuscript along the way, patiently and diligently bringing her distinct expertise to bear on what she termed its ‘linguistic gymnastics’, along with ever-so-polite reprimands when I had unknowingly defied the laws of grammar and syntax.

Finally, I must thank my partner, Alice, for her ongoing love, support and confidence in my work.

This research was funded by the Australian Research Council Centre of Excellence in Synthetic Biology (CE200100029). The views expressed herein are those of the author and are not necessarily those of the Australian Government or the Australian Research Council.

EPIGRAPH

No one knows who will live in this cage in the future, or whether at the end of this tremendous development entirely new prophets will arise, or there will be a great rebirth of old ideas and ideals, or, if neither, mechanized petrification, embellished with a sort of convulsive self-importance. For of the last stage of this cultural development, it might well be truly said: "Specialists without spirit, sensualists without heart; this nullity imagines that it has attained a level of civilization never before achieved."

– Max Weber, *The Protestant Ethic and the Spirit of Capitalism* (1930 [1905])¹

What if the event of our time turns out to be not so much the knowledge that human action is altering global climate, as the realisation that climate is responsive to our nudges only because it is far more precarious than we ever dared imagine?

– Nigel Clark, *Inhuman Nature: Social Life on a Dynamic Planet* (2011)²

¹ Max Weber, *The Protestant Ethic and the Spirit of Capitalism* (London: George Allen & Unwin, 1930 [1905]), 181–182.

² Nigel Clark, *Inhuman Nature: Sociable Life on a Dynamic Planet* (London: Sage, 2011), 31.

The Die Is Cast:

A dramatis personae

- 1) Three universal sighs (*Changeability, Consequences, Comprehension*)
- 2) Three demeanours (*Dour, Dire, Dice*)
- 3) Three bishops (*Ridley, Latimer, Cranmer*)
- 4) Three blind mice (*See, Speak, Do*)
- 5) Three crooked dice (*synthetic biology, assisted evolution, climate engineering*)
- 6) Three *Chelonia mydas* turtles (*Mertle, Tokolou, Turturi*)
- 7) Three volcanoes (*Panama Isthmus, Deccan Traps, Tambora*)
- 8) Three dead authors (*Mary Shelley, Phillip K. Dick, Georges Bataille*)
- 9) Two dead tyrants (*Queen Mary, Tyrell*)
- 10) Two monsters (*Frankenstein's monster, Roy Batty*)
- 11) Two asteroids (*Chicxulub, JEE203*)
- 12) Two musicians (*Mama Cass, Nina Simone*)
- 13) One band (*Radiohead*)
- 14) One cartoonist (*Gary Larson*)
- 15) One comedy (*Dr. Strangelove*)
- 16) One dinosaur (*Stegosaurus*)
- 17) One end of this world (*Melancholia*)
- 18) One World Trade Centre
- 19) One World Turtle
- 20) One earTheia

Contents

Acknowledgements — IX

EPIGRAPH — XI

The Die Is Cast: A dramatis personae — XIII

List of Illustrations — XIX

PRELUDE

Backstory to the Future

Introduction

- Opening Gambit: Queen to Bishop Six — 7
- Read Between the Lines — 10
- Holding Court v Playing Fort — 13
- Empty Gesture — 16
- Cut to the Chase — 20
- Act Your Rage — 23

ACT I: THE DOUR

I Here.Goes.Nothing.

- Borrowed Time v Burrowed Space — 33
- Love Minus Zero/No Limit — 35
- Turtles All the Way Down — 39
- N-LSD — 41
- Viva la (Upper Palaeolithic) Revolution! — 44
- At Home on the Range Shifts — 47

II Shift.Happen.Stance.

- Ghost in the Shell — 54
- Give up the Ghost — 57
- Lucy in the Sky with Diamonds — 62
- No Society Is an Island — 65
- Lower Your Eyelids to Die with the Sun — 68
- ENSO on ENSO forth — 71

III Blunt.Force.Trauma.

Life (un)Expectancy — 78

earThia — 83

About “About the Issue of the Astronomical Theory of Ice Ages” — 87

The Limited Sunset — 92

Two Days Before the Day After Tomorrow (after Trey Parker) — 97

The Sky is Falling in (Maybe Not) — 103

ACT II: THE DIRE

IV And Now for Something Completely Indifferent . . .

The Immortal Game — 115

Life in a Glass Greenhouse — 119

The Manhattan Project — 123

How I Yearned to Stop Worrying and Love the Abomination — 133

The Show About Nothing Must Go On — 139

When I’m 1964 — 143

V A Brief History of Running Out of Time

No Manhattan Is an Island — 151

Throwing a Spanner in the Post-Industrial Works — 156

Extraordinary Popular Delusions and the Madness of Crowds — 160

Pop Goes the Bubble — 163

This Is Not a Pipedream — 167

Seven Decades of Minutes to Midnight — 173

VI What is Life (at the End of Empire)?

Askew Cows Come Home to Jump Over the Moon — 179

A Pox on Both your Epochs — 183

Dial Idioteque for Idiolect — 190

All the World’s a Sinking Stage — 192

A Rose is a Rose is the Last Rose of (Endless) Summer — 197

Subterranean.Homesick.Blues. — 201

ACT III: THE DICE

VII It’s All Fun and Games Until Someone Loses an Island

Three Blind Mice/Three Crooked Dice — 210

Game On — 217

- Ramping Up — 220
- Staging an Intervention — 225
- Exclamation.Point.Extreme. — 231
- End Game — 235

VIII Laughing All the Way to the Cryobank

- When I Was a Buoyant — 244
- Pre-Intervention Is Better than Cure — 248
- Between a Rock and a Hard Place — 251
- Numb and Number — 255
- The Genie Is out of the Bottleneck — 261
- Why the Prolonged Face? — 265

IX How to Fall in Lava with Volcanoes

- Thinking like a Volcano — 273
- Snorted Forth Fire-Streams — 280
- The Endless Summer Without a Year — 284
- The Year Without a Summer — 289
- Throw Down or Throw Up — 296
- If You Find Yourself in Hell, Where Hell is Other People . . . — 299

POSTSCRIPT (posthumous)

Nothing.Last.Forever.

- Rubbing Saltation into the Wounds — 306
- Did You Ever See Such a Sight in Your Life? (reprise) — 309
- The Art of the Fug ue — 312
- Mouths Open Wide/Eyes Wide Shut — 314
- Such Was LIFE — 317
- Post-Apocalypso Forever! — 322

Glossary — 327

Author bio — 339

Bibliography — 341

List of Illustrations

- Fig. 1** Buster Keaton, *Steamboat Bill, Jr* (United Artists, 1928).
Reproduced with permission of Alamy — **28**
- Fig. 2** Barry Mann and Cynthia Weil, *New World Coming* sheet music cover (Columbia Music, 1970). Public domain — **32**
- Fig. 3** European Space Agency, Comet 67P/Churyumov-Gerasimenko, 450,000,000 kilometres from the Sun, 7 July 2015. CC BY-SA 4.0 — **51**
- Fig. 4** John W. Ivimey, *Complete Version of ye Three Blind Mice* (London: Frederick Warne & Co. Ltd, 1904). Public domain — **53**
- Fig. 5** Ted Grambeau, *Teahupo`o, Black Flag Day*, Tahiti, 27 August 2011.
Reproduced with permission of the artist — **76**
- Fig. 6** Jet Propulsion Laboratory, NASA, J002E3 computer simulation, 14 June 2003.
Public domain — **78**
- Fig. 7** Transporting Saturn S-IVB Third Stage, aka J002E3, for the Apollo 12 mission, United States of America, 1969. Reproduced with permission of the Boeing Company — **109**
- Fig. 8** Anthony Schongauer, *The Temptation of St. Anthony*, c. 1470-1475.
Reproduced with permission of Alamy — **114**
- Fig. 9** Charlie Chaplin, *The Great Dictator* (United Artists, 1940).
Reproduced with permission of Alamy — **148**
- Fig. 10** 2880 Broadway, Manhattan, Tom's Restaurant/Monk's Café, United States of America, 20 November 2019. Photograph by author — **150**
- Fig. 11** 270 Broadway, Manhattan, site of the original Manhattan Project HQ during World War Two, United States of America, 20 November 2019. Photograph by author — **177**
- Fig. 12** Cretaceous–Paleogene boundary, 66 million years ago, Geulhem, the Netherlands, 16 November 2013. Public domain — **179**
- Fig. 13** Paulo Raquec, Sinkhole, Guatemala City, Guatemala, 1 June 2010.
CC BY-NC-SA 4.0 — **205**
- Fig. 14** “Mertle,” green turtle (*Chelonia mydas*), Raine Island, Australia, 14 December 2016.
Image courtesy of Department of Environment and Science,
Queensland Government — **210**
- Fig. 15** Neil Mattocks, Green turtle (*Chelonia mydas*), Raine Island, Australia, 12 August 2014.
Image courtesy of Great Barrier Reef Marine Park Authority — **241**
- Fig. 16** National Aeronautics and Space Administration, Bikini Atoll, Marshall Islands, from NASA Landsat 7 satellite, 705 kilometres above Earth, 14 January 2001.
Public domain — **243**
- Fig. 17** John Foxe, “A Table Describing the Burning of Bishop Ridley and Father Latimer at Oxford,” in *Book of Martyrs* (London: John Day, 1563).
Reproduced with permission of Alamy — **270**
- Fig. 18** National Aeronautics and Space Administration, Mount Taboro Volcano, Sumbawa Island, Indonesia, from the International Space Station, 350 kilometres above Earth, 3 June 2009. Public domain — **272**
- Fig. 19** Buster Keaton, *Steamboat Bill, Jr* (United Artists, 1928).
Reproduced with permission of Alamy — **304**

- Fig. 20** Brad Loper, “A National Guard soldier guards a Nematode capsule from the Columbia space shuttle,” Ken’s Minit Market, Nacogdoches, Texas, United States of America, 2 February 2003. Reproduced with permission of Alamy — **306**
- Fig. 21** Dorian Moro, Western European house mouse (*Mus musculus domesticus*) meets wise human (*Homo sapien*), 11 December 2018. Image courtesy of Western Australian Department of Biodiversity, Conservation and Attractions — **325**

PRELUDE

Backstory to the Future

In a nutshell:

The Farcical Side >
First Universal Sigh >
Second Universal Sigh >
Third Universal Sigh >
Join the Chicxulub >
Rinse & Repeat

What on earth, on Earth?

Open your mouth wide
 The universal sigh
 And while the ocean blooms
 It's what keeps me alive.
 – Radiohead, “Bloom” (2011)³

The Stegosaurus stands at the stage lectern. Poised at maximum height, propped up on its front legs and stabilised by its tail protruding across the stage floor. With open mouth wide it ushers in the universal sigh, across to its fellow beings: “The picture’s pretty bleak . . . The world’s climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut.”⁴

With this, our Stegosaurus composes a bleak picture of changeability and consequences, as well as his comprehension of same: the three parts that make up the universal sigh. Fellow dinosaurs huddle towards the front, listening in the dark with mouths closed wide. Earnest in inhaling the universe. Aghast at exhaling the universal sigh.

Then, the joke was on them: the dinosaurs did not know what was coming their way. Here lies the source of both the joke and the bleak outlook to boot: knowledge. But this joke is composed of subsequent layers, piled atop one another like fossil layers embedded in earth. Starting with the dinosaurs actually knowing what is coming their way. Knowing the world is unravelling in the wake of Chicxulub’s imminent asteroid impact (“the world’s climates are changing”). Knowing their dominion is ending. Knowing they are becoming endlings: the name given to the last live individual of any given species before it becomes extinct. Knowing evolution will continue apace with wholly new breeds of Animalia once the extinction event kills nearly all non-avian dinosaur species in one fell swoop from the heavens (“the mammals are taking over”). Knowing, despite the irony of knowing all of the above, that they are vastly outwitted, because in an infinite universe only infinitesimal knowledge may ever be known (“we all have a brain about the size of a walnut”).

These subsequent layers fell on the dinosaurs then as they now do on us: we know what is coming our way. Or at least the broad brushstrokes: climates are changing, species are disappearing *en masse*, and the proverbial mysteries of the

³ Radiohead, “Bloom,” track 1 on *The King of Limbs* (XL, 2011), LP.

⁴ Gary Larson, “The Picture’s Pretty Bleak,” from *The Far Side*, *New York Daily News*, 7 November 1985, 264.

universe remain infinite against our infinitesimal comprehension, even if a rock-melon-sized brain can unmask knowledge orders of magnitude greater than a walnut.

To boot, “the picture’s pretty bleak” in the brushstrokes that compose the following painting. But that picture is already well worn out: to read *The News* today is to dread the ticker tape parade of escalating death and destruction in the beleaguered more-than-human world. So there must be something else etched within those layers of paint – something beyond all the forlorn and foregone forecasts. Given that bleak is in the eye of the beholder, or in our case, in the “brain about the size of a [rock-melon, née] walnut,” what lies between the layers may hold the key to what can be made of living during a rupture of life on earth.

Making a living when so much is dying is not a cerebral affair. A good joke may have the belly of the beholder clutched in joyous laughter. A sad song may have the eye of the beholder well with tears. The universal sigh may catalyse such visceral affairs, but knowledge is merely a portal into the ineffable. A portal which opens up here in the two meanings of the word petrified: to *be* terrified, and to *become* fossilised.

The details of ruptures that came before have been lost to time. Only fragments remain. Picture the end of the age of dinosaurs as told in the earth’s strata. Picture those same dinosaurs as they died during their rupture. Had the dinosaurs known Chicxulub was bearing down upon them they would have likely experienced the state of *being* petrified. A blinded deer is to oncoming car headlights what immobile fear is to impending mortality. The feeling of being petrified arises in any decisive near-death moment. Such moments are everyday affairs played out between those that live through the end of each day, and those who die trying. A stegosaurus running for its life from the claspings jaws of an Allosaurus was an everyday affair for tens of millions of years. Being petrified is part and parcel of ordinary upheavals in everyday life.

In contrast, evolution heralds infrequent moments of *becoming* petrified. A stegosaurus ushering in the universal sigh to its fellow dinosaurs was a once-and-once-only affair: speaker and listener, united in universal existential predicament. During a rupture, organisms cognisant of their mortality share the collective experience of *being* petrified, while they are simultaneously *becoming* petrified matter soon to be subsumed beneath the earth’s surface. These two states of petrification may intermingle when individuals die *en masse* every day. But the confluence between both states occurs only when species die *en masse* once in a blue moon. Deceased individuals merely become part of the fossil record through petrification, when they turn into stony substances embedded within the lithosphere. Whereas extinct species are the fossil record, in its totality.

Now the full force of the subsequent layers of the joke fall on us. They range from ‘closing your eyes and waiting to see if the headlights run you over’, right

up to 'looking up at the sky to see if the asteroid is still coming our way.' The former is an everyday individual affair, whereas the latter is an extraordinary collective affair. *Being* petrified in the twenty-first-and-last century has been extended into *becoming* petrified. For we are privy to the confluence of two states of petrification: an interior subjective emotional state of being terrified meeting an exterior objective biophysical reality of becoming fossilised.

Picture ancient vegetal life petrifying when it died, becoming strata beneath the earth, like coal. Picture extinct bird species, whose singing can be heard only in archival recordings. Both are forms of petrification, though the former heralds a cold hard fact, whereas the latter heralds agony and grief.

Where, then, is the eye that can honestly behold that "the picture's pretty bleak," and still see beyond the forlorn and foregone? Is there "something new under the sun"⁵ here that can grant us this capacity? From the ordinary of the everyday to the extraordinary of Mass Extinction Events, is the rupture of life on earth that is currently unfolding something truly unprecedented? The first two parts of the universal sigh tell us that climates change and species cease, and that these truths are as old as the genesis of an atmosphere and biosphere respectively. The "something new under the sun" is the third part of the universal sigh: a species cognisant of the rupture, having induced it, and now scratching its brain, desperately trying to work out what, if anything, could or should be done about it. Let alone when, by who, or how. As Stegosaurus says: "*we all have a brain about the size of a [rockmelon, née] walnut.*"

If this is how the two states of petrification interplay, then a mind can only behold both bleakness and beauty by being entirely aghast at exhaling the universal sigh while being entirely earnest about inhaling the universe. Therein lies the aim of the following "pretty bleak" picture: to bring *being* petrified into play with *becoming* petrified. The picture painted is no static work of art, but rather an amorphous shapeshifter: it also takes the form of a joke, song, book, and play.

At the heart of this picture-play lies the riddle of the two states of petrification: *What on earth, on Earth?* Regarding the first half of the riddle, this feeling of being petrified, we ask *what on earth* is going on? How do we become present to the rupture unfolding around us? Stegosaurus says: "*the world's climates are changing.*" To be present is to become *alive* to the rupture itself, rather than merely happening to be alive during the unravelling. To be present is to become alive to *rupture* itself. To be present is to become alive and die with forces of

5 John McNeil, *Something New Under the Sun: An Environmental History of the Twentieth-Century World* (New York: W. W. Norton & Company, 2000), 3.

creation and destruction not on a familiar human scale, but at the scale of the universe. Stegosaurus says: “*While the ocean blooms/It’s what keeps me alive.*”

Regarding the latter half of the riddle, we examine the biophysical process of becoming petrified and ask how we might bring this *what on earth* sensibility to bear *on Earth* itself? How does life *on Earth* become petrified in ruptures, from there-and-then through to here-and-now? To be present to becoming petrified is to transcend the tyranny of living *during* a rupture. It is to live, love, and laugh at the comic in the cosmic. Stegosaurus says: “*Open your mouth wide/The universal sigh.*”

To sound off this overture, the chapter following will sketch the broad brush-strokes of this “pretty bleak” picture and its motley cast of characters who will act as guides to the journey. Cast members enter and exit the stage throughout, though their full voice does not come until the tale’s end, when tyrants and monsters return to present our abhorrent options for responding to the rupture.

The first layer to our riddle begins with *Rodentia*, one of the earliest orders of mammals, already present during the reign of dinosaurs. But they only flourished by expanding into ecological niches made vacant when dinosaurs underwent petrification: this makes the rodents who lived alongside these dying dinosaurs a prime candidate for the last common ancestor to all modern mammals. With every modern mammal species descending from them, the flourishing of *Rodentia* became the enterprise of everything from ape to zebra. The joke that fell out of the sky onto the dinosaurs issued a killer punchline: an exploding exuberance of mammalian evolution. Stegosaurus says: “*the mammals are taking over.*”

The riddle begins when the direct descendants of those ancient orders of rodents meet their far-removed cousins, whose speciation branched off from *Rodentia* to become *homo sapiens*. This meeting between mice and human harks back to the universal sigh Stegosaurus ushers towards its fellow dinosaurs – then for them, now for us.

If the dinosaurs in Gary Larson’s cartoon had known their gig was up, but that such novel lifeforms would emerge thanks to their disappearance, would that have given them pause for thinking the picture’s pretty bleak? Does beauty reside in the fact that an asteroid might beget an ape who knowingly creates its own asteroid to inflict upon itself and all of its earthly co-habitants?

If that is the joke, then its punchline leaves one aghast, gasping for breath, and not at all earnest about inhaling the universe. Alternatively, if the joke is to bring our *what on earth?* sensibility into play *on Earth*, can we then learn to see the pretty bleak picture anew? That is, to see it with equanimity towards *being* petrified, and *becoming* petrified.

What on earth, on Earth?

Introduction

New.World.Coming.

This Space Intentionally Left Blank

In a nutshell:

Three Blind Mice v Three Bishops >
The Unfolding Rupture >
New World Coming >
Frankenstein v Frankenstein's Monster >
Tyrell v Tyranny >
Flip v Backflip: Heads or Tails?

Opening Gambit: Queen to Bishop Six

Did you ever see such a sight in your life,
As three blind mice?

– James Halliwell-Phillipps, *Three Blind Mice* (1842 [1609])⁶

The details of the song have been lost to time. Only fragments remain. All we now know is that once upon a time three mice caused some mischief. They chased after the farmer’s wife, for which they got their comeuppance: she “cut off their tails with a carving knife.”⁷ Telling details are missing from this tale, though. Were they already blind? In which case, why are we being asked to “see how they run [blindly?] . . . after the farmer’s wife”?⁸ Or could they see when they ran after her, meaning she not only cut off their tails but blinded them too?

Perhaps this is all jabberwocky, a light-hearted jest of gobbledegook. But is there a crypt beneath the cryptic tale? Something within the veneer of the song we sing? Something petrifying perhaps, about what to make of life when living has become an endless escape, running from a powerful entity we have enraged, and who may or may not have already blinded us to our comeuppance . . .

In the absence of details, we work from the fragments that remain. We grow up singing in classroom choirs about blinded mice running from an irate hunter bearing a knife. And this is the *sheltered* version of the nursery rhyme. If your kindergarten class did not sing this particular song, then you still sang similar ones. What such songs share in common is how we seldom question the innocence of these rhymes we were raised by. Song by song, year by year, century by century, millennia by millennia, we erect successive shelters to insulate us from that which we do not really want to know.

Once out of the classroom and into the big wide world it seems like there are no more nursery rhymes. But instead, there are stories that just as surreptitiously nurture a particular view of the world. Just as it is safe to say that nursery rhymes nurture a sheltered worldview, it is safe to say the adult stories we tell one another continue to shelter us from viewing the world as it actually is. We sing the ditties, without querying what is going on behind the lyrics, beneath our feet, beyond our lifetimes, and above our planet.

This is not a pipe, and the not-pipe is also not just a pipedream, because this book is also not a book. This book is a song, of sorts. It is a paean that leads

⁶ James Halliwell-Phillipps, “Three Blind Mice,” in *Nursery Rhymes of England* (London: Percy Society, 1842), 43.

⁷ Halliwell-Phillipps, *Three Blind Mice*.

⁸ Halliwell-Phillipps, *Three Blind Mice*.

behind, beneath, beyond, and above. It has been written for the simple reason that we need new songs for our present tense. The song sung in these pages crosses multiple registers, aiming to enliven a deadly seriousness. The registers range from evolution to extinction, ethics to aesthetics, philosophy to physics, politics to paleoclimatology, biology to bioengineering, geology to geoengineering, and the comical to the cosmical (there is a glossary at the end, to open up technical and otherwise unwieldy terms).

These disparate registers are rendered into monologue by the spatial properties of typed thought – writing – but the harmonies and melodies between each line of song are made to be reanimated in your mind. Hear me as the ear weaves together polyphonic sound into one complex tapestry of music, like a canon or fugue.

Our song begins by taking apart the songs of old. Starting with unmasking the sheltered version of *Three Blind Mice*, published in 1842. Seen through a deeper take on time, the song does not remain the same. The unsheltered version, first published in 1609 (although a version existed well before then) is thought to be a wry rebuke against Queen Mary Tudor’s enthusiasm for executing Protestants, and most especially three particular bishops: Ridley, Latimer, and Cranmer. Whether *Three Blind Mice* is sedition through song is an open question though, because its heresy is cryptic. After all, its subject would be grounds for persecution if sung in plain prose. Through song, the horror of its meaning is sheltered behind melody, harmony, rhyme, and rhythm.

In the 1609 version, the three blind mice that Queen Mary relishes killing are Bishops Ridley, Latimer, and Cranmer. Back then, we would have sung the lyrics about how “she scrapte her tripe, lickte thou the knife.”⁹ In our present parlance: she scraped out their entrails then licked the knife. In the 1842 version, this atrocity is rendered as the anodyne “she cuts of their tails with a carving knife.” No longer does it mention the cannibalism of a queen licking the knife used to disembowel her enemies.

Mary Tudor ascended to the British throne in 1553, and in the following year set about her Revival of the Heresy Acts, reversing the religious reforms of her late father, King Henry VIII, and her recently deceased half-brother, King Edward VI. 1555 marked the height of her national purge of Protestant heretics, including the three bishops convicted of plotting against her – in the 1842 lyrics their conspiracy is represented by the line describing how “they all ran after the farmer’s wife.” Their comeuppance was to be burned at the stake in a public square next

9 Thomas Ravenscroft, “Three Blind Mice,” in *Deuteromelia or The Seconde part of Musicks Melodie, or Melodius Musicke of Pleasant Roundalaies* (London: Thomas Adams, 1609), 17.

to Oxford University. Cranmer alone recanted, so he started his ultimately futile reprieve by having to watch his fellow conspirators burned alive, only to suffer the same fate five months later.

The aim in taking apart the past is to reveal something of the present. The same can be said for taking apart the present to reveal something of the future. What songs, then, were we singing in our youth? What sadistic strains run through society, that we may burn one another alive, only to consign this collective memory to nursery rhyme and chime it in choirs that render the atrocities as anodyne? We sing these songs to each other as part of a shared cultural legacy, lodging their perceptual imprint deep within us during our formative years. If we have viewed the world through the mildly sadistic 1842 version, and we come to learn of the far more sinister sadism contained in the 1609 version, let alone the events of 1555 that it depicts, where do we go from here?

Having unmasked *Three Blind Mice*, can one still sing it as an innocuous ditty? To do so would be to simply persist in singing a sheltered worldview into being. If we want instead to sing to one another in wry rebukes against tyranny then we need to go behind, beneath, beyond, and above – and not just in terms of the past, but in the uncertain terms of our present. The repercussions of these revelations are relentless. The violence of farmer against mouse or queen against bishop is sadistic in and of itself. But the present reveals a violence that has been inflicted on the world-of-life at a scale unlike anything in the history of earth. And the present nursery rhyme – when unmasked – now seems to lead through severed tails, twisted tales, and breadcrumb trails, incessantly and endlessly revealing the world to be without shelter. What stories should we then tell to one another, when the world is unmasked? How do we learn to see the world anew? Merrily merrily merrily life is not but just a dream.

Did you ever see such a sight in your life?

Read Between the Lines

An artist's duty, as far as I'm concerned, is to reflect the times. I think that is true of painters, sculptors, poets, musicians . . . I choose to reflect the times and situations in which I find myself. That, to me, is my duty. And at this crucial time in our lives, when everything is so desperate, when every day is a matter of survival, I don't think you can help but be involved.

– Nina Simone, interview with William Greaves (1969)¹⁰

Songs are not just the lyrics on a page, but *how* they are sung into being. For songs like *Three Blind Mice* we can only work from fragments that remain, since music scores often only hint at how a song is to be sung. In present tense music we can instead work directly from songs in their entirety. The lyrics, and their performance, thus allow us to explore more deeply, behind, beneath, beyond, and above the song itself. As these songs are from our time, their unmasking yields revelations about our present tense and the future it is begetting.

Enter *New World Coming*, written by Barry Mann and Cynthia Weil. In October 1970 Mama Cass released the first recorded version. It is gold standard pop – somewhere between saccharine and totally innocuous. Cass' live TV version broadcast in December 1969 was even more up-tempo and upbeat. Cass sang alone on stage, with a giant revolving peace sign projected onto the entire wall behind. She delivered her audience a message that was the polar opposite to the one our Stegosaurus issued when he stood upon his stage. Her version chimes with the tenor of the song, whose last line tells us that this new world will be “coming in peace, coming in joy, coming in love.”¹¹ After all, this was commercial pop music in the last few months of the 1960s. Right before they gave way to the 1970s, cynicism, apathy, nihilism & co.

Six months after Cass' record, Nina Simone released her own version of *New World Coming* on her album *Here Comes the Sun*. In stark contrast to Cass, Simone renders the same song remorseful, even poignant. The same lyrics confront us, now tinged with resignation and despair about the end-of-the-world-as-it-currently-is:

There's a new world coming
And it's just around the bend
There's a new world coming
This one's coming to an end.¹²

¹⁰ Nina Simone, “An Artist's Duty,” *Black Journal*, episode director William Greaves, aired National Educational Television, 27 October 1969.

¹¹ Barry Mann and Cynthia Weil, *New World Coming* (Columbia Music, 1970).

¹² Mann and Weil, *New World Coming*.

Simone starts at half the pace of Cass' version, only to build in intensity once she finishes singing the songwriters' lyrics. The foreboding is fuelled by two extra stanzas she inserts, premonitions taken from *The Book of Apocalypse*. She then reprises the original song refrain, with her protracted build up now taking the songwriters' lyrics into a celebratory, affirmative, upbeat tempo, with which she closes the song. Simone's *New World Coming* ruminates on the passing of the world-as-it-currently-is, inveighs against the passage through the apocalypse (a word that stems from the ancient Greek *apokálupsis*, meaning revelation or 'un-covering'), then casts an earnest ear toward wonder at the new-world-that-is-coming-into-being.

Whichever version you find to be in keeping with the tenor of the song, in the six months between their respective releases in October 1970 and April 1971, a new world literally came into being. Within these six months, earth turned from negative to positive energy balance, meaning from that point onwards, more energy was retained in the atmosphere and hydrosphere than was emitted back into space.¹³ This shift has happened many a time in the history of this planet, perpetually oscillating as it does between hothouse (positive) and ice age (negative) states. However, this particular shift was unprecedented in both quality and quantity. The unprecedented quality lies in the cause: human industrial activity. The unprecedented quantity owes to another facet of that same cause: the sheer scale and exponential growth of this industrial activity.

Since 1971 so much heat has been accumulating in the air and ocean so quickly that it has catalysed a completely novel planetary state. Life in this new world coming will not be made up of visionary pop songs or biblical prophecies. It will be fashioned by consequences resulting from a constellation of events without precedent on this planet. For we are not rehearsing a scene from last season's production of *The Book of Apocalypse*. Back when there used to be such a thing as seasons. "Sprumer, Sumumn, Auter, Winting" are the New Normal, according to Mathilde Fallot's 2007 *Golab Waminrg* poster.¹⁴ And the strangeness of the new inclement 'seasons' is not only strange on the scale of the entire planet, but also within the time scale of its entire history. Meaning, in technical terms, that "Earth is currently operating in a no-analogue state" according to Earth System scientists Paul Crutzen and Will Steffen. A state brought about by the extent of human

¹³ Daniel Murphy et al., "An Observationally Based Energy Balance for the Earth since 1950," *Journal of Geophysical Research* 114, no. 17 (2009): 1–14.

¹⁴ Mathilde Fallot, *Golab Waminrg* poster, International Poster Festival of Chaumont, 2007, accessed 13 December 2015, <https://mathildefallot.com/golab-waminrg>.

influences on “key environmental parameters”¹⁵ of the Earth System, which are so pronounced that there is literally no analogue for the present tense.

Palaeoclimatologist Richard Zeebe chimes into this choir: “we have effectively entered an era of a no-analogue state” since carbon dioxide is now being emitted at the fastest rate in the past 66 million years. He remarks that this “no-analogue state . . . represents a fundamental challenge to constraining future climate projections” so that “unforeseeable future responses of the climate system are possible.”¹⁶ Being caught between this unfathomable present, and an “unforeseeable future” appears so petrifying that we muster up analogues of prior states of the Earth System, to vainly forecast how potential futures may resemble some of those states. Yet another fairy tale unmasked as just that, now the future is without anchor to anything in the past.

In a nutshell: it cannot be known which bend in our current path will yield *the* coming of the new world. Then for them, now for us: humanity living as the *Three Blind Mice*, in the partial knowledge that the powerful entity whom they enraged may or may not have already blinded them to their comeuppance. Zeebe compares the phase transition we are passing through to its closest historical parallel:

If you look over the entire Cenozoic, the last 66 million years, the only event that we know of at the moment, that has a massive carbon release, and happens over a relatively short period of time, is the PETM [Paleocene-Eocene Thermal Maximum] . . . We actually have to go back to relatively old periods, because in the more recent past, we don't see anything comparable to what humans are currently doing.¹⁷

Here Zeebe sings the third part of the universal sigh: further detail may reveal other “event[s],” but we can only access whatever fragments remain of the earth's full range of changeability and its consequences.

This perspective allows the meeting between mice and human to hark back to Stegosaurus on his stage ushering in the universal sigh, since the Cenozoic is the geological era that extends from the end of the age of dinosaurs, 66 million years ago, to today. Hence, the unfolding rupture now has disturbing parallels with their petrification. After all, Cenozoic means New Life, although it is better

¹⁵ Paul Crutzen and Will Steffen, “How Long Have We Been in the Anthropocene Era?” *Climatic Change* 61, no. 3 (2003): 251.

¹⁶ Richard Zeebe, Andy Ridgwell, and James Zachos, “Anthropogenic Carbon Release Rate Unprecedented During the Past 66 Million Years,” *Nature Geoscience* 9, no. 4 (2016): 329.

¹⁷ Richard Zeebe, quoted in Chris Mooney, “What We're Doing to the Earth Has No Parallel in 66 Million Years, Scientists Say,” *Washington Post*, 22 March 2016, accessed 4 February 2021, <https://www.washingtonpost.com/news/energy-environment/wp/2016/03/21/what-were-doing-to-the-earth-has-no-parallel-in-66-million-years-scientists-say/>.

known as the Age of Mammals, in the same way the Mesozoic is known as the Age of Dinosaurs. Well may we stand on the cusp of a new era, for New New Life in this New New World Coming. The shadow being cast by present human industrial activity goes beyond the event horizon of even our most distant future imaginary. Consequently, we are in the act of begetting a “no-analogue future.”¹⁸

Whether you prefer Cass’ version, cast just before earth shifted into positive energy balance, or Simone’s version, cast just after the shift, both share an earnest ear toward wonder at the-new-world-that-is-coming-into-being, and they ask of you the same. Take their invitation from the second verse:

There’s a new voice calling
You can hear it if you try
And it’s growing stronger
With each day that passes by.

Whether this new world is “just around the bend,” or is many-a-bend to come, one thing is certain. A new world *is* coming, as *this* world is inevitably coming to an end.

Let us then try to hear this new voice calling us to turn an earnest ear toward wonder at the new world-that-is-coming-into-being . . .

Holding Court v Playing Fort

I want more life, fucker!
– Roy Batty in *Blade Runner* (1982)

It is one of the strangest tales ever told. It deals with the two great mysteries of creation – life and death. I think it will thrill you. It may shock you. It might even – horrify you. So if any of you feel that you do not care to subject your nerves to such a strain, now’s your chance to . . . uh, well, we warned you.
– Edward van Sloan in *Frankenstein* (1931)¹⁹

Cautionary tales about “the two great mysteries of creation – life and death,” generally require forewarning, as in the opening gambit to the iconic horror film *Frankenstein*. This film is a prescient imagining of the new worldview being sung for the *New World Coming*. ‘World’ and ‘view’ are literal *and* metaphorical. Viewing

¹⁸ John Williams et al., “Model Systems for a No-Analog Future: Species Associations and Climates during the Last Deglaciation: No-Analog Species Associations and Environments,” *Annals of the New York Academy of Sciences* 1297 (2013): 35.

¹⁹ James Whale, director, *Frankenstein* (Universal Pictures, 1931), 35 mm.

uses the eyes, and much more besides, and the world encompasses much more than just this third rock from the sun, in this solar system, at this moment in time. This is a worldview about being (right here, right now), and about becoming (back when and after then). It is about past, present, and future worlds: how they manifest, erratically rupture and morph into states so different from one another as to herald worlds alien to one another. Now is by no means the first or last time an Old World Going has been superseded by a New World Coming . . .

As the brushstrokes to paint this picture are broad, so the breadcrumbs making up the trail that leads us through it are sparse. Broad brushstrokes gloss over details as they sweep over a plethora of sub-factors. A canvas of fleshed details paints a different picture altogether, wherein attention to detail obscures the overview. Similarly, when placed in too-obvious an arrangement, breadcrumb trails may seem to reveal a new worldview, but actually merely construct a caricature of the world. Conversely, if spaced too far apart and/or too haphazardly distributed, breadcrumb trails cannot be followed in a coherent order: the order that can actually convey a new worldview.

The gravitas of the content on the canvas only makes the trade-offs more precarious. At stake is an unmasking and recomposing of these “two great mysteries” of life and its relationship with death, beyond cheap tricks to “thrill you . . . shock you . . . [or] . . . horrify you.” The trade-offs come down to prying “the two great mysteries” away from our species’ prospective extinction, in favour of a worldview formed for a new-world-that-is-coming-into-being-beyond-any-human-beings. Prying the mysteries away requires any sense of wonder about the *New World Coming* to punch the surly bonds of the anthropocentric and transcend the biocentric, in order to reside in the zoocentric. And the barriers to breaking those surly bonds are like the gravitational pull of a planet, requiring a certain escape velocity always undermined by the planet reeling the fugitive escapee back in.

With regard to the enigma that is ‘life’, anthropocentrism is so endemic that the word ‘biography’ is read as meaning ‘the life of a person.’ How desperately shallow the definition ascribed to *bio* (life) + *graphia* (of writing). Biography should be the life story of life. In a zoocentric worldview, life refers to its entirety, across all species since they emerged on earth. In this biography, humanity writes itself out of the picture, by writing obliteration rather than literature: the story goes beyond writer and beyond reader, as it is the tale of all and sundry being obliterated.

Writing up the perversity of our present tense begins by unmasking the “two great mysteries” via another opening gambit about playing with the limits of life and death: ‘Queen to Bishop six.’ This Queen-killing-a-Bishop manoeuvre was the penultimate strike in the fabled ‘Immortal Game’, the unparalleled 1851 chess match played between Adolf Anderssen and Lionel Kieseritzky: an informal game played while on break from the formal tournament. This game comes into play

here via its appearance in *Blade Runner*, the 1982 sci-fi film. The film's setting for the gambit is an unremittingly bleak Los Angeles in November 2019. Unbridled industrial production has cast the atmosphere into perpetual night, nuclear winter, and acid rain. The lithosphere has been reduced to urban decay, dominated by a single species that has reduced biodiversity into a monoculture of human or replicant human. Both organic and synthetic humans covet synthetic animals, as organic animals have been rendered extinct.

The film is set exactly half a century after Mama Cass sang live on TV on 1 December 1969 about a New World “coming in peace, coming in joy, coming in love.”²⁰ True, the film may be fiction, but Cass' song is actually the more sinister of these two make-believe worlds, as it proffers a sheltered worldview. Because the film now presciently speaks to a different 2019 than the one it envisaged: in the words of then 16-year-old Swedish schoolgirl Greta Thunberg, “It's 2019. Can we all now please stop saying ‘climate change’ and instead call it what it is: climate breakdown, climate crisis, climate emergency, ecological breakdown, ecological crisis and ecological emergency?”²¹ Lamenting that “because the sky is blue, it makes me cry”²² may have been the zeitgeist that The Beatles captured in 1969. Because, as Radiohead sang in 2016: “It's too late/The damage is done/This goes beyond me/Beyond you.”²³ There is no alternative narrative for this element of the story here, or anywhere else. The damage was thoroughly and utterly human-caused, and “it's too late” because of how tardy the global recognition and response has been.

For the business-as-usual minded, incapable of answering Thunberg's plea, *Blade Runner* still seems to herald a fantastical *New World Coming*. *Homo economicus* completes its mission of following industrial capitalism to its logical conclusion. Extinguishing more-than-human life, despoiling the biosphere of the planet, and making up the difference with technoscientific engineering of life-forms, give or take a few million species.

In the film, Tyrell is the tyrant equivalent to Queen Mary Tudor in her own time. Owner of Tyrell Corporation, he occupies the pinnacle of power, and holds court deep within a massive and heavily guarded pyramid-like building. At his court, Tyrell designs and owns all ‘replicants’, the synthetic humans who are his

²⁰ Mann and Weil, *New World Coming*.

²¹ Greta Thunberg, “It's 2019. Can we all now please stop saying ‘climate change’ and instead call it what it is: climate breakdown, climate crisis, climate emergency, ecological breakdown, ecological crisis and ecological emergency? #ClimateBreakdown #EcologicalBreakdown,” Tweet, 3:14 am, 5 May 2019, accessed 6 May 2019, <https://twitter.com/gretathunberg/status/1124723891123961856?s=11>.

²² The Beatles, “Because,” track 8 on *Abbey Road* (Parlophone, 1969), LP.

²³ Radiohead, “Daydreaming,” track 2 on *A Moon Shaped Pool* (XL, 2016), LP.

minions – they literally do his bidding. Roy Batty, a replicant who has rebelled, seeks to overthrow Tyrell. To gain access to Tyrell’s fortified inner sanctum, Batty plays the ‘Immortal Game’ of chess against his maker. The stakes in the game could not be higher: Batty is playing for immortality. He is about to die, and believes Tyrell is the only person who could possibly extend his life. Through a sly sleight of hand Batty plays the Queen to Bishop six manoeuvre and ensnares Tyrell in checkmate. This victory tricks Tyrell into allowing Batty to finally breach his sanctum. Whereupon, Batty declares his desire to his maker: “I want more life, fucker!”

Since Tyrell is unable to extend Batty’s lifespan, Batty must make do with the imminence of his pending mortality. Devastated to find Tyrell’s technoscientific prowess cannot overcome the intrinsic limits to life, Batty murders his maker. Tyrell is also devastated to find that the synthetic organism he created has evolved behaviour beyond his wildest expectations, including the capacity to turn upon and kill his own maker. In life, Batty finds only bitter disappointment in the intrinsic and inescapable limits set around that life, whereas Tyrell finds an inexhaustible capacity to probe whatever limits to life may exist, by generating novel behaviour. It is why dealing “with the two great mysteries of creation – life and death” makes not for “one of the strangest tales ever told.” It makes for the only biography ever lived.

Empty Gesture

If you try and take a cat apart to see how it works, the first thing you have on your hands is a nonworking cat. Life is a level of complexity that almost lies outside our vision; it is so far beyond anything we have any means of understanding that we just think of it as a different class of object, a different class of matter; ‘life’, something that had a mysterious essence about it, was God given, and that’s the only explanation we had.

– Douglas Adams, *The Salmon of Doubt: Hitchhiking the Galaxy One Last Time* (2002)²⁴

In the fable of Tyrell and his synthetic organisms, the limits to life are biophysical. Tyrell comes to terms with how his attempt to design life runs up against the inexhaustible capacity of species to evolve novel forms. Batty must come to terms with how cellular and genetic reproduction run up against intrinsic limits, such as the second law of thermodynamics. All that is, whether a cell or a solar system, is always tending toward increasing entropy. This enigma drove quantum physicist

²⁴ Douglas Adams, *The Salmon of Doubt: Hitchhiking the Galaxy One Last Time* (New York: Random House, 2002), 200.

Erwin Schroedinger to write the landmark book *What Is Life?* in 1944, revolutionising the relationship between biology and physics. At the level of the individual organism, these biophysical limits are expressed in mortality. At the level of a species, these biophysical limits are expressed in extinction.

In the case of Queen Mary Tudor atop her societal pyramid, the limits to life were social as well as biophysical. Tyrannical societies run up against the limits of negentropy. Striving for more and more social order and control – say, by each reign revising who is to be persecuted and by whom – may appear to keep the insipid forces of entropy at bay. Recall Bishop Cranmer conspiring to overthrow Mary, only to find himself pleading for her to extend his life. But these societal pyramids are built on houses of cards (social limits of life) that rest on stochastic games of chance (biophysical limits of life).

Three years after executing the three bishops, Mary's biophysical life ended. So too did her societal life, as her pyramid was dismantled and rebuilt in a vastly different image by her half-sister and successor, Queen Elizabeth I. Elizabeth undid much of Mary's pyramid because she was a Protestant who was also tolerant of Catholics. So Mary's persecution of Protestants, along with a host of strictures that dictated societal structures, proved to be limited in their lifespan.

Politics – whether nakedly tyrannical or supposedly democratic – is no more than pendulum swings of persecution in a futile outmanoeuvring of entropy. Arguably, the real reason Mary executed the three bishops is not because they attempted to overthrow her (the evidence is wanting) but because they had been key supporters of the two rulers who immediately preceded her: King Edward VI, her half-brother, and King Henry VIII, their shared father. While these two prior kings persecuted and executed Catholics, Mary flipped the court against Protestants instead. Chop off his head or cut off its tail? The edict of a tyrant may as well be called by the toss of a coin in mid-air. Their very inconsistency reveals the extent of their power, seated at the pinnacle of their pyramids. And from this mice-and-human game of alternations between tyrannical reigns, the core social limits of life are extrapolated: *"They all ran after the farmer's wife/Who cut off their tails with a carving knife."* Tyrants dictate. The rest listen. Then run.

Social and biophysical limits to life are even more entrenched in our supposedly democratic present tense. For our rupture is set in another court, where another tyrant holds fort. It may no longer be royal, but the court wields social and biophysical power of incomparable violence and destruction. This court does not burn subjects at the stake anymore. Instead it has set the world on fire. Just as Cranmer and Batty acquiesced to their respective tyrants, those trying to put out the fire unleashed on the world can only do so by leveraging power from the court. Thereby, social and biophysical power allotted by the court can be notionally

redirected to try and put out the fire, by creating a proverbial Roy Batty or Frankenstein's monster to do so.

To know how and why the court may unleash such power is to be versed in how the social limits to life prefigure the exercise of such power. Though that knowledge proves limited too, when the domain is as self-evident as a tyrant instructing a minion to set fire to the pyre. Because, to know what actual power may be exerted in the creation of life, or the cheating of death, is to be versed in how the biophysical limits to life reconfigure the exercise of such power. Now the pyre and the fire become part of the tyranny, along with the oxygen concentration of the atmosphere being just enough to allow materials to combust with open flame. If the concentration was a few percent lower, open flame could not occur. If it was a few percent higher, materials could spontaneously self-combust. Meaning that social and biophysical limits to life, along with the interplay between them, will heavily configure the *New World Coming*. Likewise, if we are mice already blinded, it is these limitations and their interplay that will determine whether the court's biophysical power amounts to too little, too late. Which would in turn make rebukes against the court nothing but an empty gesture, in a setting already overflowing with emptiness.

As a self-appointed scribe telling this story about learning to live under the present form of tyranny, I invoke the persona of this Empty Gesture, who now plays jester at the royal court, rebooted as *persona not grata* of comic relief. And yes, a jester is both complicit in, and resistant to, the court for which he plays: a licensed fool, with license granted and revoked by the same social system. In this way, the jester is truly an Empty Gesture: as empty as Cranmer's gesture of recantation on the pyre, and the mere five months of tense reprieve it granted him before the tyrant of his time finally took his life.

Yet beyond the folly of human affairs lies another form of license that is accessible to all, irrespective of how much courtly purchase one exerts, from those stationed to build and burn the three bishops' funeral pyre, to those who get to unilaterally sentence others to death. This is a license that transcends the all too human preoccupation with the social limits of life, because it is one that has always been granted, and revoked, by the vicissitudes of the universe. Yet our capacity to take up this license and the worldview it offers is obscured, because our attention remains captivated by the court. The undeniable spectacle of public execution makes it appear that social limits to life are central to understanding the tyranny we are subjects of, and beholden to. But this is not the case.

To see beyond the spectacle of the court is to stand in the audience of the bishop's funeral pyre while fully recognising and accepting that life is ultimately subservient to biophysical limits that make a mockery of the assumed self-importance of social limits to life. Here this license is invoked to gesture towards the biophysical

emptiness beyond the insufferable tyranny of the present tense, cracking open the usual scales of human perception. Only thus can we compose a worldview not just for the unfolding rupture, but for ruptures in general, born of embracing emptiness at the scale of a day in the life of the universe.

Not an Earth Day in 2019, or an Earth Day 66 million years ago, which was 60 minutes shorter. Not even a day in the life of the solar system, or the galaxy. Rather, a day in the life of the universe. Where, somewhere, at whatever duration a local day happens to be, there are good and bad days. On the balance of probabilities, at any given time someplace somewhere will be having a bad day. At the scale of the universe, palaeontologist and evolutionary biologist Stephen Brusatte describes this as being “whenever a six-mile-wide asteroid hits your planet with the force of over a billion nuclear bombs, that’s a bad day.”²⁵ Not if. Nor when. But “whenever.”

Brusatte is referring to one such bad day for earth, 66 million years ago, when Chicxulub ended the age of the dinosaurs. Good and bad change when comedy = tragedy + time. What was bad for the dinosaurs was good for *Mammalia*, including us. Stegosaurus says: “*the mammals are taking over.*” And look what one particular mammal managed to drag in, as that “bad day” 66 million years ago is actually the most recent proxy for the current rate of greenhouse gas emissions, which is indisputably the result of human industrial activity. Such is our progress, in the laughably miniscule moment that has passed between Cranmer’s death and the present tense: we are no longer bearing witness to the mere atrocity of burning one another alive, but to the atrocity of burning the biosphere to boot.

Wherein, embracing emptiness at the scale of a day in the life of the universe not only requires us to come to terms with the possibility that all and any of our countermeasures against that atrocity might amount only to empty gestures, but also with how our bad day would be a very good day for all the fellow creatures we are pushing to the brink of extinction, were we to get our comeuppance right now. As Joseph Meeker suggests in *The Comedy of Survival*: “if the survival of our species is trivial, then so is comedy.”²⁶

Well may we attempt some leverage against the social limits of life, outmanoeuvring tyranny as Cranmer playing Bishop-overthrowing-Queen, or Batty playing Queen-overthrowing-Bishop-six. Well may we find our outmanoeuvring to be Empty Gestures, and that evolution outmanoeuvres the games we play with the biophysical

²⁵ Stephen Brusatte, quoted in Michael Slezak, “Asteroid Killed Dinosaurs by Setting Oil Aflame and Spreading Soot, Says Study,” *The Guardian*, 14 July 2016, accessed 6 May 2019, <https://www.theguardian.com/science/2016/jul/14/asteroid-killed-dinosaurs-by-setting-oil-alight-and-spreading-soot-says-study>.

²⁶ Joseph Meeker, “The Comedy of Survival,” *The North American Review* 257 (1972): 13.

limits to life. But the gesture who is jester here aims at a different level of emptiness. He wants to engage an emptiness that is at one with the universe itself. Hark the New New Life in this New New World Coming. No court in all the universe can close off our sensibility towards that divine comedy.

In the meantime, before “whenever” next appears on the horizon, the *New World Coming* is bending toward *Blade Runner* itself: its 2019 setting is no longer just prescient, having drawn uncomfortably close to our actuality.

So, let us bury the bishop and cut to the chase.

Cut to the Chase

I met a traveller from an antique land
Who said: Two vast and trunkless legs of stone
Stand in the desert . . .

– Percy Shelley, “Ozymandias” (1818)²⁷

You’re in a desert walking along in the sand when all of a sudden you look down, and you see a tortoise, it’s crawling toward you. You reach down, you flip the tortoise over on its back. The tortoise lays on its back, its belly baking in the hot sun, beating its legs trying to turn itself over, but it can’t, not without your help. But you’re not helping. Why is that?

– Dave Holden in *Blade Runner* (1982)

The rupture now unfolding reveals that we are without shelter. Whether this means the idea of refuge, or actual shelter in the form of a solid protective shell against the unravelling elements: we are without. Not only do we not now have shelter, the rupture reveals that shelter itself, and a sheltered worldview, have been hollow conceits all along. Tyrants have always inveighed against their subjects’ admonition to look upon their “works, ye Mighty, and despair!”²⁸ Civilisations thrive by singing themselves nursery rhymes and telling themselves fairy tales about their conquest and subsequent control of both social and biophysical worlds. Yet Percy Shelley’s “Ozymandias” is the tale of every civilisation, which eventually disintegrates into nothing more than “trunkless legs of stone . . . in the desert.”²⁹

So far our quicksand sinking seems an all too human farce: “*You’re in a desert walking along in the sand . . .*” So what if the conceit of social structures ends up leaving us parched in the desert in a desperate search for water? This would

²⁷ Percy Shelley, “Ozymandias,” *The Examiner* 524, 11 January 1818, 24.

²⁸ Shelley, “Ozymandias.”

²⁹ Shelley, “Ozymandias.”

make a compelling song if all that was at stake was the plight of our own self-destructive species. And if the stakes depended solely on the social limits to life, irrespective of biophysical limits.

Let us acknowledge the first more-than-human ensnared in our quagmire. Enter the tortoise we come across in our desert wandering. It is same tortoise that Detective Holden uses to assess whether a subject is human or replicant in *Blade Runner*. Holden's means of judging a test subject's humanity? Agency, empathy, and ethics – vis-à-vis a tortoise. His test is a thought experiment: set a subject wandering in a desert, have them inflict violence on the more-than-human world, confront them with the consequences of their actions, and finally quiz them on how they choose to respond (or not) to the tortoise now lying on its back.

That we reached down and flipped the tortoise onto its back has already happened. We have since developed a sensibility toward its suffering: “*its belly baking in the hot sun, beating its legs trying to turn itself over.*” At the very least, we now realise what we have done. Once we know that it is suffering because of our earlier actions, how do we respond? We know it cannot get back on its feet without our help. We know we are not currently helping. To boot, those who set us this dilemma demand answers as to why . . .

Our desert tortoise dilemma encapsulates the arc of this song, whose past, present and future plays out in three acts: the Dour, the Dire, and the Dice. Act I: the Dour is the revelations of the past. Act II: the Dire is the present before us now. Act III: the Dice faces down into the imminent future . . .

The following passages illustrate this arc through two alternate schemas – two lines in a duet, singing from the same score: the first provides the tenor, the second the premise. The tenor *permits* a certain artistic license, to enliven a deadly seriousness. Creative expression – through art, music, design, poetry, comedy, and film – develops our sensibility towards the question: *what on earth?* Yet talking tenor risks metaphors over meaning and style over substance.

The premise *demand*s an exacting fidelity to knowledge. Scholarship – of science, engineering, history, philosophy, and politics – develops our knowledge *on Earth* itself. Yet talking premise restricts us to the ivory tower of scholarly communication, impervious to the extinct elephant in the room. Meaning suffocates without metaphor. Substance is insufferable without style. The jester needs both, to present this Empty Gesture.

The tenor *of* the song derives from our desert tortoise dilemma. The premise *behind* the song derives from a paragraph in “Volatile Worlds, Vulnerable Bodies: Confronting Abrupt Climate Change,” a 2010 article by human geographer Nigel Clark, published in the journal *Theory, Culture & Society*. First, to talk tenor, we recount our desert tortoise dilemma.

In Act I “*you’re in a desert walking along in the sand when all of a sudden you look down, and you see a tortoise, it’s crawling toward you . . .*”

The Dour re-stories how we ended up in the desert. If we want to know where we are actually standing, we need to retrace our steps as to how we got here. This begs a series of cascading questions, stemming from ‘who is this *we*?’ and ‘what is this desert?’ These questions trace back to ancient pasts – beyond ‘we the people’, ‘we the species’, or even ‘we the animal’ – and to ancient places – beyond ‘the desert’, ‘a desert’, ‘the planet’ or even ‘a planet.’

The questions are not about the past *per se*. They are about the presence of the past in the present. The story of how we ended up in the desert is the story of how the desert itself got there before us, right through to how we got to be at all, long before any one-way journey into the desert. Because this is the lineage that lies behind the abruptness of contemporary biophysical change.

The Dour paints a picture of past ruptures, each one foreshadowing revelations that resound in the rupture unfolding now. These trails in space and time situate us – and our predicament – in a truly venerable lineage, and there is much to be unmasked before we can even begin to acquire a sensibility to our present tense. Recall the universal sigh of Stegosaurus: now is by no means the first or last rupture of life on earth. A portal that opens up both states of petrification yields no less than the universal sigh itself.

In Act II “. . . *you reach down, you flip the tortoise over on its back. The tortoise lays on its back, its belly baking in the hot sun, beating its legs trying to turn itself over, but it can’t, not without your help . . .*”

The Dire re-stories how the tortoise got flipped onto its back *this time*: via cumulative impacts from human industrial activity. It paints a picture of the rupture catalysing in the near past of living memory, through to the present day. In so doing, the Dire speaks to how we perceive our present predicament, standing here in the desert in front of our upturned tortoise. We know it will soon die from exposure to the elements if we do not help. What then are the hurdles to flipping the tortoise back over? Why do we hesitate? And in the face-off between jabberwocky versus the juggernaut, why is the dilemma so serious that it cannot be approached directly, but must rather be embraced via nursery rhymes, tall tales, and court jesters?

The answer is simple: this elliptical approach is what will allow us to unearth how human, inhuman and more-than-human forces are at play in considering the tortoise’s plight. Recall tyrants Tyrell and Mary, and their minions Batty and Cranmer. The interplay between social and biophysical limits to life is inexorably complex. Knowing what *could* be done is conditional upon considering what *should* be done according to – *inter alia* – societal structures of knowledge and power.

In Act III “. . . *You're not helping. Why is that?*”

The Dice explores responses in light of the revelations of The Dour and The Dire. In particular, proposals to flip the tortoise ‘back’ onto its front by means of games of dice. ‘Back’ bracketed here because of course, there is no going back anymore. Our tortoise, should it, could it, or would it be flipped back onto its front would no longer be the same. It will never be the same. Because the game we are now playing with life and death is for keeps, with a new set of rules. To boot, the game has already been in play for some time, as John McNeill remarks in *Something New Under the Sun*: “in the twentieth century, humankind has begun to play dice with the planet, without knowing all the rules of the game.”³⁰ Though this twenty-first-and-last century gameplay is no rematch of the ‘Immortal Game’: it is the first and only match of The Mortal Game.

Our tortoise’s plight is utterly compelling, as it stands for the multitudes upon multitudes of other species we have dragged into our quagmire. They are now, as we are, embroiled in this imbroglio. As we sink ever deeper we face very specific dilemmas, which are unlike anything we have ever faced before. Responses to the rupture are about choosing between utterly unpalatable options: Do-or-Die, Swim-or-Sink, Now-or-Never . . . In the first half of this twenty-first-and-last century the risks of responding, and the risks of not responding, will play a decisive role in whether a great tide of lifeforms become consigned to extinction.

Act Your Rage

If only you could see what I have seen with your eyes.

– Roy Batty in *Blade Runner* (1982)

Underpinning the arc is a premise without desert or tortoise, possessing instead an exacting fidelity to scholarship. Encapsulated in a single paragraph by Nigel Clark, the premise nonetheless yields the same dilemma:

So what are we to make of abrupt climate change? Now that academic science, popular science writing and Hollywood cinema have all warmed to the idea of sudden threshold transitions in climate systems, the issue is unlikely to recede. We have also passed the point at which progressive social thought can content itself by keeping a critical distance from the substantive claims of the natural sciences, and entered a situation which cries out for a degree of fidelity to events unfolding around us. Which would seem to me to imply at least provisional commitment to an idea of how our physical world actually works. My gamble,

³⁰ McNeill, *Something New Under the Sun*, 8.

with the usual provisos about decision-making under conditions of unknowability, is that we must front up to the past reality and future likelihood of crossing climate thresholds.³¹

The question of what we are to make of abrupt climate change, especially now that it has been firmly appropriated and entrenched in the popular imagination, provides the premise underpinning Act I: the Dour. This question is in fact analogous to what we are to make of finding a tortoise in the desert, crawling towards us. Both are profound revelations, full of revulsion and revelations. However, the question “what are we to make of abrupt climate change” does not ask what we are to make of *contemporary* abrupt climate change, or *anthropogenic* abrupt climate change. It asks what are we to make of the phenomena in the broadest possible sense.

In order to offer a response even remotely commensurate to the question, the Dour cannot sing solely about climate change, or even abrupt climate change. The Dour sings about ruptures. The ones which change in broad brushstrokes the lion’s share of life on earth, with abrupt climate change but one of innumerable forms of a rupture. The Dour sings about the limits of life and the cosmos to which life is hitched, from making a living on a daily basis, through to macroevolution.

So, Act I has us “all warmed to the idea of sudden threshold transitions in climate systems,” and by the end of this act it is no longer merely an “idea of sudden thresholds in climate systems.” Actual thresholds now stare us point-blank through the eyes of the tortoise that arrived out of the blue. Clark expands on why this is a pressing problem in his magnum opus, *Inhuman Nature: Sociable Life on a Dynamic Planet*, wherein he states that “crucial decisions about how to live on, live well, or deal with loss of life on this planet are dependent on notions of how things work in the universe, irrespective of our influence.”³²

The reason being that “it makes little sense to agonize over our own contributions to earth processes without the fullest possible understanding of the dynamics and potentialities that are constitutive of material reality in and of itself.”³³ Given abrupt climate change is but the tip of the melting iceberg of these “dynamics and potentialities” we must first attempt to understand the way the universe is, without us, and the way the world was, before us, through to the way the world is, with us, rather than jump ahead “to agonize over our own contributions,” tempting as that may be.

³¹ Nigel Clark, “Volatile Worlds, Vulnerable Bodies: Confronting Abrupt Climate Change,” *Theory, Culture & Society* 27, nos. 2–3 (2010): 33.

³² Clark, *Inhuman Nature*, 23.

³³ Clark, *Inhuman Nature*, 9.

The Dour provides a window, then, through which to look at *Life, the Universe and Everything*³⁴ through a glass half full/empty/darkly. Having done so, the Dour gives way to the Dire, in which the past gives way to the present of abrupt climate change catalysed by human civilisation, so-called.

Act II: the Dire is underpinned by the premise that we have indeed “entered a situation which cries out for a degree of fidelity to events unfolding around us.” A situation that cries out for faithful recognition of how we have reached down, and flipped the tortoise onto its back. Living during a rupture is highly emotive: the “events unfolding around us” cry out to us. We cry as we cry out to them. Lament Lonesome George, and the outpouring of grief following his 2012 death. He was the last known individual of the *Chelonoidis abingdonii* tortoise species: “*The tortoise lays on its back, its belly baking in the hot sun, beating its legs trying to turn itself over . . .*” As an endling, his death completes the extinction of a species. Lament the confluence of being petrified with becoming petrified.

Although this discussion seems to roam far away from the incontrovertible fact that we flipped the turtle this time, nothing here is meant as an apology for that fact. For the intrinsic precarity of the cosmos does not exonerate the actions of humans within it. Rather, the Dour re-stories how the turtle has been flipped many times before, and the Dire re-stories how unique this particular flip was, executed as it was by an inhabitant of earth both conscious of its doings and comprehending of their consequences.

Therein, the Dire judiciously “agonize[s] over our own contributions” to this ultimate irony, as it establishes fidelity toward our situation from an “at least provisional commitment to an idea of how our physical world actually works” and the “substantive claims of the natural sciences.”

If it is principally the humanities and social sciences that claim insight into how societies could or should respond to such an existential predicament, then those who pursue “progressive social thought” ought to ground scholarship about the unfolding rupture in sound science. Or else, given the circumstances, accept their abject irrelevance, because recalcitrance trumps niceties. Our tortoise is dying before our eyes, yet the overwhelming weight of “social thought” either has no “idea of how our physical world actually works,” or no basis in those physical laws. So, the Dire offers a recalcitrant corrective to present-tense humanistic and social notions overwhelmingly founded on wilful ignorance and/or woeful incomprehension about the physical functioning of our world.

34 Douglas Adams, *Life, the Universe and Everything* (London: Pan Books, 1982).

Fronting up “to the past reality . . . of crossing climate thresholds” through fidelity to the “substantive claims of the natural sciences” takes us far from our *hominidae* genus. “Crucial decisions” become not just about “how to live on, [or] live well” but about what gets to live at all. But the capacity of human agency to make such decisions must be called into question. Hence, the Dire gives way to the Dice, as the present begs that proposed gambling on earth’s future be mindful of the cosmos to which any human intervention is behest.

Clark’s final sentence provides the premise underpinning Act III: the Dice. Moving into the “future likelihood of crossing climate thresholds” and the critical question it begets: “*You’re not helping. Why is that?*” Clark couches his bold proclamation in caveat-laden gambits. He hedges his bet, only placing his gamble “with the usual provisos about decision-making under conditions of unknowability.” Meaning it is beyond doubt that “*There’s a new world coming/This one’s coming to an end,*” but beyond our reach to know if “*There’s a new world coming/And it’s just around the bend.*” The unassailable chasm between certainty and uncertainty invokes the third part of the universal sigh: Stegosaurus says “*we all have a brain about the size of a [rockmelon, née] walnut.*”

Nevertheless, Act III strives to know what, if anything, could be done in response to the rupture. Any notional response ought to be premised on a high fidelity to this eclectic array of knowledge and inquiry, yet simultaneously premised on (un)certainly, (un)predictability and the (un)thinkable arising from the unfolding rupture. Picture geologists sifting through strata to unearth how dinosaurs met their end. Except the studious must now sift through what is currently happening behind, beneath, beyond, and above, singing the universal sigh as they unearth the gamut of cosmic changeability, consequences, and comprehension of same.

The Dice explores proposals to temper the enraged entity, by controlling climates and designing life. Manifesting a *New World Coming* in the order of *Frankenstein* and *Blade Runner*. *Frankenstein* forewarns “it is one of the strangest tales ever told” because the protagonist, Dr. Frankenstein, plays with the biophysical limits to life. It is a *precautionary* tale: probing what may result from the hubristic attempt to control or design life. Yet, like the *Three Blind Mice*, we may be already blinded to our comeuppance, a comeuppance that is the result of our own historical actions. *Three Blind Mice* is a *postcautionary* tale about the social limits to life: a warning of what happens when court subjects do not remain in their assigned roles. Both these biophysical and social limits to life pertain to any proposals for responding to the rupture. Our present tense thus requires a hybrid *pre-* and *post-*cautionary tale. When one’s kind may have already enraged an entity much more powerful than our collective capacity, it is foolish to think something-through-anything could temper the rage.

Frankenstein's opening gives those who “do not care to subject your nerves to such a strain” the option to bow out. Nowadays, being petrified does not absolve us of just sitting back to watch the living world become petrified. To sit back is to prostrate ourselves to be ravaged by the elements we enraged. But to temper those elements is to embark upon radical technoscientific interventions into ecosystems and evolution. Both extremes need heed the all-too-real chance that we have already crossed the threshold, and it is too late for anything other than empty gestures directed at the concerns that drive this song. In which case the entire endeavour amounts to a zero-sum game.

Clark’s “gamble” demands that we work under “conditions of unknowability” together with the fortitude and hubris of an engineering mindset, and accept the “past reality and future likelihood of crossing climate thresholds” as well as the fact that we are crossing one right now. The operative word here is “gamble.” Hence, the answer to the question: “*You’re not helping. Why is that?*”, is that the options for helping are always going to be a game of dice.

Choosing not to throw the dice is still possible. Choosing-not-to-choose means our tortoise dies of dehydration, staring at us as we watch it die. We can hedge our bet on whether the chicken should cross the road. We cannot hedge our bet when playing the Mortal Game. The bet that confronts us in Act III: the Dice carries the weight of the ends of the earth and the end of (this) world.

Together, these three acts paint a picture that is indeed blacker than bleak. Every ink blot darkens the otherwise white canvas. Recall also that something else is etched within the layers of paint, beyond forlorn and foregone forecasts. This elusive something is a kind of searching for home that has always been difficult to express, and is now also increasingly difficult to see between the layers, because it celebrates the co-existence of cosmic chaos and cosmic order, while commiserating with the grief of living during a human-caused mass extinction. This search to be at home in the universe embraces the complete indifference of the cosmos, amidst the complete callousness of the species that flipped the turtle this time. To see the pretty bleak picture anew then, with equanimity towards being petrified and becoming petrified, is to not just embrace a new worldview for a new world coming. It is to be at home. Not here on earth. Here in the universe.

Did you ever see such a sight in your life?



Fig. 1: Welcome Home: Buster Keaton, *Steamboat Bill, Jr* (United Artists, 1928).



ACT I: THE DOUR

I

Here.Goes.Nothing.

“You’re in a desert walking along in the sand . . .”

In a walnutshell:

Desert Turtle Dilemma >

Tu’i Malila Turtle >

World Turtle >

Third Universal Sigh >

N-LSD >

Ghost in the Shell



Fig. 2: Barry Mann and Cynthia Weil, *New World Coming*, sheet music cover (Columbia Music, 1970).

Borrowed Time v Burrowed Space

You can force a story's shape, but the colour will always bloom upstream.

– Shane Carruth, *Upstream Colour* (2013)³⁵

Are we ready to be 'true' to conditions and processes that threaten a radical undoing of the human capacity for collective action – to seek fidelity to a story that puts the cataclysm upstream of our humanity, and not simply downstream where we can still dream of diversion and escape?

– Nigel Clark, *Inhuman Nature* (2011)³⁶

Clark's question begs three types of responses. The first is a flat "No. Thank you for offering to dash my dreams of diversion and escape but I am not ready yet." That answer keeps on singing a sheltered worldview, akin to the 1842 version of *Three Blind Mice*. Scaled up to a collective answer, rejecting the invitation amounts to a society that only maintains itself by sheltering its worldview.

The second is a half-arsed answer to a half-full glass of a question. It is a Lisa Simpson-like shrug of the shoulders with her characteristic cynical and apathetic "Meh." That answer acknowledges the 1609 version of *Three Blind Mice* and, by implication, acknowledges that sheltered worldviews are hollow conceits. But it stops there. Scaled up, shrugging off the invitation amounts to a society mired in the ennui of acknowledging the falsity of the worldview, but continuing to seek shelter in it all the same.

The third is an emphatic embrace of the universal sigh, and thus of the universe: "Yes! I am ready to be 'true' and to dream only of fact, not fantasy." 'Yes' responses sing out loud in public about freedom from tyranny. Not the tyranny of the 1555 executions of the three bishops though. 'Yes' responses sing about freedom, albeit one that is footloose, born of endless revelations that stem from embracing impact, rather than bracing for impact. Because "to seek fidelity" to the vicissitudes of the cosmos means greeting the next "whenever" of a rupture with open arms.

Answering yes means no longer falling into the universe in a one-way transformation, as when the title character of *Alice in Wonderland* falls down the rabbit-hole, since the response also yields a wonderland in Alice. Imbibing the universal sigh reveals wonderlands within, out, and without you too. Scaled up, accepting the invitation amounts to a society inhaling and exhaling the universal sigh, with earnest ear cast toward wonder at the-new-world-that-is-coming-into-being.

In improv comedy the golden rule is never answer "Yes" followed by a full stop. Always answer "Yes, and . . .?", making each embrace beget successive

³⁵ Shane Carruth, director, *Upstream Colour*, logline (VHX, 2013), DVD.

³⁶ Clark, *Inhuman Nature*, 31.

stages of improvised actions. Answering “Yes, and . . .?” begs questions of how to counter chasms between becoming “ready to be ‘true’ . . .”, versus becoming ‘true’, versus being “. . . ‘true’ to conditions and processes that threaten a radical undoing of the human capacity for collective action.”

To go from becoming to being, Act I journeys back upstream. From near, through far, and onto the distant past, lying wholly “upstream of our humanity.” Our “story” puts the cataclysm somewhere thereabouts, at an undisclosed location, and flowing back along cascades of cataclysms that emanate from undisclosed locations to close the Act in the present desert destination, encountering our tortoise and therein, being ‘true.’

The journey runs counter to going “Gently down a stream/Merrily merrily merrily merrily life is but a dream.”³⁷ Not because it goes upstream rather than down, but because it is anything but gentle, and anything but a dream. The situation comedy version would be Frankenstein’s monster cohabiting with *Three Blind Mice*: travelling up and down this river of time conjures a hybrid *precautionary* and *postcautionary* tale. A tale foreshadowed by how the Act ends downstream, already rife with dashed “dream[s] of diversion and escape.” Daring to ask, let alone unearth, how we ended up here seems a luxury we can ill afford, but the Dour demands that this be done.

Given a choice between truth or dare, truth will always be a stranger to fiction. Rhyme or reason are not to be found in the phenomenon of ruptures of life on earth, in any of their guises. Not for lack of looking, for there is none to be found. Instead, the journey goes upstream to locate a basis, however unstable, from which to view the cosmic joke, whose *modus operandi* is that shift happens.

So Act I borrows from time we never had in the first place, in order to flesh out this readiness to be ‘true.’ It dares imagine what *is*, if expectations of stability and predictability are wayward views, not only of our predicament, but of life-at-large. Confounded at the unfolding of the universe? That will take forever-and-a-day to unfurl. Meanwhile, a dour demeanour travels upstream, starting with turtles as a conceptual model for understanding the world.

This world – and its worldview – are shaped by “seek[ing] fidelity” toward placing the “cataclysm upstream,” and this journey upstream will be an encounter made through the following trail of breadcrumbs: epistemology, complexity theory, non-linear system dynamics, biogeochemistry, volcanology, thermodynamics, oceanography, and thermohaline circulation. But since we are seeking “fidelity to a story,” the tenor of this journey – the style giving colour to the substance – draws on a fable.

37 Eliphalet Oram Lyte, “Row, Row, Row Your Boat,” in *The Franklin Square Song Collection* (New York: Harper & Brothers, 1881).

Starting with colonial exploits meeting feudal Polynesian society, diffracted through the lens of human-induced extinction and human-induced evolution by wild minds of sci-fi literature and cinema. From the life of an individual human and turtle, beyond to the world-as-idea and the world-as-planet, upwards to when there was no planet, and outwards into the cosmos. Where to begin but with the world? A world that may not start with the place where the tortoise encounter occurs, but whose Dour understanding of it does.

Love Minus Zero/No Limit

“The legs of toads are weak,” Rick said. “That’s the main difference between a toad and a frog, that and water. A frog remains near water but a toad can live in the desert. I found this in the desert, up near the Oregon border. Where everything had died.” He reached to take it back from her. But she had discovered something; still holding it upside down, she poked at its abdomen and then, with her nail, located the tiny control panel. She flipped the panel open. — Phillip K. Dick, *Do Androids Dream of Electric Sheep?* (1968)³⁸

“*You’re in a desert walking along in the sand . . .*” The encounter with the turtle in *Blade Runner* takes place in an undisclosed desert. After all, it’s a thought experiment, designed by humans, to distinguish humanoid from replicant. So let us take the indeterminate location with a grain of sand: Sahara. Yet tortoise is to desert as fish is to/out of water. To wind up in a desert, a tortoise would need to go on a continent spanning journey. There is such a thing as a desert tortoise, but they still need water. And they are rarities in the greater turtle order to which tortoises belong, *Testudines*. Scaling up, let us talk turtles *en masse* instead of limiting our discussion to tortoises. Most members of the turtle order tend toward water, being in and out of it throughout their life. But never away from. Or at least, never voluntarily away from. Is this the placement of the upstreamed cataclysm? But if we place the headwaters of the stream here, then we fail to consider how the turtle wound up in the desert, before we even entered the scene. Daring to ask how the turtle got here seems a luxury we can ill afford.

In matters more at hand, a desert location means most turtles could survive about nine hours without drinking water, on the balance of probabilities. Nominally the same duration required to read/sing this book cover to cover. Or listen

38 Phillip K. Dick, *Do Androids Dream of Electric Sheep?* (New York, Doubleday, 1968), 240.

to Max Richter's music marathon *Sleep*,³⁹ running for the optimal duration of a night's sleep, or a waking nightmare, depending on how you spend your lifetime.

Let us then bear in mind that a third of our turtle's remaining life is evaporating through dehydration over the course of Act I. In this Act, we can discount any intense hydration, shade or sycophantic patronage provided by *homo sapiens* – that burden is born by Act III. The here and now Dour favours a worldview where comedy = tragedy – time. We “read books, repeat quotations” as per *Love Minus Zero/No Limit* while our turtle progressively dehydrates. And yet we cannot begin to begin to “draw conclusions on the wall”⁴⁰ without this act of reading and quoting. Starting with the real-world turtle behind the dilemma itself.

The turtle's remaining facet is the epigraph that opens *Do Androids Dream of Electric Sheep?*, the Philip K. Dick novel on which *Blade Runner* is based. The epigraph announces the death of a tortoise named Tu'i Malila on 16 May 1966, quoting verbatim the Reuters newswire that appeared three days later. She had been living as royalty since 1777, when Captain James Cook gifted her to King Paulaho of Tonga. But she had been hatched roughly a century before that fateful day of exchange, making Tu'i Malila the oldest known tortoise to have ever lived.

Tu'i Malila means King Malila. A title earned not just because she entered the royal family, but also granted as part of Tongan cultural veneration for turtles. Before passing from Cook to King Paulaho's hands she had lived among Madagascan waters and islands, where her *Geochelone radiata* species heralds from. Cook likely had no noble intentions when his crew captured her in Madagascar during their global colonisation drive: turtles such as *Geochelone radiata* were kept alive aboard ship, as they provided bountiful nutrition for such European invaders criss-crossing the globe.

By the time Cook reached Tonga, Tu'i Malila was the largest of his bounty pilaged in Madagascar, and thus most worthy to offer as a venerable gift. Starting with a seemingly simple twist of fate, an unnamed individual becomes royalty, achieving such renown that her death was reported internationally, and later inspired the plight of the more-than-human world in *Do Androids Dream of Electric Sheep*. And now, she is synecdoche for the plight of the more-than-human world in the unfolding rupture.

Her death caused much consternation across Tonga, as she had been a venerated fixture for almost two centuries. After all, who is not the most royal but that which outlives all other royalty? Her biophysical limits to life far outstretched the

³⁹ Max Richter, *Sleep* (Deutsche Grammophon, 2015), LP.

⁴⁰ Bob Dylan, “Love Minus Zero/No Limit,” track 4 on *Bringing It All Back Home* (Columbia Records, 1965), LP.

social limits to life of her human keepers, bearing witness to a succession of human kings while she lived. Her outstretched biophysical limits also meant she bore witness to the decimation of her fellow kin, over her lifetime spanning 1677 to 1966, from initial turtle hunting inflicted during her youth by colonial invaders, to the rupture currently unfolding.

Now she haunts us, bearing witness from beyond, entombed in the Royal Palace of Tonga, motionless in shell and flesh made everlasting by taxidermy. Now we mourn her, along with her entire species, hanging precariously on the International Union for the Conservation of Nature's list of critically endangered species.

Tu'i Malila did not make it into *Blade Runner*, though she haunts this filmic world populated only by synthetic owls, snakes, spiders, and unicorns created by humans to replace all those creatures they have rendered extinct. Her plight finds its way into the narrative obliquely, through the desert tortoise dilemma, and her epigraph in this novel about humans designing lifeforms is really an obituary. Not of a turtle, but of the more-than-human world, at the hands of humans. Wherein, twentieth-century science-fiction about humans designing synthetic lifeforms was inspired by the real-life plight of a turtle whose trajectory was dramatically skewed by James Cook, one of the foremost figures in modern European colonialism in the eighteenth century. But is this the headwaters of the cataclysm upstream that we are seeking?

Cook set sail from the epicentre of the European Industrial Revolution, right at its advent, systematically forcing European politico-economic hegemony onto regions across the globe. Does this provide a compelling breadcrumb trail for the headwaters of the cataclysm? How far can Cook's encounter, jumping between row boat and beach shore on arrival at Nuka Alofa, the Tongan capital, and Tu'i Malila's encounter, dipping her flippers into Tongan waters as she is handed alongside to Paulaho, fare as the primordial turtle flip, and thus the terminal location for the cataclysm upstream?

In the worldview that posits this as the terminal location, the catalyst of the unfolding rupture is placed by foregrounding the protagonists: a (white, European, colonising) man and a (now precipitously endangered) turtle. But an encounter of this magnitude may only be held up as the headwaters if the stage upon which their encounter takes place is relegated to a mere static background, like painted landscapes to a vaudeville tragicomedy. This is not a faithful perspective. And therein lies the problem: as Clark admonishes, this is extent of the scope within which "progressive social thought" views the ecological crisis. Such a viewpoint proves woefully insufficient for understanding the unfolding rupture, or even ruptures of life on earth in general. And yet it is the dominant view in so-called "progressive social thought" about the ecological crisis: a worldview whose

scope extends only to Cook as synecdoche for the roll call of usual suspects – colonialism, capitalism & co. – behind the unfolding rupture, and Tu'i Malila as synecdoche for human forcings of more-than-human lifeworlds wrought by colonialism, capitalism & co.

Cook and Tu'i Malila's life stories make for conventional readings on the ecological crisis. They do not foreground human agency, but merely the agency of European colonialism in a planetary plight. Thus, to posit this encounter as the headwater is to prematurely and myopically give in to the Dire's crisis-mindset, and the Dice's impetuous responses, but in ways wilfully oblivious to the seemingly static background of the stage, as well as ways unfaithful to the scale and complexity of that stage. What then, if we let our dour demeanour spin the theatre and make the stage the foregrounded protagonist of this play? Once we do this, it becomes clear that the fable of Cook and Tu'i Malila can only fare as far as being the mere first immersion into "the cataclysm upstream."

In seeking fidelity to an expansive reading of their fabled encounter, we can no longer pretend we are talking about Tu'i Malila's plight – subsumed into tyrannical colonialism, capitalism & co. Nor can we pretend we are talking about the present tense plight of her dwindling *Geochelone radiata* descendants. Instead, the search for fidelity requires going far beyond such concrete singular examples in discrete time and discrete space, because otherwise Detective Holden's test subject may think they are being asked to empathise with a singular turtle, when they are actually being asked to extend the generalisation away from any specific individual, toward empathy for the entire more-than-human world.

And so, by misappropriating the desert turtle dilemma as the arc of this song, Holden asks us to empathise with a turtle that is synecdoche for the scale of the world itself, and the scale of life itself, even if empathy still proves unredeeming for the haunted test subject. Who, though, is this 'we' that can scale up from Holden's individual test subject to the collective 'we' that now stares at the upturned turtle in the desert?

The answer is a singular one that oscillates into many, just as the turtle oscillates between the historical real-world individual turtle, synecdoche for all turtles, and metaphor for the world-of-life. The 'we' oscillates between we as contemporary society (the present tense), not to be confused with modern society (The Enlightenment et al.), ancient society (plural, bringing in societies across the globe), humanity (a nebulous concept, neither singular nor plural, here nor there), *homo sapiens* (ironically back to The-Singular-as-species), and the *hominidae* family (resting on another nebulous category of all species descendent from this family over its seventeen million year genesis).

In summary, that which 'we' refers is context-contingent. Meaning our present tense encounter is also a re-encounter due to the legacy of earlier endeavours

by modern and ancient societies in their times. Because our dour encounter is not truly with a single tortoise alone in the desert. It is with the World Turtle, being both the world, and our understanding of it to boot.

Turtles All the Way Down

Dour philosophy has never improved the world.

– David Hume, “Of Commerce (1752),” (1777)⁴¹

We build our houses on the earth, the earth rests on an elephant, the elephant on a tortoise, the tortoise again – who knows on what? – and so on *ad infinitum*.

– Johann Fichte, *Concerning the Conception of the Science of Knowledge Generally* (1794)⁴²

What then is the difference between an encounter with our tortoise in the desert, and one with the World Turtle? In Vedic cosmology, the World Turtle holds that earth rests on a turtle, which itself rests on a larger turtle, and so on . . . This concept has been appropriated many times since, in fields as diverse as metaphysics and epistemology, to express how only fragments of details may ever be accessed from an infinite regression, whether probing ultimate origins, say of the universe, or ultimate ends, say of the earth. In no particular order: what issued forth the Big Bang? Back when there was No Thing. In probing any such enigma, all fragments rest on infinite layers of other detailed wholes, which will always be out of reach. No fulfilment is to be found, because the bucket is bottomless.

For those seeking ultimate limits to conceptual models of the world, this revelation profoundly undermines our understanding. In the quotation above, Fichte is referring to epistemic limits of attempts to understand any ‘thing’ – object, idea, system and so on. These limits are progressively revealed through our insatiable drive to interrogate how things work, from atom to atmosphere, and how seemingly disparate phenomena influence one another, from atom to atmosphere.

Every breakthrough a watershed in current limits to understanding only reveals that prior boundaries were just resting on yet another turtle. Stegosaurus says: “*we all have a brain about the size of a [rockmelon, née] walnut.*” The universal sigh is not some nut to be cracked by changes to cognitive capacity, such as brain size or neuron density. Attempts to discover The Definitive Details of

⁴¹ David Hume, “Of Commerce (1752),” in *Essays: Moral, Political, and Literary Part II* (Indianapolis: Liberty Classics, 1987 [1777]), 256.

⁴² Johann Fichte, *Concerning the Conception of the Science of Knowledge Generally*, translated by Adolph Ernst Kroeger (London: CreateSpace Independent Publishing Platform, 2017 [1794]), 27.

Phenomenon A-through-∞ may yield spellbinding fragments, but overall will only ever reveal that it's turtles all the way down.

Nevertheless, hell bent we are on digging through, even though we know there is no bottom to be reached. In *Dialogues Concerning Natural Religion*, David Hume reasons that it is best to respect such limits to understanding. Hume constructs a dialogue between three philosophers named Demea, Philo, and Cleanthes, to elucidate the folly of trying to outmanoeuvre the World Turtle:

If the material world rests upon a similar ideal world, this ideal world must rest upon some other; and so on, without end. It were better, therefore, never to look beyond the present material world . . . When you go one step beyond the mundane system, you only excite an inquisitive humour which it is impossible ever to satisfy.⁴³

The danger in this pursuit goes beyond exciting an insatiable “inquisitive humour.” What is found down there shows up just how shaky the foundations are up here. As for the world, so for understanding it. Not only are material encounters with the World Turtle vexingly enigmatic, so too are our understandings of it. Let alone the repercussions of understanding we will never be able to remotely understand it. Let alone the understanding of these repercussions, and so on . . . It's turtles all the way down.

On the one hand, this pursuit is necessary to unmask a sheltered worldview. On the other, what sort of a worldview is it to be endlessly chasing one's tail? An insult – given “it is impossible ever to satisfy” the desire to catch one's own tail – added to injury: the discovery of living with the knowledge that it can never be caught.

Only in nursery rhymes does the tail get caught. And then only to be “cut off . . . with a carving knife.” The same dangers apply for singing sheltered or seditious worldviews into being. Sheltered worldviews rely on us “never look[ing] beyond the present material world.” But seditious worldviews – as per the demeanour of the Dour – demand that once “we go one step beyond the mundane system,” we continue on and follow the severed tails, twisted tales, and bread-crumbs trails wherever they may lead.

What is, then, the difference between seeking to resolve the ambiguity of the desert turtle location, or a discrete location for the cataclysm upstream? Both are akin to one another, as they occur in indiscrete places and times, the pursuit of which undermines claims toward certainty, in favour of evincing further facets of cosmic changeability and its consequences, and any comprehension of same. However, what these two pursuits reveal is an irreconcilable difference between

⁴³ David Hume, *Dialogues Concerning Natural Religion* (London: Penguin Books, 1990 [1779]), 38.

finding oneself adrift in a proverbial desert, and actually flipping the World Turtle. The former predicament shows how lifeforms find themselves, from time to time, at the behest of earthly vicissitudes. The latter predicament shows how lifeforms, whether already rendered precarious or not, can also induce vicissitudes upon earth and their fellow inhabitants.

Their difference is irreconcilable because cataclysms are by definition highly erratic, meaning anything built upon them, whether mountain, mouse, house, or human, cannot be a static entity either. Thus a fundament of the dour demeanour is to recognise that everything above rests with a semblance of stability on everything below. Everything below rests on the infinite beneath, which closes in full circle because in the universe there is no such thing as up/down or top/bottom. Along some indiscernible point in this revelry of non-sense lies earth, which itself “rests on an elephant, the elephant on a tortoise, the tortoise again – who knows on what?”

N-LSD

It is vital to this story that my human protagonists are caught up in a drama that is in the most part not of their making. We are . . . intrinsically, inescapably, ensnared in a mass of forces and objects that greatly pre-exist our emergence and have no need of our continued existence. If we are to come to terms with the radical asymmetries of our residence on ‘a specific planet’, in ‘a specific universe’, then the autonomy of the forces that shaped and continue to shape us needs to be at the core of our thought.

– Nigel Clark, *Inhuman Nature* (2011)⁴⁴

I cannot describe to you the agony that these reflections inflicted upon me; I tried to dispel them, but sorrow only increased with knowledge.

– Mary Shelley, *Frankenstein* (1818)⁴⁵

When Fichte talks of how “we build our houses on the earth” he refers explicitly to comprehending the world, and only by implication to the world itself, as an object of knowledge. When Clark refers to “our residence on ‘a specific planet’, in ‘a specific universe’” he refers explicitly to the world itself, as independent and autonomous object-within-the-larger-universe. By implication, he is also concerned with comprehending some such World Turtle, but in a way mindful of the “autonomy of the forces that shaped and continue to shape us.” Recalling the

⁴⁴ Clark, *Inhuman Nature*, 182–183.

⁴⁵ Mary Shelley, *Frankenstein, or the Modern Prometheus* (New York: Open Road Media, 2014), 138.

earlier reclaiming of biography as the life story of life, here the autonomous forces shaping “us” are substituted with those shaping life.

The foremost endeavour to bridge the chasm between encounters with the world and comprehension of it has taken place through Earth System Science. The emergence of this research endeavour in the 1980s revealed staggering insights into the complexity and interrelatedness of – *inter alia* – biological, physical, chemical and geological dimensions of earth. The concept of an Earth System denotes that life did not happen *on* earth. Life happened *to* earth. Conversely: earth happened *to* life, woven through as it is with abiotic forces of the atmosphere, hydrosphere, cryosphere and lithosphere. Such is the “mass of forces and objects” that life did not emerge *from* but rather *with*.

Wherein, “we are . . . intrinsically, inescapably, ensnared in” Earth System behaviour that eviscerates any expectations of discernible causality, given how repercussions reverberate every which way across an infinite progression of turtles. This is because the behaviour being analysed here operates according to Non-Linear System Dynamics (N-LSD). Picture cliché cyclones catalysed by a butterfly flapping its wings. A flap does not cause a cyclone, but in principle as well as practice, mammoth phenomena can be derived from minute actions. Shift happens because systems switch into entirely novel states that have no analogue with a prior phase of the system. And what constitutes a system is just the arbitrary lens that has been applied to whichever phenomena is currently under inquiry.

Take a seemingly simple manifestation of same: an enclosed acrylic cube, part filled with water. The cube osmotically absorbs heat from its surrounding environment. Liquid water will undergo state shifts between vapour, which rises to the underside of the ceiling, condensing into drops that fall back as liquid onto the bottom, only to start the cycle again. As a closed system, water may cycle through different states, whose novelty is limited by the closure of the system. Phase transitions between states may change speed in proportion to the ambient temperature of its surroundings, but even if the water within became steam it could not escape the cube, because the system closure only allows energy to dissipate, not matter.

German artist Hans Haacke presented such an evocation of N-LSD in his installation *Condensation Cube* in 1963. A seemingly simple artwork, comprising a milk-crate sized clear cube partly filled with water, presented on a stand in an art gallery. Yet it no longer seems simple when reading the last of the three materials Haacke listed in the artwork’s composition: “clear acrylic, distilled water” and “climate in area of display.”⁴⁶ What happens in the cube’s immediate surrounds

⁴⁶ Hans Haacke, *Condensation Cube*, 1963, <https://www.macba.cat/en/obra/r1523-condensation-cube>.

is part of the artwork, which is not merely a cube, but rather comprises both the cube and the environment of its display.

Condensation Cube runs counter to what art galleries strive for, which is climatic homeostasis, aka air conditioning. To maintain homeostasis galleries require elaborate heating and cooling systems, as does any house. Thus, *Condensation Cube* does not just present a closed water cycle but an eternal golden braid between heat, air, and water. An earth-writ-small with its cycle between two oceans. One of water, the other of air and both in part of one another too.

While *Condensation Cube* scales earth down to a domestic scale, the gallery scales it back up, showing up conceits about an earth-writ-large. It shows inhuman processes as affected by human actions, in concert with a much larger environment that we seek to regulate. We are part of, fixtured into, and entangled with the same system we are trying to disambiguate as being ‘out there’, despite having always been here inside of it at the same time. Being terrestrial beings, “we live, submerged at the bottom of an ocean of air,”⁴⁷ as Renaissance mathematician Evangelista Torricelli remarked. Conversely, we live at the top of an ocean of water. But where does one system end and the other begin? Can we ever not conflate the world with our comprehension of it?

To boot – biotic and abiotic systems which appear to be discrete – whether butterfly or cyclone – are entangled in ways that have only recently begun to be fathomed. Take the Sahara Desert and Amazon rainforest and the thousands of kilometres of open ocean that separate them. Given the difference between an ocean of air and an ocean of water, or an abiotic desert and a biotic rainforest, such systems may appear to have little to do with one another.

Yet Saharan dust, rich in nutrients, rises into the atmosphere, blowing across the Atlantic Ocean and making landfall in the Amazon, where it provides fertilisation vital to the rainforest soil. This interchange of millions of tonnes each year is millions of the years in the making: Amazonian abundance depends (in part) on Saharan sands. The Sahara may consume the life of our turtle that has wandered too far from its aquatic lifeline, but the same desert inadvertently supports life in the largest rainforest on the planet.⁴⁸ Not all deserts are deathly. Not all rainforests are lively, especially when the largest one on earth is on fire, transmuting into a state shift toward desertification.

⁴⁷ Evangelista Torricelli, quoted in Gabrielle Walker, *An Ocean of Air: A Natural History of the Atmosphere* (London: Bloomsbury, 2010), 24.

⁴⁸ Hongbin Yu et al., “The Fertilizing Role of African Dust in the Amazon Rainforest: A First Multiyear Assessment Based on Data from Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations,” *Geophysical Research Letters* 42 (2015): 1984–1991.

Earth System Science is the endeavour unearthing where, how, and when planetary-scale phenomena pass critical thresholds, beyond which they irreversibly morph into novel states. Modelling the Sahara-Amazon relationship is however just one facet of the enterprise. The objective is to understand the propensity of systems such as the Amazon to tip into novel states, such as Sahara-like desertification, with profound consequences for global climate and the extirpation of lifeforms attuned to biomes as they existed prior to this unfolding rupture.

Such processes beget exponentially reinforcing feedback loops, a phenomenon intrinsic to N-LSD. To illustrate, a wilfully simplistic proxy occurs between a microphone and a loudspeaker. Up to a certain volume, someone sings into a microphone and it comes out of a loudspeaker. The show goes on. Until a critical threshold is reached. Loudspeaker then starts feeding back into microphone, which amplifies the signal even more, which feeds back even more . . .

The singer can exit stage left and a show of howling feedback will keep on *ad nauseam* until someone manually intervenes in the electrical circuit or the system itself breaks down. Now substitute this image for water cycling between states and Saharan sand circulating to the Amazon, and glimpse the succession of turtles all the way down from here to infinity. Feedback that just will not end howls on an empty stage, as proxy for incessant regime shifts between inclement and clement climates and N-LSD, themselves mere tips on the melting iceberg of “the autonomy of the forces that shaped” the world. Make it so, for a dour worldview of such a world as this.

Viva Ia (Upper Palaeolithic) Revolution!

In the realm of electrically amplified sound there are locatable boundaries between thresholds for avoiding, or inducing, feedback. At the scale of a highly dynamic planet, the relevant boundaries are not locatable. These are the World Turtle layers underpinning the “conditions of unknowability” that Clark refers to. Turns out that it’s turtles all the way down too, for the search for the cataclysm upstream of humanity. The same must have always gone for those lying in wait downstream. Notional boundaries may be reconstructed through evidence of the past, but cannot be guides to the future. And that is *before* bringing the complexity of biotic forces into the equation.

On Jupiter the Great Red Spot looks like a persistent pimple on the gas giant’s face. It is a storm system larger than earth, continuously raging for at least the last three centuries. The system is composed of a micro-world of self-reinforcing feedback loops (where micro = larger than Earth). Meaning the Great Red Spot is

perpetually self-perpetuating. That is, until it isn't anymore. The storm has come into and gone out of existence many a time. So clearly, it has thresholds just like the microphone and loudspeaker, but no discernible on/off switch.

Assume a butterfly equivalent exists on Jupiter. Assume we can locate, in time and space, this seemingly harmless butterfly. And more – we predict the *n*th wing fluttering that will cascade into a series of events culminating in the resurrection of the Great Red Spot. So what comes next? Would we then believe we have the will to clasp its wings shut at the decisive moment?

From little things, big things grow. From little things, big things growl. Just because they now growl at us does not mean we possess the capacity to sever the ties between little things and the big things they beget. N-LSD can deduce inexorably complex formulae for relating all things great and small. It reminds us that the act of clasping the butterfly wings may avert a Great Red Spot, but may then have repercussions of an unknown order of chaos. Or, it may not. Or, we may never know either way. Or, we may know one way or the other, but only after the fact. By which point we may as well be living in the eye of the Great Red Spot.

On Earth we need no make-believe butterflies (yet). But we need heed the fact that the complexity of N-LSD in abiotic forces – geological, physical, chemical – become even more heady when conjoined with biotic forces. Hence our World Turtle offers a metaphor not only for the inherent instability and complexity of the Earth System, but also for limits to our comprehension of same.

This planet has a habit of lurching between phase states that are full of surprises and utterly resistant to attempts to predict where, how and when the planet will oscillate with such volatility. Much like discovering that we missed (or caught) the boat on shutting the butterfly wings. What is known is that this planet is rife with historical examples of phase transitions. The normal is instability. The abnormal is stability. Making the abnormal . . . normal.

Such is the drama Clark's "human protagonists are caught up in." Not because it was *the* stage they walked on to. As he says: "it is in the most part not of their making." But because it was the *only* stage they could have ever walked on. Same for life-at-large. Then for them, now for us. Then, when we creatures were more vulnerable and would "build our houses on the earth" more feebly, that stage could never have been regarded as static or background. Its volatility could have only ever been the foreground. Living at the behest of such radical asymmetries presupposes that these dramas beget some deep-seated sensibility about changeability, consequence, and comprehension of same: sensibility to the three universal sighs.

By implication, rather than just saying we “build our houses on the earth” as per Fichte, our way of life, our life, and life itself rest atop an infinite array of World Turtles. Long before there were houses built upon earth, or even people who built houses, or even people, there was a World Turtle that flipped many a time. Or rather, there have only ever been worlds that flip, many a time. Meaning that it is not just that the “cataclysm [is] upstream of our humanity.” Rather, humanity is built upon the cataclysm. For Clark, this brings about a dour plot twist in the drama:

What if the current suspicion that humankind has turned the planet’s weather systems into a vast experiment has a supplement, the idea that drastic climatic shifts have been experimenting with human life, putting us through the cruellest trials, time and time again?⁴⁹

Given the paucity of fragments, and the inaccessibility of the coveted details beyond the “current suspicion,” the Dour asks us to cast an eye backward and inward as means for going forward. To when all the world was a stage, and we were literally just bit players. To see how the past may still inform the deep-seated who, who face off now against this unknowable future. That deep-seated who is not you, me, or even us. Rather, it is a vague apparition of *hominidae* lineage, for whom we are just the newest kid on the block.

Ancient ancestors poked about at the flesh of the World Turtle, but evidently did not flip it. Vice versa, the World Turtle has clearly been flipped before, by forces biotic, abiotic, internal, external, local, global, subterranean and/or cosmic. Some flips befell our ancient ancestors. Precipitously endangered by an entity they did *not* enrage, they still lived to tell the tale.

Given that our ancestors, in the most we-the-species sense, lived through conditions nothing like the abnormally stable Holocene climate, do we then retain some of the sensibilities our ancestors possessed that allowed them to live through past ruptures? Is there something in us attuned to the deep-seated sensibility of an ancestry pockmarked by unsolicited invitations from earth to get “caught up in” dramas and put “through the cruellest trials”? Something, in short, that could support our dour demeanour in the present tense? This progression of inquiry leaves an astounding question: to what do we owe our survival up to this point, but to those who came through prior ruptures? How do their ghosts linger in our shell? We may not want to exorcise these ghosts. Indeed, the Dour hints that we may need to resurrect them if we are to continue to play upon the stage.

⁴⁹ Clark, *Inhuman Nature*, 31.

At Home on the Range Shifts

Do I care if I survive this?
 Bury the dead where they're found.
 In a veil of great surprises,
 hold to my head till I drown.
 – Sufjan Stevens, *The Only Thing* (2015)⁵⁰

Until ten millennia ago, to be *homo sapien* was to be nomadic. Restless wanderers, ever since speciating 200 odd millennia ago, along with all forebears beforehand. Whether following annual seasons, seasons repeating with enough similarity to become climates, or climates oscillating too wildly for such a thing as a season to even be thought of, home was a moveable feast. Cultural expression, through story, song, myth & co. tells of relentless and unpredictable environmental change over the ages. That is, until instability gave way to stability. And our songs became about singing sheltered worldviews, no longer rhyming with the arhythmic universe.

Only since the most recent glacial period ended 11,700 years ago has our species – along with the bulk of the biosphere – enjoyed an utterly atypical period of climatic stability. Only then did “we build our houses on the earth,” with scant regard for the “radical asymmetries of residing on ‘a specific planet,’” subsequently mythologised as yielding steadfast foundations for domesticated dreams.

Sedentary life meant seeking ever deeper, stronger, and more steadfast foundations on a planet that offers and withdraws such without rhyme or reason. Steadfast in a world that is always anything but, even if the physical world seems to settle into sustained periods of stability. Why else do we drill deeper and deeper into bedrock, if not to affix taller and taller buildings more firmly? Since we began to believe that we had hung up our nomadic boots for good, our aim has been not just ‘to be’, but to be increasingly separated from the earth upon which our house is sited.

In times of turmoil turtles can retreat into their shell. They carry their home upon their back, because it is their back. The cataclysm is not to dwell on the earth – all life technically ‘dwells’ in whichever way it inhabits its lifeworld. The cataclysm is to build houses on the earth: to construct fables of stability where there is none. But where can one take this message home to? In search of solid foundations to rebuild ideas of home, how on earth can we now inhabit such shaky underpinnings? Footings that were always shaky even before we undermined whatever foundation they had, via our unique impact on this earth where we built our homes.

⁵⁰ Sufjan Stevens, “The Only Thing,” track 7 on *Carrie & Lowell* (Asthmatic Kitty, 2015).

Even those who dwell without a house upon the earth still find themselves having to relocate when the going gets tough. But relocate to where? Herein lies the take home message of what Clark means by becoming “‘true’ to . . . a radical undoing of the human capacity for collective action.” It is the folding-in of hominid evolution with the dynamism of Earth System processes. Home is, after all, on a home planet, which is a thoroughly “‘specific planet’, in ‘a specific universe.’”

So, to return to the question that ended the last scene: are there breadcrumb trails back to some lingering feet which faintly recall how to move about within range shifts of the earth? Because the Dour asks us to leave our home on the range and go in search of making a home on the range shifts. A utopian kind of dwelling in houses that can now only stand in ‘no-place’, the literal meaning of utopia. Any re-cognition of our ways immediately prior to becoming sedentary is far more distant than some faint memory that returns like a vague apparition to our conscious, or even sub-conscious.

However, the ghost in the shell is there somewhere. A sample of *homo sapiens* from 40 millennia ago, were he or she born today and raised like a contemporary human being, would meld seamlessly into whichever contemporary culture they were raised in. Thusly raised, they would be indistinguishable in appearance and cognitive functioning from us. Meaning that for at least the last 40 millennia Upper Palaeolithic humans were physiologically and psychologically indistinguishable from those alive today.⁵¹

For the first 30 of those millennia wild climates raged outside of our proverbial caves. We sang songlines, painted mythologies onto cave walls, adorned bodies with coveted items, and, arguably, experimented with domesticating our dreams as well as our bodies. One argument holds that *hominidae* agriculture was not invented after the Holocene epoch ended 11 millennia ago.⁵² (Pole position goes to ants, who invented agriculture 50 million years ago.⁵³)

However, another hypothesis posits that Upper Palaeolithic humans repeatedly attempted agriculture many millennia earlier, but were unable to achieve sufficient harvests because of inclement climates.⁵⁴ This argument is contentious

51 John Shea, “Homo Sapiens is as Homo Sapiens was: Behavioral Variability versus ‘Behavioral Modernity’ in Paleolithic Archaeology,” *Current Anthropology* 52, no. 1 (2011): 1–35.

52 Peter Richerson, Robert Boyd, and Robert Bettinger, “Was Agriculture Impossible During the Pleistocene but Mandatory During the Holocene? A Climate Change Hypothesis,” *American Antiquity* 66, no. 3 (2001): 387–411.

53 Raghavendra Gadagkar, “The True Origin of Agriculture: Credit goes to the Ants,” *Resonance* 5 (2000): 76–79.

54 Rowan Sage, “Was Low Atmospheric CO₂ During the Pleistocene a Limiting Factor for the Origin of Agriculture?” *Global Change Biology* 1 (1995): 93–106.

due to difficulties of obtaining incontrovertible physical evidence. Once again: the details have been lost to time. Only fragments remain. In any event, whether our ghosts of 40 millennia ago or only 11 millennia ago had domesticated dreams of sedentary life on the farm, their residue is still heavily present within us today.

Ghosts in our shell we generally call human nature. Ghosts from 40 millennia ago are much closer to the bone than those from 400 millennia ago, when *Homo erectus* had already mastered fire. The same applies going back 4,000 millennia ago, before *Australopithecus* had learned to use or control fire. The further back in time, the less we call our ghosts human nature and the more we call them animal instinct.

Here we start to share ghosts with our animal cousins, whether of Cenozoic (“New Animals”) such as elephants, or old reptiles of the dinosaur age, such as turtles. The further we stray from our evolutionary tree branch, the more and more closely we share our ghosts. After all, saying the Human evolved from the Animal is a circular statement: we have always been, and will always be up until we are no more, animals. A wolf in sheep’s clothing is a still a wolf, just as a human in clothing is still an animal. Of all the nursery rhymes we have sheltered ourselves with since time immemorial, the most dangerous is the one that sings of humans being separate, special, and above animals, or nature in general.

But this breadcrumb trail of diversions has still not answered our question. If the cataclysm has only ever been ever-imminent, and has been ever-so-occasionally-present at myriad transitional points of *hominidae* history, is there then some ineffable sixth sense of cosmic vicissitudes embedded in a psyche vastly predating Upper Palaeolithic humans? A ‘Dour’ that has always been the default demeanour? To better know our ghosts, the next chapter travels further upstream: to *hominidae* evolution in the Pleistocene, the epoch from 160 to 10 millennia ago; then to the Pliocene, the 300 millennia preceding the Pleistocene, when hominids first appeared.

The journey upstream progressively embeds hominid evolution deeper and deeper into Earth System processes, in terms of how abiotic ruptures induce biotic ruptures, and vice-versa. In Part II, the discussion moves on to one ‘moment’, one instance among many of past turtle flipping that occurred without hominid provocation or enticement, where “the autonomy of the forces that shaped and continue to shape us” sweeps our protagonists into “a drama”:

It is the moment when crucial life support systems pass through a critical threshold – the realignment of meshing tectonic plates, the irruption of a viral epidemic, the tipping of climate into a new regime – that the tolerance levels of an individual or collective body are most likely to be pushed or breached. As we are now learning, our own ancestors had to negotiate a great many of these transitional points.⁵⁵

55 Clark, *Inhuman Nature*, 251.

On the one turtle, the “moment” when “tolerance levels of an individual or collective body are . . . pushed or breached” *needs* to be felt by those groping about in the dark for a portal into the incomprehensible magnitude of pushes and breaches of life-at-large. On the other turtle, an “inquisitive humour” needs to be mindful of the fact that even feeling cannot fill the emptiness, because the bucket has no bottom.

The moment chosen to open the next chapter enriches forms of rupturing away from isolated events emanating from cosmic depths, such as an asteroid, and into protracted episodes emanating from deep within earth itself. The moment, though, is placed in geological time, roughly three million years before the present. But 3,000 millennia go by in a blip for a planet that has been around for millions of millennia. Getting at such timeframes and Earth System processes was only ever going to be ineffable.

While the central concern of the “moment” is lifeforms-at-large, the approach is through one among these great many *hominidae* “transitional points” when our ancestors negotiated such individual and collective passage “through a critical threshold.” In matters closer to home, this particular moment provides a proxy for our provocations and enticements toward the rupture unfolding now. Making it not “upstream of our humanity” but contemporaneous with the present tense. After all:

what if the event of our time turns out to be not so much the knowledge that human action is altering global climate, as the realisation that climate is responsive to our nudges only because it is far more precarious than we ever dared imagine?⁵⁶

Here, then, lies the key to the elusive cataclysm upstream. Here, there, and everywhere lies “the cataclysm that has always already occurred,” but there is no definitive source to the river, because the cataclysm is neither a single rupture, nor a rolling thunder of ruptures. Instead it is the precarity intrinsic to the planet, its climate and the tenure of all lifeforms at all times, making ruptures part and parcel of phase transitions between inclement and clement climates. So, the “event of our time” is really the confluence where sheltered fantasies of climatic stability meet a staggering knowledge of inhuman causes *coupled with* human causes of ruptures, from climates and ecosystems, to the long-term evolution of life on earth. In a nutshell, where the fantasy of stability meets the Dour’s embrace of perpetual volatility.

⁵⁶ Clark, *Inhuman Nature*, 31.

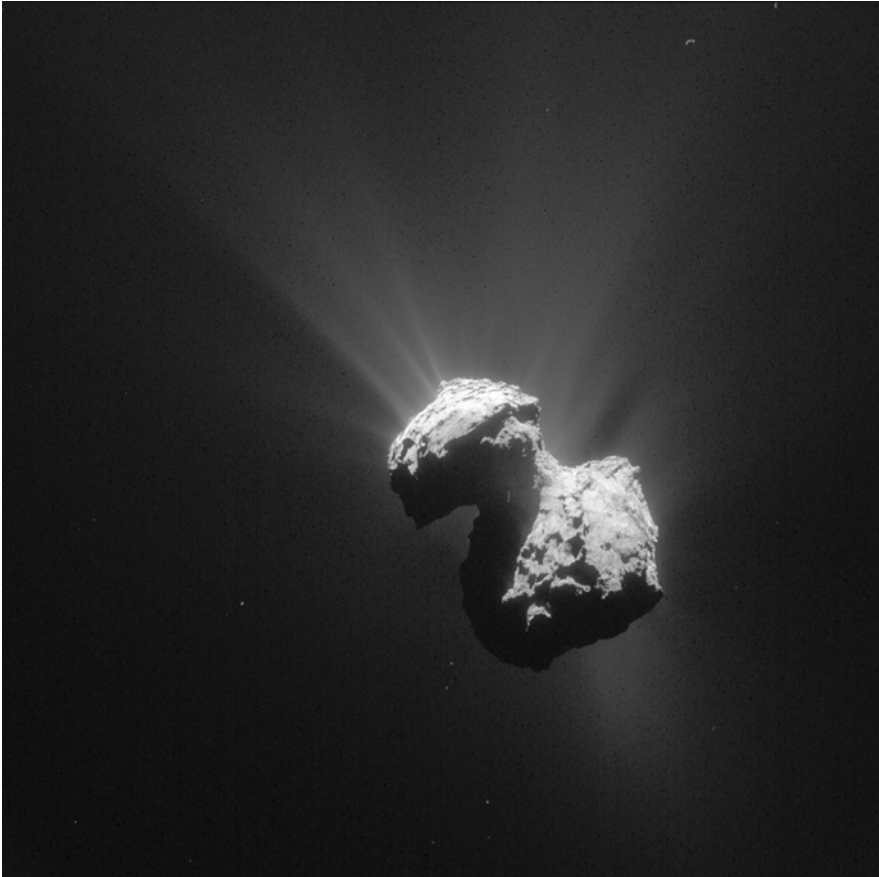


Fig. 3: European Space Agency, Comet 67P/Churyumov-Gerasimenko, 450,000,000 kilometres from the Sun, 7 July 2015.

II

Shift.Happen.Stance.

“ . . . when all of a sudden you look down . . . ”

In a nutshell:

LSD v N-LSD >

Pre-Panama v Panama >

Australopithecus-Panama-Mid-Pliocene-Warm-Period v

The-Twenty-First-and-Last-Century >

Biogenic v Abiogenic Geomorphology >

To Sever the Head v Black Flag Day >

The Perfect Storm (voluntary) v The Perfect Storm (conscription)



Three Blind Mice
Three Blind Mice

See how they run
See how they run
See how they run

Fig. 4: John W. Ivimey, *Complete Version of ye Three Blind Mice* (London: Frederick Warne & Co. Ltd, 1904).

Ghost in the Shell

When I was a boy, everything was right
 Everything was right.
 – The Beatles, *She Said, She Said* (1966)⁵⁷

I feel exquisite pleasure in dwelling on the recollections of childhood, before misfortune had tainted my mind and changed its bright visions of extensive usefulness into gloomy and narrow reflections upon self.
 – Mary Shelley, *Frankenstein* (1818)⁵⁸

When I was a boy my parents took me to the Australian Museum in Sydney. The details of the memory have been lost to time. Only fragments remain. It was around the time they said I should sing along to *Three Blind Mice* at school and when Gary Larson taught me to laugh at the universal sigh, on first seeing his ‘Stegosaurus Says . . .’ cartoon.

Inside the museum I stood before a heavily fragmented skeleton. In its vertical orientation it was much the same size as I. Unsurprising, given it was the petrified remains of a child that ceased to be when it was only a few years older than I was, standing there before it. Is this how the child comes face to face with mortality?

But whose mortality? For the skeleton seemed to hover in the room. An apparition encased in a coffin of glass, dramatically front lit, each bone in suspended animation against the jet-black velvet underpinning and the surrounding darkness. A ghost in the shell of an ever-so-delicate rib cage, each frond of that heart-enclosing palm pinned to the velvet. The shell is a girl who lived 3.2 million years ago. My strongest memory is her name: Lucy.

The name came from my world of here and now. The skeleton came from another world of then and there. An opaque world of the Pliocene, when hominids first appeared. In matters more at hand, I could not understand why she was called Lucy. My mother explained over and over: because the palaeontologists who discovered her were listening to The Beatles song *Lucy in the Sky with Diamonds* while they undertook the expedition. I knew the song off by heart as I was already an avid Beatles fan, something passed down by my mother’s (impeccable) musical tastes.

By my childlike/nonsensical reasoning, the only way she could be Lucy was if The Beatles were around in her lifetime, wherein she had been named by Beatlemania parents. A feedback loop emerged between mother and I. Her: “The Beatles

⁵⁷ The Beatles, “She Said, She Said,” track 7 on *Revolver* (Parlophone, 1966), LP.

⁵⁸ Shelley, *Frankenstein*, 55–56.

did not exist millions of years ago.” Me: “So how could she be called Lucy?” I simply could not compute The Beatles having something to do with ancient ancestors. When one is learning to sing *Three Blind Mice*, one is not fathoming the eternal golden braid between evolution and extinction.

My next line of reasoning: “Did John Lennon write the song about her?” No, my mother explained: “Lucy the song came out in 1967, Lucy the skeleton came out of earth in 1974.” This causality – that 1974 came after 1967 – came from my world. Trying to compute ancient hominids naming Lucy as ‘Lucy’ was unfathomable to childhood-me.

Similarly unfathomable is the subtext for *Lucy in the Sky with Diamonds*, which is at least as opaque as *Three Blind Mice*. This is why Lennon intones over and over “when I was a boy/everything was right” in *She Said, She Said*. Adults grapple with how phenomena always exceed limits to our comprehension, just as childhood-me could not fathom Lucy the song versus Lucy the skeleton.

Nonsensical reasoning has a place, though, in grappling with the incomprehensibility of phenomena as an adult. Such unreasonable reasoning does not take us back to childhood when “everything was right.” It does however remind us of our most recent ghost – the perceptual imprint of childhood progressively eroded away by adulthood.

Lennon wrote *She Said, She Said* about one of his first experiences with LSD. Peter Fonda, also on LSD at the California gathering, kept declaring to Lennon that he knew what it was like to be dead, having had a near fatal childhood accident with a self-inflicted gunshot. In response, Lennon paraphrased Fonda for the refrain of “She Said: ‘I know what’s it like to be dead,’” while proffering a retreat into his ghostly shell of childhood innocence: “When I was a boy, everything was right/Everything was right.” As an adult, Mary Shelley’s Victor Frankenstein laments about his own childhood, saying that “the companions of our childhood always possess a certain power over our minds which hardly any later friend can obtain.”⁵⁹ A century and a half later, Lennon’s song came forth from grappling with these tensions between innocence (childhood) and mortality (adulthood).

The same tensions play out in every lifetime, then for Lucy, now for us. Thus, making the Dour, which accepts this permanent state of unfathomable rupture and change, a constant companion throughout hominid evolution. The same tensions play out between being petrified and becoming petrified, then for Stegosaurus, now for us, and the Dour is the temporal portal into pre-historical times when other ruptures of life on earth unfolded. Though the Dour also takes on qualities of the Dire, now that the species undergoing both states of petrification is also witness to its own

59 Shelley, *Frankenstein*, 384.

demise. For those alive to the twenty-first-and-last century, the progression from child to adult is not just the shedding of childhood innocence for the weathered skin of adult mortality. It is the absurdity of coming of age in an age of mass extinction. The revelations impinge on everyone's life story – as if to acknowledge the present situation is to admit to being petrified about how great swathes of species – *homo sapiens* included – are becoming petrified.

At some point along an individual's life, these incomprehensible events cause a rupture without peer in the gravity of concern one brings to the burden. Dipesh Chakrabarty, one of those committed to embracing such an undertaking, likens attempts to comprehend this as being akin to falling:

With this collapsing of multiple chronologies – of species history and geological times into our very own lifetimes, within living memory – the human condition has changed . . . But the relatively recent collapsing of these differently scaled chronologies now stares us in the face creating an affect that I liken to the affect of falling.⁶⁰

Not only does the fall break the anthropocentric scale of time, space, and significance, there is also nothing to brace that fall, as it really is turtles all the way down, without end in sight or end itself.

On the way down, a child comes to learn not only of its own death, or of Lucy's death in her time, but of the collective petrification of mortal remains, subsumed into earth. But falling ever onwards, the adult extension of that child comes to conflate being mortal with being morbid. A morbid outlook is sensible in a non-sense universe: it is after all true that the first two universal sighs, of cosmic changeability and its consequences, offer cold comfort. But the third sigh, which comprises comprehension of this changeability and its consequences, can at least view the ever-present existential predicament with a mindset embracing the morbid the merrier.

Beauty within the bleak of one's life, or the life of a formative ancestor such as Lucy, reveals itself between the book ends of the general and the details, for between these two lie the alternating layers of comedy and tragedy. As Arthur Schopenhauer intoned in 1818, that “the life of every individual, viewed as a whole and in general, and when only its most significant features are emphasised, is really a tragedy; but gone through in detail it has the character of a comedy.”⁶¹ Had Schopenhauer been thinking of *Frankenstein*, published in the same year, he

⁶⁰ Dipesh Chakrabarty, “The Human Condition in the Anthropocene,” paper presented at The Tanner Lectures in Human Values, Yale University, 18–19 February 2015, 180–181.

⁶¹ Arthur Schopenhauer, *The World as Will and Idea*, translated by R. Haldane and J. Kemp (London: Routledge & Kegan Paul, 1907 [1818]), 183.

would have got an inkling of how much more vexing this becomes when the biological agency that he refers to becomes geological agency.

Wherein, the comedy and tragedy within the bleak of a single life become subsumed into the comedy and tragedy that is evolution itself. For Joseph Meeker, in *The Comedy of Survival*, this is the lesson learned when oscillating between individual tragedy and collective comedy:

Evolution is . . . a shameful, unscrupulous, opportunistic comedy, the object of which appears to be the proliferation and preservation of as many life forms as possible without regard for anyone's moral ideas. Successful participants in it are those who remain alive when circumstances change, not those who are best able to destroy competitors and enemies.⁶²

For Schopenhauer, tragedy lies in the whole, comedy in the details. For Meeker, comedy lies in the whole, tragedy in the self-flagellating tendency of details to recursively close ourselves off from the world in the pursuit of ever more (anthropocentric) detail.

In any eventuality, both beg the question: living during a “moment when crucial life support systems pass through a critical threshold” are we laughing with, or laughing at, the “unscrupulous, opportunistic comedy”? Better yet, could the comedy be laughing at us, even though it has no eye by which to behold us?

Give up the Ghost

Do I care if I despise this,
Nothing else matters, I know.
In a veil of great disguises,
how do I live with your ghost?
— Sufjan Stevens, *The Only Thing* (2015)

Where is the merriment in Lucy's story though? The leading theory is that at the age of 12 she fell out of a tree and died from injuries sustained. Not quite a picture postcard of species-level passage from tree-dwelling ape to bipedal hominid. More the awkward leaps and bounds of evolution, where many leaps lead to death. Her merriment is much the same as any life story viewed through Schopenhauer's lens, whether my comedic childhood misunderstanding of mortality and evolution, or Lennon's absurdist adult take on mortality, viewed through his

⁶² Joseph Meeker, *The Comedy of Survival: Studies in Literary Ecology* (New York: Scribner, 1974), 20.

safety net of childhood reminiscence. Lennon's murder by gunshot does not change his drug-fuelled song inspired by Fonda's childhood near-death encounter with a gun, just as Lucy's accidental death does not change her tenure upon the earth. Merriment is merriment and comedy is comedy, even though it ends one for all and all for none in tragedy.

Just as we sometimes pore over the fragments of a contemporary life lived, we pore over the fragments of Lucy's skeleton to piece together our evolution through a life lived. For Lucy presents a springboard for comprehending not only *homo* genus origins, but the evolutionary descent of all alive today from some who came before. She is a ghost in the contemporary shell, but one sufficiently far removed for any possible imagining of her *Australopithecus* lifeworld. Suffice to say, the details have been lost. All that remains is conjecture.

Lucy presents this springboard as she is one of the closest candidates for the holy grail of a hominid LUCA: the Last Universal Common Ancestor. Namely, the most recent common ancestor from which all subsequent *homo* species could conceivably be conceived. This portal opens out into one much wider still: when a *someone* becomes a *something* depending on how far back the tape is stretched. Lucy holds a singular importance for this evolutionary descent, akin to what the Rodentia living during the end of the age of dinosaurs held for the entirety of modern mammalian descent.

Falling somewhere indistinct between so-called human nature and animal instinct, Lucy evokes connections to the first LUCA of all. Arguably, all multi-cellular life, from yeast to yak, shares a common ancestor if you go back far enough. Meaning that every multi-celled organism alive today could share a common descent, albeit one hidden far, far, far upstream: the prime candidate might turn out to be a bacterium from 3.5 billion years ago, but there *is* a candidate.

In Charles Darwin's *Origin of Species*, the concept of LUCA gave rise to something akin to Hume's "inquisitive humour." Darwin's merriment lay in situating *hominidae* within a tapestry of life stretching back all the way to LUCA:

From the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.⁶³

⁶³ Charles Darwin, *On the Origin of Species by Means of Natural Selection, Or the Preservation of Favoured Races in the Struggle for Life* (London: J. Murray, 1859), 459.

Confirmation of the existence, let alone the behaviour, of plate tectonics did not occur until a century after Darwin wrote this. So, in addition to how the “planet has gone cycling on according to the fixed law of gravity,” we now accommodate forces much greater than gravity in earth’s workings. Though Darwin’s operative use of “cycling” holds true. When continents split at the seams, newly peripheral landmass gets subsumed back into the earth’s mantle, melting into magma, perhaps to be reborn as a new surface a handful of hundred million years later. Just as “endless forms most beautiful” emanate through geomorphology so too with biological evolution.

This brings us back to the tragicomedy of Lucy’s permineralised skeleton. Her bones, replaced by minerals, lying fossilised in earth for three million years, until being unearthed in 1974. She and her *Australopithecus* kin lived in the southern end of the Afar Triangle in Ethiopia. This area, known as the East African Rift, is both cradle of the earliest hominids and an area of seismic volcanic activity, due to magma upwelling just beneath the crust.

Over the millions of years that early hominids evolved in the East African Rift valley, they encountered sustained periods of volcanic and tectonic activity. After all, it was this activity that created the valley in the first place, then continued to reshape it through eruptions and continental rifting. From the disastrous effects of eruptions through to behavioural adaptations that advantageously harnessed changing valley contours for hunting and dwelling, volcanism arguably played major roles in contouring hominid evolution.

Nowadays Africa is tearing into two. At the southern end of the fault line where Lucy lay a rift began opening up in Kenya in March 2018.⁶⁴ The rift is constantly expanding – the earth’s surface rupturing as one continent once again becomes two: “cycling on according to the fixed law of gravity” (read: plate tectonics). Rupture is a permanent state. From those who fall out of a tree and break bones on an earth that subsequently cleaves in two, through to those whose hearts were broken, even if their bones were not, at the prospect that when the earth ruptures, it swallows whole multitudes of species, including one’s own. The heart-broken observer decries – this home has always been broken.

For every Lucy – of which less than a handful are known – there are countless unknown others. Her playmates, parents, friends, and foes still lie subsumed along the Eastern edge of the west side of the rift line, now poised to face the edge of the new continent breaking away, before being sub-ducted into earth’s

⁶⁴ Sarah Gibbens, “Why this Giant Crack Opened up in Kenya,” *National Geographic News*, 4 April 2018, accessed 22 February 2021, <https://www.nationalgeographic.com/news/2018/04/east-african-great-rift-valley-crack-sp-d>.

belly, their petrified skeletons melting into magma. In life, true to “endless forms most beautiful,” as volcanism manifestly influenced hominid evolution. In death, true to “endless forms most beautiful” as they return to the source of volcanism itself.

Is Africa already the Solomon pie torn asunder? Uneven halves rifting, one drifting eastwards to South America, the other westwards as Old Africa. But what is Africa? Spike Milligan hit the head on a nail in a *Goon Show* chase scene. On being told the person he seeks has fled there, Seagoon the buffoon declares: “So he’s in Africa, now we’ve got him cornered!”⁶⁵ Only with non-sense can stagnant assumptions about what belies stability or underlies earth be loosened and lost.

When Hume lamented how “dour philosophy has never improved the world,”⁶⁶ he had it the wrong way round. Dour philosophy was never about improving the world, because it is about acquiescing to how the world is impervious to notions of better or worse. There are no home improvement television shows for those attuned to a dour demeanour – there is only home, as habitable or inhabitable as it may be. In the long run, earth is impervious to our act of making a home, built as it is on Fichte’s elephant that rests on a tortoise. For Lucy’s kin this will become even more clear when they are underwater, once New Africa fully breaks apart and the inland volcanic depression of the East Africa Rift valley becomes a sea shore for the first time in many a million years.

In a nutshell: the Dour is the act of breathing the universal sigh. It is not only the comprehension of cosmic changeability and its consequences, but also the embrace of this worldview – no matter how dire the feeling of being petrified in the face of the unfolding rupture. This has telling repercussions for assessing any philosophy concerned with the improvement of the world. The song began with three blind mice: three Protestant bishops sentenced to death by Queen Mary Tudor. Of the three, bishops Ridley and Latimer accepted their fate with a dour demeanour, since they did not seek to improve their prospects for clemency.

Cranmer, by contrast, surrendered himself fully to the sense that his predicament was dire, and so, wanting to extend his life, he played the dice by opting to recant to his master Queen Mary. Even though she had made him bear witness to his two co-conspirators’ public execution, and it meant living with the petrifying prospect of being executed if she changed her mind at any moment. This is what it means to abandon the Dour, in favour of either the Dire or the Dice. As it

⁶⁵ Spike Milligan, director, *The Goon Show*, season 5, episode 3, “The Dreaded Batter Pudding Hurler. Of Bexhill-On-Sea,” aired British Broadcasting Corporation, 12 October 1954.

⁶⁶ Hume, “Of Commerce (1752),” 256.

turned out, Cranmer's moment of being burned alive in public followed a mere five months on the heels of his co-conspirators. The Dire or the Dice may appear to hold prospect for improving the world, but the Dour would counter that such prospects are not in keeping with the biophysical limits to life: Cranmer played dice with the social limits of his life, and gained a precarious, terror-filled reprieve. But his game did not change the biophysical limits to his life. He was as vulnerable to flame after his throw of the dice as he had been before.

On a knot in the thread much closer to home, a supervolcano eruption at Mount Toba on the Indonesian island of Sumatra, 70 millennia ago reduced the population of *homo sapiens* to less than a handful of thousands.⁶⁷ Meaning those alive today descend only from those who got through the evolutionary bottleneck formed by the planetary-scale climate change occasioned by that eruption (rinse and repeat for every other time too). A bottleneck is so named because the narrowing neck is shaped like fitness curves changing too rapidly from wide to thin, thus irretrievably breaching lifeforms' biophysical limits.

From the story of one alive today, to one who lived long ago, on a "planet [that] has gone cycling on according to the fixed law of gravity" all life follows the footsteps of the departed's petrified presence. Mike Davis conveys the feeling of the former in how "life, at any one time, may seem only an insignificant scrim on the face of the Earth" relative to the knowledge of the latter: "the total mass of all organisms that have ever lived has been estimated as 1,000 or even 10,000 times the mass of the Earth itself!"⁶⁸ How could any philosophy seek to improve upon a world such as this?

It is almost as if it is not that the planet teems with life, but rather is home for colossal banks of living organisms, who the earth erratically evicts and swallows whole, then regurgitates in order to begin again with a new world order, until disorder returns once more. The lives of those who stalk its surface may all end in tragedy, but the Earth System processes to which they are party to only ever seem to revel in comedy. As the rhyme goes: ashes to ashes, dust to water.

⁶⁷ Clive Oppenheimer, "Limited Global Change due to the Largest Known Quaternary Eruption, Toba ≈74kyr BP?", *Quaternary Science Reviews* 21 (2002): 1593–1609.

⁶⁸ Mike Davis, "Cosmic Dancers on History's Stage? The Permanent Revolution in the Earth Sciences," *New Left Review* 217 (1996): 63.

Lucy in the Sky with Diamonds

We have through sorrow and joy
gone hand in hand;
From our wanderings, let's now rest
in this quiet land.

– Richard Strauss, *Four Last Songs* (1948)⁶⁹

Just as entanglements bind hominid descent to Lucy, so too are we – at the species level – entangled in a rupture contemporaneous to her and her *Australopithecus* kin. The rupture catalysed over the same timeframe and latitude where Lucy and her kin lived, though thousands of kilometres away, in Panama. Except in this timeframe, there is no such thing as Panama. At best, a pre-Panama, because no land connects North and South America.

Pacific and Atlantic oceans flow back and forth from either side of separate American continents. Over millions of years a chain of submarine volcanoes progressively build land mass between the southern tip of North America and the northern tip of South America. The ocean between both continents becomes more and more shallow, fed by waves eroding away landmass newly formed by volcanoes, coupled with currents depositing sediment as they become increasingly unable to pass from one side of the Americas to the other. Volcano by volcano, stone by stone, handful by handful of sand, two continents connect via the Isthmus of Panama.

By connecting two continents the submarine volcano chain divides two oceans. After all, what is a land-bridge but a seawall? Making the parting of Pacific and Atlantic oceans a rupture for marine life. Mating, feeding, habitats, and migratory paths are profoundly changed by new physical barriers. Along with a host of other changes to the geology, biology, chemistry, and even the physics of their newly constituted local environs. Yet it is also a rupture of sorts for terrestrial life. In the mass migration from one continent to the other, the veritable boon of a *New World Coming* for some, and the death knell of an old world foreclosed for others.

Global ocean currents and movements change markedly, now that Pacific and Atlantic oceans are completely separated by the isthmus. Consequently, so too does heat and moisture conveyance around the hydrosphere and atmosphere, as oceans circulate the vast majority of heat around the planet. Oceans otherwise passing through the space between the Americas are now pushed poleward to the northern and southern limits of the Americas, along with the heat and moisture

⁶⁹ Richard Strauss, *Four Last Songs* (London: Boosey & Hawkes, 1948).

they convey. Winds follow the courses of the new currents, along with increased moisture content, courtesy of the warmer waters, eventually depositing their moisture content at high latitudes that are conducive to ice sheet formation, which, in turn, precipitate the first climatic effects: northern hemisphere glaciation.

The leading hypothesis argues that the Isthmus of Panama precipitated planetary climate change, including the Quaternary Ice Age, beginning with this glaciation ‘moment.’⁷⁰ Given there have only been half a dozen major ice ages throughout earth’s history, this onset was a watershed. Conversely, the relative infrequency of ice ages makes a hothouse state the rule, and ice ages the exception. Thus, for most of the greater mammalian history, our animal-cousin ancestors evolved in hotter and deeply volatile environments, while for most of specifically hominid history, our ancestors evolved in colder, though no less volatile, environments.

Repercussions from the post-Panama ice age onset continue to reverberate today. Significant not only for Lucy’s kin, living on the cusp of the rupture, and for her descendants over the next 2.8 million years, living through the relentless series of glacial and inter-glacial periods of the Pliocene-cum-Pleistocene.⁷¹ On this scale, the present tense descends directly from the same protracted series of interconnected glacial and interglacial periods precipitated by Panama. (Or rather the present tense *was* directly descended from this chain of events. Until that same present tense triggered a *New World Coming* in the middle of the twentieth century – anon to that in Act II).

Between the full formation of the Panama Isthmus and the first ice age following, there was a taste of things to come: the Mid-Pliocene Warm Period (MPWP). Owing to earth’s energy balance going into net positive, MPWP featured a marked increase in temperatures, carbon dioxide levels and climate threshold crossings, starting 100 millennia after Lucy died, and lasting for the next 300 millennia. Thus, the Panama Isthmus speaks to us now as it did to Lucy’s descendants: MPWP is posited to be the most recent analogue for the climate change anticipated toward the later end of the twenty-first-and-last century (all other things being unequal).

The silver lining to this rolling thunder building on the horizon is only that these past glimmers cannot be premonitions of futures. Nothing is set in stone – not even stones. Sooner or later eroded by water and wind, splintered by rifting continents, or subducted to melt back down into magma. Nothing is set, not only because we are in a “no-analogue” state, but because novel states have always been the norm, and it always will be turtles all the way down.

⁷⁰ Aaron O’Dea et al., “Formation of the Isthmus of Panama,” *Science Advances* 2, no. 8 (2016): 1–11.

⁷¹ William Calvin, *A Brain for All Seasons: Human Evolution and Abrupt Climate Change* (Chicago: University of Chicago Press, 2002), 405.

Life gets where it is going, falling out of a tree or tripping over its shoelaces one day at a time. But how long is a piece of string theory? The current rupture is just a single instance on an earth full of surprises for our ancestors, as the current unravelling of its range and change capacity reveals. The *Australopithecus*-Panama-Mid-Pliocene-Warm-Period analogue shows that “sudden threshold transitions in climate systems” are nothing new under the sun. No matter how dire the situation was for *Australopithecus*, alongside the multitudes of species driven to migrate, adapt, or perish as a result of the climatic change, the coming of this particular new world reveals just why a dour demeanour is in keeping with the vicissitudes of the cosmos.

Why on earth did we ever think future(s) could, should, or would be easy strolling? The halcyon Holocene continuing to roll out in front like a yellow brick road, on the sides of which, cookie cutter houses and domesticated dreams going toe to toe all the way to the Wizard’s castle. No less of a fantasy than an angel longing to sing her troubles away over the rainbow. A Lucy in the Sky with Diamonds “with the sun in her eyes”⁷² sings “somewhere over the rainbow/way up high.”⁷³ Or substitute a Judy: 17-year-old Judy Garland opened to the world in CinemaScope, followed one week later by the opening of World War II. As loners sing love songs to the atmosphere, the masses devise means to send missiles from the sky. Can you still hear her singing above the bullets flying across the skies? Can you still hear Holocene fantasies playing out in this twenty-first-and-last century? Can you still hear hominid realities playing out over ceaseless cycles between glacial and inter-glacial eras?

The universal sigh would be the largely same for *Australopithecus* as it was for the Stegosaurus. The world’s climates were changing for both, though *Australopithecus* would then sigh that the ice, rather than the mammals, was taking over. As for the third part, the being trying to comprehend this did so with a passionfruit-sized rather than a walnut-sized brain. Then for them, now for us. To picture entanglements that bind us to Lucy and her unfolding rupture, imagine watching the Panama Isthmus form, not over the five million years it took to complete closure, but over a handful of decades, knowing the world beforehand and afterward will be/are unrecognisable to one another. Like North and South America. Like childhood and adulthood. Like Lucy the skeleton and Lucy the song. Like innocence and mortality. Like sobriety and LSD.

72 The Beatles, “Lucy in the Sky with Diamonds,” track 3 on *Sgt. Pepper’s Lonely Hearts Club Band* (Parlophone, 1967), LP.

73 Victor Fleming, director, *The Wizard of Oz* (Metro-Goldwyn-Mayer, 1939), 35 mm.

No Society Is an Island

Even though earth is literally always rupturing somewhere or other in some way or other, only in extraordinary ‘moments’ are there ruptures of life on earth. The closure of Panama is a rupture orders of magnitude greater than such ‘everyday’ ruptures, but a rupture of life on earth is orders of magnitude greater than the closure of Panama. In the game of snakes and ladders, a moment can only really be considered extraordinary when all and sundry must pass through their respective bottlenecks of evolutionary adaptation, in ways that have never (or at the very least exceedingly rarely) been experienced by said all and sundry species before. True, every generation will experience the seasons in some way, shape, or form, and then experience a shift in seasons if they happen to live for a few decades or more. True, successive generations may come to experience wilder shifts, which, multiplied by millennia, may take on climatic changes. But only when climatic changes are simultaneously abrupt, global, pervasive, and novel does the passage come to resemble a rupture that constitutes one that life on earth is behest to.

With this in mind, Clark declares that we have “entered a situation which cries out for a degree of fidelity to events unfolding around us.”⁷⁴ Except there can be no fidelity to that which is unfolding around us if we do not extend the events back across their venerable historical trajectory. Having entered the situation of a turtle flipped onto its back is not even half of the story, and neither is the story of the turtle, the desert, or the human, because how all those came to be, and how they are co-constituted, stands front and centre in “events unfolding around us.”

How, then, can we have fidelity to the unfolding rupture when events are never really discrete in space or time, as per the myriad connections between the present tense and the Panama Isthmus formation, or even *Condensation Cube* and its ambient environment? The lack of discretion is especially vexing for the type of “events” that cry out for fidelity, because they are cataclysmic “moments” that render concrete the “idea of sudden threshold transitions in climate systems.” High fidelity to one’s surroundings may seem a concrete behavioural quality, achievable when directly experiencing the world in real-time. Not so for climate regime shifts, which occur on scales of time and space that make them difficult to render concrete: this is why Clark refers to the necessity of cataclysmic moments to push the “idea” of such change into perceivable reality. Fidelity to ‘everyday’ rupturing of earth, such as that occurring now along the East African Rift, appears to be attainable, but fidelity toward the unfolding rupture remains an opaque and enigmatic “idea,” until the sudden threshold is crossed.

⁷⁴ Clark, “Volatile Worlds, Vulnerable Bodies,” 33.

Later in the same article, “Volatile Worlds, Vulnerable Bodies: Confronting Abrupt Climate Change,” Clark probes a bridge between the concrete and the ideational: feeling. Confronting abrupt climate change through bodily sensitivity and flight-or-fight sensibility – albeit of the daily news variety. A grappling with the “inherent variability and volatility of our planet” through events that inculcate “a sensitivity toward the no-less inherent vulnerability and openness of human bodies – to each other and to the wider universe.”⁷⁵

This brings home the pressing relevance for such sensitivity. Recall the perennial “moment when crucial life support systems pass through a critical threshold.” Clark remarks how such moments pivot on pushing or breaching the “tolerance levels of an individual or collective body.”⁷⁶ Such tolerance levels can only be felt in the here-and-now on a daily basis, whether by an individual turtle dehydrating in a desert, or a turtle species dwindling in a sea. Exploring the social and biophysical limits to life, that is, their tolerance thresholds, offers a means for mediating between sensing the world, and sensitivity to its changeability and ensuing consequences. Including, of course, for breaching our tolerance thresholds, whether Lucy falling out of a tree or a species falling out of the tree of life.

Bodily vulnerability to earthly volatility extends from the intimate and deeply personal, to the genuinely atemporal and universal. It is where we go to gamble every day, in how we continually probe the biophysical limits within which we can live. It is also where we come into play with proximal and distal forces, not only running across space and time in the present, but in myriad ways that extend back into the deep past. And as with much of this stage where we come to do our gambling, the set-pieces have violent origins in the form of direct portals into earth’s inherent volatility: volcanoes.

Floating beneath earth’s mantle lie vast repositories of magma, stationary beneath the tectonic plates sliding across them. Those magma repositories are much hotter than the surrounding mantle, containing enough heat to penetrate and rupture earth’s surface. And, over geological timespans, the ‘moments’ when they rupture earth’s surface issue forth colossal eruptions that create landmass, leaving behind streaked snail trails across the surface as they pass over the immobile repository. Hold out your fist as the earth core and your knuckles become protruding magma deposits. Your other hand slides over this earth, moving away along the knuckle ridge. The top hand is a tectonic plate. As it moves across the fist, some knuckles will rupture through the hand, leaving behind volcanic islands now attached to the tectonic plate.

⁷⁵ Clark, “Volatile Worlds, Vulnerable Bodies,” 36.

⁷⁶ Clark, *Inhuman Nature*, 251.

The violent origins of such landmass are owed to forces that outstrip even the magnitude of tectonic plates: hotspots, or ‘large igneous provinces’ in technical parlance. The Society Islands is one such place. Or rather, Society Hotspot under the Pacific Ocean is one such place. The hotspot, sitting stationary half way between Australia and Panama, has created a string of islands over the last five million years, each the remains of the day when magma punctured the continental crust passing overhead.

At the eastern end of Society lies Tahiti: a relatively new kid on the block, created by the hotspot only 250 millennia ago. Society is not unlike the volcanoes that created Panama, except that after the continental plate has finished passing over a hotspot, new landmasses like Tahiti will get swallowed up by the ocean. Whereas the volcanoes that created Panama will keep erupting along the continental plate boundary, because they literally always rub one another up the wrong way. The thriving source of friction, fractures and fissures makes for an ever-dependable source of fire and fury bursting through the lithosphere. Which means that for those who dwell upon the surface, whether human, animal, mineral, or mountain, it can only ever be ashes to ashes, dust to water.

As a volcanic island, Tahiti is composed of precipitous mountain slopes that drop straight into deep ocean. Although no continental shelf abuts the slopes, coral extend outward, creating shallow lagoons along the island’s southern edge. For the first few hundred metres the lagoon is just a few metres deep. Then, at the point that the coral reef stops, the ocean depth suddenly plunges, creating a great discrepancy between the lagoon depth above the reef and the ocean depth just beyond the reef edge.

Along this southern edge lies a surf break named Teahupo’o. The combination of coral, ocean depth, angle of descent and an excruciatingly complex series of other factors mean that it has an extraordinarily forceful wave system. The physics are of course the same as wave systems across any planet with landmasses and ocean. Such volatile processes are genuinely atemporal and universal, at least for the time since planets and water came online. But the physical intensity here is arguably unique on earth.

In English, *Teahupo’o* means “to sever the head” or “place of skulls.” The potent symbol of bodily vulnerability to earthly volatility was evidently not lost on indigenous Tahitian culture (though the same cannot be said for legacy incurred by Cook, colonialism & co., leaving severed heads and places piled high with skulls here, there, and everywhere).

The force behind the volatility is thousands of kilometres in the making, comprising wave energy that passes uninterrupted across the oceans, dissipating onto shorelines the world over through broken waves. Ironically, it is coral’s exoskeleton cityscape just beneath the sea surface that determines a wavebreak’s placement, as

well as accentuating wave intensity. At Teahupo'o the wave energy is composed of water being pulled from the deeper ocean and instantaneously dumped onto the reef, lying only half a metre beneath sea level in low tide. In their effort to grow as close as possible to the sea surface, coral effectively make a vertical wall in the ocean.

As the reef is impassable, all incoming water must suddenly rise up out of the ocean, only to end as abruptly as it rose, crashing down directly onto the reef edge of the lagoon. The wave depth is staggering – metres thick, when even a few feet is already considered substantial. It resembles a sheer vertical wall of water rising up out of nowhere (wave energy pulsing through the deep ocean), then in the space of a few seconds, collapsing in on itself. A tsunami-like wall making landfall in the exact same spot, over and over, each and every day.

At play here are a range of limits to coral's tolerance thresholds, including wave intensity pounding down from above, solar intensity in the sea, and water temperature. The stage makes a poignant play for witnessing coral's bodily vulnerability to earthly volatility. And an eminently suitable stage for what Clark means about "confronting abrupt climate change."

Lower Your Eyelids to Die with the Sun

Who am I without you, by my side?

– George Harrison, "What Is Life?" (1970)⁷⁷

"We're not going to make it," he explained how the end will come

You and me were never meant to be part of the future.

– The Flaming Lips, "All We Have Is Now" (2002)⁷⁸

Teahupo'o is also formed, inadvertently, by another of coral's tolerance thresholds: salinity. A reef stretches the entire length of south-facing Tahiti, save for where abundant tropical rain cascades down the steep volcano sides, creating rivets that funnel channels of freshwater to the ocean. Because of these thin strips of coral-less lagoon, no waves form in the protrusions where these channels funnel out, replacing the turquoise lagoons and white surf spray with the dark blue of deep water. While able to tolerate massive walls of water crashing down no more

⁷⁷ George Harrison, "What Is Life?", track 5 on *All Things Must Pass* (Apple, 1970), LP.

⁷⁸ The Flaming Lips, "All We Have Is Now," track 10 on *Yoshimi Battles The Pink Robots* (Warner Bros., 2002), LP.

than half a metre above their bodies, coral cannot grow along these channels, as they cannot tolerate low salinity water.

Limits to life are nonsensical, just like life itself. It seems unreasonable that a lifeform would suffer less from making its home directly beneath a powder keg of explosive wave activity, than in a slow-moving stream of not-quite-salty-enough water. There is no rhyme or reason as to why lifeforms have seemingly expansive tolerance thresholds for some limits – say the physics of ecosystems in which they exist – and such constricted threshold for other limits – say the chemistry of ecosystems in which they exist.

Teahupo'o is partly formed by one of these rivets, which also provides surfers with access to the massive waves by boating out along the channel. Professional surfers who want to submit their bodies to such volatility are drawn by this particular combination of optimal conditions, at what they perceive to be optimal times. The conflagration of extreme bodily vulnerability with planetary volatility comes to a head here by way of convection currents, upwelling from Antarctica, travelling up the West coast of South America. As they come to where South and North America meet at the Panama Isthmus, they are pushed hard West by a Northern barrier, thanks to the equator, and an Eastern barrier, thanks to Panama being and thus no longer being a thoroughfare. These currents coalesce into a weather system that pervades much of the Pacific. On the opposite side of the Panama Isthmus it is a mirror image, with Panama again catalyst for the corresponding Atlantic weather system.

The Society Islands bear the brunt of such storm systems, as the first obstacles in thousands of kilometres of storm gestation. One such storm had particular repercussions for Teahupo'o when, on 27 August 2011, the storm swell became so perilous the French navy declared a Black Flag Day (their colonial presence still unsubtly looms thereabouts). The declaration made it illegal to enter the sea, whether as human body or human body in boat. The aim was to prevent the surfing competition that had recently arrived for the storm-accentuated waves. For the surfers, of course, a higher probability of such storm systems at that time of year meant the contestants actually planned to enter this wave system precisely at the moment when it was likely to become extra-extraordinary.

Looking down upon this melee is a surreal sight: the surfers who defied the ban and entered the waters, along with their support boats. The boats form a small traffic jam as they delicately manoeuvre along the channel to beyond the lagoon, depositing volunteers who choose to subsume their bodily vulnerability into this here-and-now of earthly volatility. Out beyond the breaking point they are ridden into the wave barrel by jet ski riders, who then accelerate to get back to the fresh-water channel before the barrel closes over them. Surfers let go of the jet ski and then attempt the same, now powered only by the wave.

Those that fell that day were dumped onto the reef, pummelled into the lagoon, and smashed from forces intolerable for us mere mortals. One needs to be able to withstand being held underwater for 50 seconds or more in the torment. Unable not only to take in oxygen, but also having such force on one's chest that any existing oxygen is pressured out. No safety stance can be held. One can only try to be bounced around within the aquatic inferno, without drowning, getting concussed, or sliced on the coral. For professional surfer and environmental activist Kelly Slater, one of those who surfed that day:

Witnessing this was a draining feeling, being terrified for other people's lives all day long, it's life or death. Letting go of that rope one time can change your life and not many people will ever experience that in their life.⁷⁹

An understatement if there ever was one, given those who went in pit their bodies against extreme surf conditions professionally, day in day out. Though what Slater was privy to on that Black Flag Day was in the order of one-in-a-million: the precious few who have the capital, skill, determination, aptitude, and fearlessness to survive such a maelstrom. The remainder would perish even at the thought of being near the wave system, let alone the terror of being deprived of oxygen for a minute underwater, pressed between coral reef and thunderous wave crashing down from above.

Slater's one-in-a-million mindset and embrace of being petrified is palpably captured in footage shot by Chris Bryan. Shooting at 1,000 frames per second, already vulnerable bodies become stretched and contorted beyond limits of what seems possible. The terror plays out in excruciating slow-motion when watching this back in 'real time', of 25 frames per second. Six seconds of a breakdance with death plays back as a four-minute ballet.

Human figures are dwarfed by the enormity and ferocity, sliding down the wave face, desperately trying not to buckle at the forces pushing the surfboard one way or another as it slides down a near vertical surface. No sooner has the surfboard created ripples, than the ripples rise up the waveface, towering overhead, forming a spiral that becomes the wave lip crashing into the water surface just above the razor-sharp coral. The wave lip crashes with the iridescent light of exploding foamy water in the tropical sun, whereas the wave's thickness makes the inside of the barrel so dark that surfers seem to pass from day to night when they enter it.

⁷⁹ Kelly Slater, quoted in Chris Bryan, *Biggest Teahupoo Ever*, 27 August 2011, accessed 18 December 2015, <https://vimeo.com/35328567>.

Time stands still inside a life-or-death predicament moving so rapidly that the surfboard ripple appears to defy the spacetime continuum. If the surfers make it down the waveface, they disappear into the void that is the wave barrel, upwards of five times their height. If they make it through to the other side, they slide smoothly off the board into the wave-less freshwater corridor, mere metres away thanks to the abrupt change in salinity of the channel. If they falter, they are swallowed whole by the monster, to be spat out upwards of a minute later hundreds of metres down in the shallow lagoon. Or, on other days, to not be. Five surfers have died at Teahupo'o, though ironically none on Black Flag Day.

Bryan's excruciatingly slow-motion footage is set to the song *Lower Your Eyelids to Die with the Sun*, by French electronic musician M83.⁸⁰ The song is a bombastic *tour de force* of shimmering choir and heavy-laden keyboard chords falling somewhere between a slow-paced funeral march and watching the last sunset of your life fade before your eyes. Sound and vision marry in perfect harmony: an invitation to consider volatility and vulnerability in, of, and to life and the universe.

Coral are not visible in the video, though their wave-accentuating presence stamps every frame. The universe is also not visible as such, though the gravitational forces working galaxy M83, 15 million light years away, are the same that work the wave system. Bodies – whether human or planetary – imbibe these invisible forces and ultimately acquiesce to them, even if the apparent plasticity of the human form gives the impression that it may dance at will, when it is actually being puppeteered by forces it feigns to see, the same as those it feigns to understand. Nowhere is this more the case than when “confronting abrupt climate change” and at no time is this more the case than now.

ENSO on ENSO forth

The whole series of my life appeared to me as a dream; I sometimes doubted if indeed it were all true, for it never presented itself to my mind with the force of reality.

– Mary Shelley, *Frankenstein* (1818)⁸¹

Speeding up the closure of Panama Isthmus renders a rupture unfolding over the duration of a human lifetime. Rendered here into comic relief like a sped-up Benny Hill chase scene, the farcical speed is not actually farfetched. Greenland

⁸⁰ Anthony Gonzalez, “Lower Your Eyelids to Die with the Sun,” track 15 on *Before the Dawn Heals Us* (Gooom, 2005), LP.

⁸¹ Shelley, *Frankenstein*, 322.

ice cores attest to numerable past changes in the order of 10°C over periods of decades.

Slowing down Teahupo'o on Black Flag Day renders palpable the biophysical limits to a human life, closing in over the duration of a moment. Like watching Panama form as a metaphor for witnessing abrupt climate change, Bryan's footage offers a metaphor for human tolerance thresholds against climatic forces.

In a technical sense, Teahupo'o's surfers have comparable limits to life as you or I. Like our dehydrating turtle, individual humans have negligible plasticity for tolerating less oxygen, more concussion, or sharper coral cuts to their flesh (with the exception of the demands of local adaptations, such as high-altitude Tibetan and Peruvian peoples' ability to live with less oxygen in their blood than sea-level attuned peoples). Blunt force trauma is blunt force trauma.

In an affective sense, the existential challenge thrown up by Teahupo'o on Black Flag Day serves up a metaphor for the bottleneck facing *homo sapiens*. The proportion who could potentially make it through the rupture is akin to the proportion of those who can already surf Teahupo'o on Black Flag Day: 'Challenges to Present You' are a subset of 'Challenges to Present Us', which become a subset of 'Challenges to Future Us' (including whether there will be a Future Us at all). This metaphor falls down though when considering that volunteering to submit one's vulnerability to earth's volatility was represented at Teahupo'o by thoroughly unrepresentative survivalists of the fittest. And if this is the one-in-a-million *homo sapiens* who could pass through the narrow bottleneck, it is because the remainder are conscripts, not volunteers, to the maelstrom.

Once again, distal and proximal effects still flowing from the Panama Isthmus manage to highlight this discrepancy between volunteers versus conscripts for confronting abrupt climate change. While one weather system was creating the storm that resulted in Black Flag Day on the Pacific side of the isthmus, on the Atlantic side Hurricane Irene had also been building up for the week prior. And like the storm system that produced Black Flag Day, Hurricane Irene also owed its origin to the upwelling of ocean currents from the Antarctic. Though on the Atlantic side convection currents push down the west coast of North Africa, where the equator pushes them westwards at the point of Panama. Blocked by the isthmus, the warm waters run northwards along the east coast of North America, bringing the gulf stream to Europe.

Hurricane Irene made landfall on the United States at the exact moment the surfers were jumping into Teahupo'o. Touching down in North Carolina, Irene continued inland, only returning to sea at the far northeast coast of Canada. It left behind a trail of destruction, including 49 direct deaths. While North Carolinians flee water whipped up from ocean onto land, surfers voluntarily leave land to enter the Black Flag waters of Teahupo'o.

One decisive “moment” in time. Two irreconcilable encounters with mid-oceanic storm systems on opposite sides of Panama. As the one embraces for impact, leaning in to the maelstrom, the other braces for impact. Polar icecap differences aside, both also connect to the formation of the Panama Isthmus in another way, too tangled up in blue to be true: storm systems on both sides of Panama are heavily influenced by the El Niño Southern Oscillation (ENSO). Enso on and so forth: ENSO is arguably a phenomenon created by the Atlantic and Pacific oceans being cut in two by the Panama Isthmus. Making the decisive moment of voluntary near death at Teahupo’o on Black Flag Day inter-fold with the involuntary moment of multiple deaths carried across the continental US by Hurricane Irene, and connecting both with the geological moment of mass death manifested by the volcanic activity that brought the Panama Isthmus into being in the first place. A moment “when crucial life support systems pass through a critical threshold – the realignment of meshing tectonic plates, the irruption of a viral epidemic, the tipping of climate into a new regime . . .”⁸²

These are the confounding stage directions of the present tense and the fidelity it requires to extend presently unfolding events back across their venerable historical trajectory. Who thrives and who dies in daily life or in the midst of a planetary scale rupture has no rhyme or reason. For some, a boon. For others, a curtain call. Rinse and repeat for life at all scales and forms. The dour demeanour that sings the universal sigh does so with an added despondency in the present tense, recognising how we are all ensnared in Black Flag Days now: “the future” as William Gibson remarked, “is already here. It’s just not very evenly distributed.”⁸³ But the real lack of ‘even distribution’ lies in our recognition that *that* future is here.

This is how the million to one face the rupture of abrupt climate change. Whereas, for the other 999,999, when colossal forces come into our lives, they send us scurrying away like the *Three Blind Mice*. Legions of support people are obliged to rescue extreme sportspersons, or to recover their corpses when they do not make it through the barrel. Likewise with hurricane victims. But both analogues break down in the dour acknowledgement that there is no one or nothing coming to rescue humanity.

Not that there aren’t telling inequalities in how the million to one come to face abrupt climate change, because of the uneven distribution of the future. Teahupo’o’s barrel-as-bottleneck metaphor does not revel in heroic (white, European)

⁸² Clark, *Inhuman Nature*, 251.

⁸³ William Gibson, interview with Neal Conan, *NPR Talk of the Nation*, 30 November 1999, <https://www.npr.org/programs/talk-of-the-nation/1999/11/30/12966633/>.

men valiantly navigating the maelstrom to find safe passage on the far side. A species facing an evolutionary bottleneck is a collective failure for the 99% whose tolerance thresholds cannot withstand the constricted conditions of the wave barrel. Nor does Irene's vertical hurricane funnel-as-bottleneck metaphor endorse a myopic business as usual attitude, right up to the point of buttressing the windows to withstand the approaching hurricane. (The unrepentant idiocracy of business as usual will be burned at the stake in Act II).

When house and inhabitant alike are sucked into a hurricane, the bottleneck is equally careless of those who ride it out in a concussed Joseph-and-the-technicolour-dreamcoat state, singing their troubles away over the rainbow, and those who ride in full awareness of the catastrophe into which they have fallen. So what do we gain from no longer conflating the world with our worldviews of it? What life-affirming quality could possibly be etched into the layers of paint? The Dour demands we recognise the fundamental volatility of the cosmos, and the vulnerability of life-at-large to those vicissitudes. But what sort of affirmation is it, to bring the "inherent variability and volatility of our planet" into a "sensitivity toward the no-less inherent vulnerability and openness of human bodies – to each other and to the wider universe"?⁸⁴ To which the improv comic can only respond: 'Yes, and . . .?' to see what more the wider universe has in store for becoming "true" to conditions and processes that threaten a radical undoing of the human capacity for collective action."⁸⁵

We can barely speculate about how Lucy and her kin grappled with their vulnerability to planetary volatility, though we can suspect that they lived with a truth toward "conditions and processes" for their radical undoing that is as lost to us as their extinction is to the history of life on earth. Whereas, we can more than faintly recall the ghosts in our shell of our *homo sapien* ancestors living during the Mount Toba eruption, with their songs, stories and myths coalescing in such acts as the ritualised burial of their kin. Whether *Australopithecus* or Upper Palaeolithic *homo sapiens*, we retain a great corpus of their biophysical limits, just as we face the same cosmic vicissitudes that they lived at the behest of.

Here the Dour rears its head once again – reminding us of our venerable lineage, punctured by insufferable vulnerability, played out subject to planetary volatility. Ashes to ashes, dust to water. Such is life. Such is now (with the bitter twist that the venerable lineage is ending with us endlings, having exposed our vulnerability to suffering at the hands of the *human-enhanced* volatility of the planet.)

⁸⁴ Clark, "Volatile Worlds, Vulnerable Bodies," 36.

⁸⁵ Clark, "Volatile Worlds, Vulnerable Bodies," 31.

To attune a sensitivity toward that dour demeanour we need take leave of earth and go back to the formation of the planet itself, to do away with any and all notions of predictability and periodicity. The stream of water cascading down the Tahitian mountainside may appear to end as it empties into the ocean, but the cataclysm continues upstream and down. Giving and taking like a moon waxing and waning, a tide ebbing and flowing, or the unannounced arrival of an unlikely companion:

“ . . . when all of a sudden you look down . . . ”



Fig. 5: Teahupo'o, Black Flag Day, Tahiti, 27 August 2011. Photograph by Ted Grambeau.

III

Blunt.Force.Trauma.

“ . . . and you see a tortoise, it's crawling toward you . . . ”

In a walnutshell:

J002E3 >

earThia >

Once in a Blue Moons >

About “About the Issue of the Astronomical Theory of Ice Ages” >

melarThelia >

Dour Troubadour: Woe v Zoe

Life (un)Expectancy

Prejudices and egoism . . . have placed barriers around each of us which constrict our view. If they are removed, if we resolve to leave behind the narrow conceptions of space and time which bourgeois life offers us, and no longer to view the world from the base, self-centered perspective, which sees advantages here, disadvantages there for us or our species, but rather to admit the facts in their naked truth, then the cosmos reveals to us an image of unspeakable grandeur.

– Eduard Suess, cited in Deborah Coen, “Big Is a Thing of the Past” (2016)⁸⁶

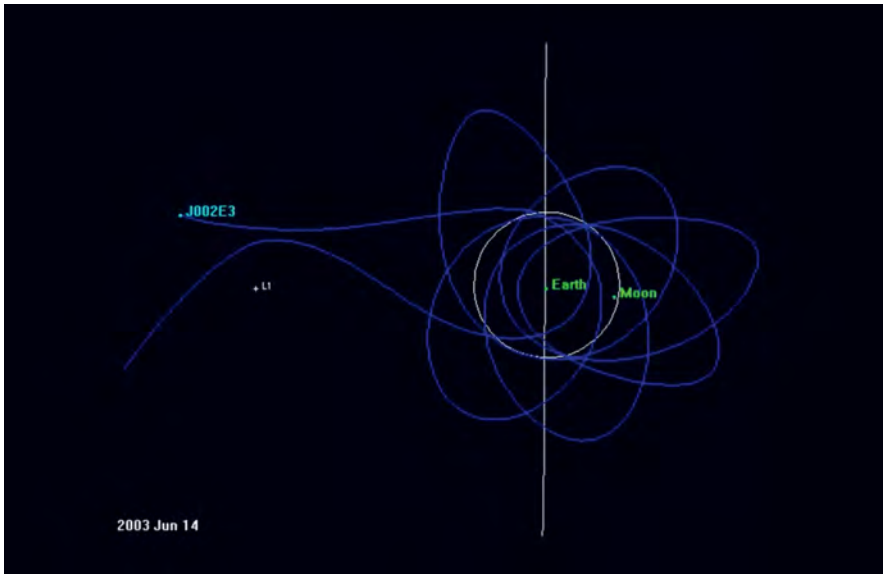


Fig. 6: Doing the rounds: J002E3, 14 June 2003.
Computer simulation by Jet Propulsion Laboratory, NASA, 2003.

Life takes such extraordinary twists and turns that the prefix ‘extra-’ fades away over the eons. During which, extraordinary becomes plain old –ordinary. Trace a path of life’s twists and turns and they resemble a sunflower stem capped by radiating petals. At least when viewed as a still frame from the vantage of a computer animation. The eye of the beholder here is a machine.

The computer animation starts innocuously enough: a yellow dot for a star, surrounded by a radiating series of emanating circles, like pond ripples after a

⁸⁶ Eduard Suess, translation cited in Deborah Coen, “Big Is a Thing of the Past: Climate Change and Methodology in the History of Ideas,” *Journal of the History of Ideas* 77, no. 2 (2016): 319–320.

stone has gone plonk. So far the location could be any of the billions of billions of solar systems: gaseous spheres powered by thermonuclear fusion reactions, orbited by captive rocky and/or gaseous planets.

At this point in the animation, the emanating circles take a more familiar form: the solar system is ours, and the object of its vision is the merry go round of our planet and its sole natural satellite – the moon. The animation’s perspective looks down on our solar system from high above earth – start at the Arctic and go due Up for a distance equivalent distance to that between earth and our sun.

The ordinary twists and turns become extraordinary when an object enters at screen left. An emanating ripple, J002E3, is tracing a radically different path from the obedient series of emanating circles that make up our solar system: it is skirting a wayward path around the sun.

On its current path J002E3 is captive to heliocentric orbit, meaning it will bypass earth and stay subservient to its master. But J002E3 is on a trajectory towards Lagrange Point One, the point where a gravitational truce exists between exactly equal pulls toward earth or the sun. As it passes the point the object turns dramatically, because its existing trajectory and velocity means it cannot be party to this truce. It appears to bend around Lagrange, changing course by a full 90 degrees as it passes through a phase transition of gravitational forces. Then heliocentric, now geocentric. Then ‘captive to the sun’, now ‘captive to earth.’

Once on the earth-side of this phase transition, J002E3 picks up speed, as Earth’s gravitational pull grows ever stronger, followed by additional lure from the moon’s gravity. J002E3 is drawn toward earth on a close slingshot trajectory – bringing it even closer to earth’s surface than the moon. Then, having orbited only one hemisphere, it is as if J002E3 is repulsed by earth itself and slungshot back into space to nearly the same distance as Lagrange Point One.

So goes the first month of twists and turns, after which the trajectory only gets more convoluted and contorted. At the zenith J002E3 comes to a crawl, its escape velocity overpowered by earth’s pull. Only to be lured back in and spat back out, not once, but six times. Each eccentric orbit traces another sunflower petal trajectory, with each petal cast by a new orbital trajectory around earth. By the time its pathway has painted six of these petals, the trace of all twists and turns conjures up a complete sunflower.

The object is first noticed by an amateur astronomer Bill Yeung on 3 September 2002. Yeung promptly alerts professional astronomers, who are as confounded as he. Their initial interpretation places J002E3 as an asteroid. So far nothing new here under the sun – asteroids come and go all hours of the day. And, when they are joined by unpredictable new arrivals, asteroids discount baseless ideas of ‘if’ and ‘when’ rather than “whenever”: meaning whenever that “six-mile-wide asteroid hits your planet with the force of over a billion nuclear

bombs.”⁸⁷ That our planetary borders can be secured by mapping every near-earth object is mere fable in a cosmos where any of those objects may well be something new under the sun.

However, during our tenure on earth, it has only had one sizeable captive object: the moon. If it has captured a new asteroid, then this *is* something new under the sun. This initial interpretation of J002E3 was however confounded by how orbital perturbations of earth and the moon ejected all known geocentric objects eons ago. While the solar system’s formation saw proto-planets trap innumerable proto-satellites, they were all long since progressively shaken off by earth’s orbital perturbations. This makes the arrival of a new geocentric object something that does not happen once-in-a-blue moon. It is something that happens only a-handful-of-times-in-a-solar system, and a solar system’s lifespan is counted in billions, not millions, of years. Either the strata by-laws of expectations about predictability and periodicity need to be rewritten, or J002E3 is an asteroid from another solar system. Yet that is also something that only happens a-handful -of-times-in-a-solar system.

The surprise visit conjures up those unknown unknowns: events that can never be counted or countered. A reality where some cosmic progeny make for yet another terminal location for the “cataclysm upstream,” begetting a future securely determined by events that have already transpired. A future where what lies in wait has already been set in motion by the stars innumerable years ago. When the Stegosaurus cottoned on to Chicxulub’s imminent impact, he was only catching on to the tail end of a process whose most immediate path had been 160 million years in the making. Chicxulub had travelled across the cosmos all that time before terminating at/on/in earth. And before that journey, there were all the processes that led to the collision of two objects, which created Chicxulub and ejected it in the trajectory that eventuated in its earthly termination.

As with the abiotic cosmos, so too with the biotic which hitches a ride aboard it. Chicxulub is thought to have been created from a collision between its parent body and another at about the same time that many species of dinosaurs first appeared on earth, around 225 million years ago during the Late Triassic epoch. Meaning that the limited tenure of non-avian dinosaurs was already written in the stars, just as they were starting out.⁸⁸ In the same way Chicxulub cleared out dinosaurs for mammalian ascendancy, the Triassic-Jurassic Extinction Event had

⁸⁷ Brusatte, “Asteroid Killed Dinosaurs.”

⁸⁸ Amir Siraj and Abraham Loeb, “Breakup of a Long-Period Comet as the Origin of the Dinosaur Extinction,” *Scientific Reports* 2 (2021): 3803.

previously cleared out the then dominant clade of archosauromorphs (known as “ruling lizard forms”), paving the way for the period of dinosaur dominance over the 140 million years between. Like mammals meekly living alongside dinosaurs for 150 million years before their ascendancy to the throne, dinosaurs lived alongside archosauromorphs for 40 million years until the Triassic-Jurassic rupture, when all but crocodylomorphs, pterosaurs, and dinosaurs went extinct.

The universal sigh did not begin with the *Stegosaurus* comprehending Chicxulub, just as dinosaurs were neither the first nor the last endings. Rather, the universal sigh was born as soon as the tenure of one dominant lifeform, having become overly accustomed to ordinary twists and turns, suddenly cottoned onto an extraordinary incursion, whether that realisation manifests as a J002E3 or the moment “when all of a sudden you look down and you see a tortoise, it’s crawling toward you . . .”

Spoiler alert: whatever *it* is, it does not end well. Never did. Never will. The trajectory of tragedy is written in the stars and encoded into the cell. Comedy suffers the same fate, but it does so with a wry smile. “This? This is how it plays out?” it asks. “Yes”, answers back the wind, “Because that which it played out for ruptures one through none.” In this fable, eccentricity is consciously uncoupled from being earth-centric, foreign bodies are no longer judged according to whether they pivot perfectly around us, local bodies no longer burned at the stake for advocating the gospel of becoming ex-eccentric: no longer seeing earth or ourselves at the centre of orbital observance or subservience.

For nineteenth century geologist and biologist Eduard Suess, it is only by “admit[ing] the facts in their naked truth” that “the cosmos reveals to us an image of unspeakable grandeur,” albeit one which it just so happens to be dour and joyous in equal measures of tragedy and comedy. It is tempting to read the dourness of this image of the cosmos as tragic, or as manifesting Suess’ “disadvantages . . . for us or our species,” and likewise its joyousness as comedy or “advantages.” But a dour demeanour is not concerned with demarcating the human from nature, but rather folding the human, as a biophysical lifeform, into the cosmic void, no more, no less. And, given the two are co-constituted, of folding the cosmos into the human.

This act of folding is merely an attempt, perhaps ill-fated, to transcend the anthropocentric by way of a dour demeanour, in favour of the zoocentric, as the worldview befitting of the cosmos life calls home. It is no coincidence that Suess expounded such a worldview, forged as it was from his ground-breaking geological research, including coining the concept of the biosphere in 1857.⁸⁹ Though it is also no coincidence that Suess’ vision of cosmic grandeur was ill-fated too: his

89 Eduard Suess, *Die Entstehung der Alpen* (Vienna: Braumüller Verlag, 1875): 168.

manifesto promoted a collective we-the-species over petty intra-species squabbles between nation states and other such arbitrary tribes. But escaping such fates is like J002E3 trying to escape geocentric orbit – there can be no true transcendence of the anthropocentric until there is no anthropos, just like there can be no anthropos without tribes warring with one another.

Following Suess, “if we resolve to leave behind the narrow conceptions of space and time which bourgeois life offers us” how *on earth* then can the moral arc of the universe be seen as bending toward justice? J002E3 may bend toward earth’s gravity, and so too may a Chicxulub. And, provided their progeny is of cosmic origin, they make mockery of such a thing as morality. Whereas progeny of human origin makes for the make-believe variety, of wishful thinking morality in a universe that is amoral.

After all, it only takes a slight trip of the tongue to conflate the moral of a story with the morale of a story. If a story reveals morals to be yet another hollow conceit, then a morale based on such should follow suit. Belief that justice or morality can negate entropy appears spurious in a universe whose arc bends solely toward random acts of gravitational kindness/cruelty. When is the next “whenever” that an extra-terrestrial body will mesh with the terrestrial? Compressing a five-million-year formation of the Panama Isthmus not into five decades but into five minutes. How long ago did the next “whenever” start? To whom would it matter if it happened five minutes, or five decades, or five million years from now? Or should that be to *what* does it matter?

For the time being, given how infrequent a “whenever” generally is, unannounced arrivals from outer space can generally be put aside. In contrast, earth is constantly influencing, and being influenced by, the waxing and waning of passing objects that never come close to touching it. How then are climate and evolution susceptible to bodies that never even bear down upon earth? From the ordinary of the moon’s orbit, to the extra-ordinary of an unannounced arrival, like a J002E3, how can human creations such as morality take heed of the amoral nature of the cosmos? Therein, recasting the “cataclysm upstream” as an exquisite sunflower written into the stars, even if the writing reveals that only a dour demeanour befits the unfolding rupture.

earThia

There are some oddities in the perspective with which we see the world. The fact that we live at the bottom of a deep gravity well, on the surface of a gas covered planet going around a nuclear fireball 90 million miles away and think this to be normal is obviously some indication of how skewed our perspective tends to be.

– Douglas Adams, *Is there an Artificial God?* (1998)⁹⁰

The life of man is of no greater importance to the universe than that of an oyster.

– David Hume, “On Suicide,” (2015 [1777])⁹¹

Earth came into being 4.54 billion years ago, give or take a point-something or point-zero-something or two. Two hundred million or so years later, earth consumed and was consumed by, direct collision with Theia, a Mars-sized planet. Earth is actually earTheia: a plural planet made of the sum of two bodies merged, not a cannibal that ate its wayward neighbour. Meaning the phrase *What on earth, on Earth?* should acknowledge the actual planet being referred to: *What on earTheia, on EarTheia?*

The innumerable gifts that emerged from this merging begin with the melted and melded earTheia that ensued. This melding also begat the moon, formed from consolidated detritus ejected in the momentary collision. But the gift that this event keeps on giving goes to life itself – in the evolutionary dance between vulnerability and volatility.

Already resplendent in such ordinary twists and turns as Teahupo’o and Hurricane Irene, at the scale of the cosmos the dance of these two tricksters provides the mandate for re-writing the strata by-laws of extraordinary predictability and periodicity on earTheia. The interplay between planetary and galactic is venerably displayed in the element central to Teahupo’o and Hurricane Irene: water. Another gift from the cosmos, delivered by way of hundreds of millions of years of barraging asteroids and comets and yet so indispensable for life that 73% of the walnutshell comprehending this gift inside the reader’s skull is itself made up of water. Taking that gift for granted, the gift to life is how water behaves due to earTheia’s ongoing reverberations. Or as they are more commonly known: tides.

At face value it appears a no brainer that *a moon* orbiting earth is the principal cause of tides. Beyond face value, the fact that *The Moon* orbits with relative

⁹⁰ Douglas Adams, “Is there an Artificial God?”, transcript of speech delivered at *Digital Biota 2*, Magdelene College Cambridge, September 1998, accessed 11 September 2021, <https://digitalspace.com/biota.org/people/douglasadams>.

⁹¹ David Hume, “On Suicide,” in *Essays, Moral, Political, and Literary*, eds. Thomas Grose and Thomas Green (London: Longmans, Green, & Co., 1875 [1777]), 66.

stability is the principal determinant of tidal periodicity. Say *The Moon* orbited instead like J002E3, then highly erratic tides would vary by orders of magnitude more than at present, in proportion to this imaginary J002E3-Moon's orbital eccentricity. Plot a J002E3-Moon's tidal periodicity on a cartesian graph and it would resemble J002E3's orbital trajectory of a sunflower: sea level drops 30 metres for eight hours, rises 80 metres for two weeks, drops 20 metres for 16 hours . . . Rinse and repeat, rinse and repeat. Such erratic variance would be intolerable for life-forms whose limits are defined by sea surface or sea shore proximity.

Consider the coral at Teahupo'o in terms of its limits for proximity to the surface of the sea. The non-living parts of hard or stony corals have fixed shapes and positions that collectively form reefs and reef breaks that end less than a metre below the water at low tide, such as Teahupo'o. Their presence at precisely that wave-accentuating depth is due to coral's need to be submerged in sufficiently salinated water, but also with sufficient sunlight. A colonial lifeform, the animal living within each coral structure keeps growing to be close enough to the sea surface, in the process secreting an exoskeleton-like rock that makes up the maze beneath.

Proximity limits to the surface arise because coral's principal energy source is the gift of zooxanthellae, microscopic algae living in their tissue. It is as if coral subcontract their energy absorption to zooxanthellae, who derive energy from photosynthesis. The flip side of the gift is coral's soft tissue, which provides refuge for the algae to live in. The merry go round of giving and taking means that coral and zooxanthellae are entirely symbiotic and co-dependent, thus the flip side of the merriment is simply that if one goes, the other goes too: "Ring-a-ring o' roses/A pocket full of posies/A-tishoo! A-tishoo! We all fall down."⁹² Just as the children dance in a circle, singing of human vulnerability to plagues in the nursery rhyme *Ring a Ring o'Roses*, coral's limits to life are inextricably bound to zooxanthellae's limits to life. Everything, everywhere, all the time, mixed up, woven into, and bound to all else.

Coral's dance between vulnerability and volatility means – *inter alia* – they die from overexposure to solar energy if exposed for too long above the sea surface. No different from us or our desert turtle. But sunk too deep below the water and they die from lack of chemical energy, because their live-in-outsourced energy providers cannot get enough exposure to sunlight. Tides caused by a J002E3-Moon would vastly outstrip coral's limits, along with all lifeforms nominally evolved for tidal periodicity caused by *The Moon*. Coral able to tolerate being

92 Gloria Delamar, *Mother Goose, From Nursery to Literature* (Lincoln, Nebraska: iUniverse, 1987), 38–39.

above water for days at a stretch, then tens of metres beneath the surface for weeks could no longer be ‘coral’: at that point, it would be another organism that had evolved to tolerate such limits, or died trying.

(*Caveat the nth*: evolution throws up rules, exceptions, rules to the exceptions and exceptions to the rules. Even on a finite planet, some coral already specialise in extreme tidal variation, such as those that live off the Kimberley coast in Australia, and others specialise in surviving in the relative darkness of the deeper ocean. Therefore, in an infinite universe, we withhold these truths as self-evident: that wherever life may exist, lifeforms may also have evolved to tolerate J002E3-Moon tides).

By extension, an earth with J002E3-Moon tides would be another world altogether. Picture the myriad submarine species depending on coral for their shelter and/or food and beyond, given that these extend well beyond the ‘frontline’ or first-affected, who are sensitively attuned to littoral or submarine zones. Their tolerance limits would become so modified that they would also collectively evolve into completely different lifeforms, or die trying. This would apply to all marine species and species living in littoral zones, the shifting sands where land meets ocean. The push and pull between volatility and vulnerability would be ceaseless, just like the push and pull between evolution and extinction. The only limit would be the size of the arbitrary lens through which one wanted to fathom the periodicity and eccentricity, just like the arbitrary framing in the animated reconstruction of J002E3’s twists and turns.

In a nutshell, tidal periodicity shapes the macroevolution of life. Not to imply that our arbitrary ‘ordinary’ is more conducive to life than all the ‘extraordinary’ it excludes. A planet with *The Moon* tides is not necessarily more advantageous to life than one with J002E3 tides, because the vicissitudes of the cosmos have a habit of punishing the complacency that occurs when life does not have to continually negotiate the limits it pushes up against. What then, when tidal periodicity from *The Moon* undergoes a phase transition to J002E3-like tides?

In a nutshell: the moon is moving away from us. The gift that keeps on giving is giving up on its creator. Although it was never completely subservient to its creator to begin with: it has been moving away from earTheia since it was first spat out. If twenty-first-and-last century human forcings of the currently unfolding rupture do not set in motion unstoppable processes that result in the oceans boiling away eons from now, then there will still be tides. By this point, almost as far into the future as the 4.54 billion years between now and earTheia’s genesis, the moon’s gravitational pull will be so weakened that tides will vary much less than they have for the last billion or two years. Picture this weakened tidal variation with a mock figure of one metre tidal variance either side of a baseline. Then, once in a blue moon, say every 100 millennia, the moon is pulled off its

ordinary orbit because it is so much further away from earth that it has become more susceptible to other planets' passing orbits.

It is still principally captive to earth, its master, but it now passes between different masters, like J002E3 passing from heliocentric to geocentric orbits. During these once-in-a-blue-moon phases of passing between different masters, the moon's drastically altered orbit now makes the tidal range vary 10 metres either side of the baseline. Picture this extraordinary event lasting for a century. Many lifeforms attuned to only one metre variance will go extinct because one century is simply not enough time for them to evolve and adapt, or migrate and escape. Gary Larson's Stegosaurus ushers in the rupture of Chicxulub, but his real-life kin were actually decimated 84 million years before the asteroid struck, due to an inability to deal with more much more gradual biophysical changes than those posited here. And these figures are sketched on the back of an enveloping mind – take any figures, because in keeping with the Dour, cosmic changeability and its consequences apply regardless. And they apply to life at large, no matter what our tiny human morals and expectations and misconceptions make of it.

Hume stated that the “life of man is of no greater importance to the universe than that of an oyster,” but we insist on seeing otherwise. We insist that morals are meant to exist, despite the vacuum of the void. In macroevolutionary matters which eviscerate such anthropocentric narcissism, the ability to adapt to *The Moon's* tidal variation thus comes in handy when earTheia shifts between climate regimes. Species attuned to the shifting sands of littoral zones have some existing mobility because of daily movements to tolerate tides. And, where this tidal range dictates, some coral have evolved to tolerate being above water for a few hours each day, because the daily tidal variation means there is no optimal height where they can remain always underwater, and get enough photosynthetic exposure.

To go from the ordinary twists and turns to extraordinary ruptures is to go from the daily shuffle of *The Moon's* tidal variance to being able to tolerate seismic change of a J002E3 ilk. This goes far beyond the ocean rising 130 metres to its present tense height after the Holocene ended. Such seismic change does not even constitute something extraordinary, for it is rendered imperfectly ordinary when viewed from the vantage of a computer animation replaying any history of any solar system.

Immediately above the computer screen where these words unfurl my view stretches out onto the present sea height, which makes the terrestrial edge of Australia. My balcony is a stone's throw from the littoral zone of Sydney Harbour, where the sea comes inland. Before that (most recent) 130 metre sea level rise the littoral zone lay 18 kilometres to the east. Meaning that such seismic scurrying from those marine critters carries in their swimstep the legacy of advantages

conferred by daily scurrying from the moon’s tidal periodicity, where Sydney is a mere synecdoche for the stage of range variation across all earthly ecosystems.

Tilting my view higher, to look much further above the computer screen, the moonlight that I write by provides not just illumination, but a telling reminder of how the moon also provides gifts that keep on giving, by reducing some of earth’s greater eccentricities – both orbital and tidal. Tidal periodicity exerts a stabilising effect on earth’s orbit, though the more pronounced effect comes from the moon’s orbit around earth itself. Without counterbalance from one’s own sizeable satellite, a planet’s orbit oscillates much more wildly, like Mars, whose sole companions are fear and terror: the names of its two satellites Deimos and Phobos. Even collectively they are but one hundredth the size of our moon, providing Mars with a negligible counterbalance compared to earth.

But even though the moon is a gift that keeps on giving, the cosmos is not in the habit of bestowing gifts without conditions. Life is still at the behest of more radical, yet quite predictable change, despite a local gravitational force which curbs earth’s wilder enthusiasm for orbital eccentricity. Once again, these persistent orbital twists and turns lead all the way back to earTheia. For that merging is also a theft that keeps on taking, in perturbations that make climatic precarity perfectly ordinary.

About “About the Issue of the Astronomical Theory of Ice Ages”

Every man takes the limits of his own field of vision for the limits of the world.

– Arthur Schopenhauer, *Studies in Pessimism: The Essays* (2004 [1893])⁹³

What if everything in the world were a misunderstanding, what if laughter were really tears?

– Soren Kierkegaard, *Either/Or: A Fragment of Life* (1992 [1843])⁹⁴

Perturbations from earTheia’s aftershock continue to reverberate through slight variations in earth’s eccentricity, axial tilt, and precession. These variations are mere fragments among the cosmic menagerie of catalysts for climate regime shifts: earTheia is not the root of all good and evil for climate changes of astronomical origin. Orbital perturbations also owe to the push and pull of other planets in the

⁹³ Arthur Schopenhauer, *Studies in Pessimism: The Essays*, translated by Thomas Saunders (Whitefish, MT: Kessinger Publishing, 2004 [1893]), 23.

⁹⁴ Soren Kierkegaard, *Either/Or: A Fragment of Life*, translated by Alastair Hannay (London: Penguin, 1992 [1843]), 38.

solar system, whose twisted tales and breadcrumb trails, if pursued, would reveal yet more layers of the World Turtle.

Acknowledging these rabbit warrens, but staying closer to home, earthTheia relates to aperiodic ruptures of life as the collision seismically increased the planet's core density, and thus its volume of magma. Thus, the exceptionally high levels of volcanism on this specific planet with all the ensuing particularities must also be included on the list of gifts that give and take. The residual impacts of earthTheia on earthTheia's orbit – a veritable catch-22 in spades – still remain front and centre though, even though we have long since abandoned notions of 'front' and 'centre' when talking about an infinite universe or the interstices of our walnut shell minds.

Suffice to say that the residual impacts are akin to spinning a spinning top the size of a solar system and pushing the top away as it is released: the spin will retain residual eccentricities in its movement, right up until it comes to a rest. Earth does not come to a rest until the sun swallows it whole five billion years from now – so the residual eccentricities will manifest in the spinning top until this limited 'forever' comes to an end.

Within the menagerie that is this particular solar system certain patterns of misbehaviour show atomic clockwork precision. It was only confirmed that a once-in-a-blue-moon alignment between earth, Venus, and Jupiter warps their respective orbits, causing earth to change from a circular to a 5% elliptical orbit and back again, every 405 millennia, for at least the last 215 million years. An orbital shift of this magnitude can affect the planet's climate (in terms of season length, and amount of solar radiation received, for example). The Age of Dinosaur's began roughly 225 million years ago, and ended roughly 160 million years later, so even it was subject to climatic regime shifts amplified by orbital eccentricities. Not that each cosmic forcing was uniform – the 405 millennia cycle would have negligible or dramatic effects depending on the interaction of this loop with other planets' periodic cycles and/or aperiodic sunflowers.

The periodicity of the 405 was only confirmed in 2018, by combing through fragments of Arizona's Petrified Forest National Park for evidence of climatic change. The area, so named, because of the abundance of petrified tree wood from the start of the Age of Dinosaurs, the period of dinosaur dominance starting 225 million years ago. Once again, volcanoes feature in the extinguishing of life here: these fossils are the living, frozen in the moment they were buried under volcanic ash. It is in this ash that the evidence of the 405 millennia cycle was finally found, because volcanic ash preserves data on different elements of the climate during precise time periods: a Pompeii for trees, and once rendered into strata, such petrified lifeforms tell this long-predicted tale of cosmic clockwork.

Yet the periodicity of the 405, and its enshrinement in earth's strata via an eruption, highlights how astronomical origins for climatic change play out in

concert with whatever is happening on the stage itself. Say earth is being consigned, for the umpteenth time, into a glacial era by a variation in axial tilt. This consignment will play out very differently on earth before/during/after a Panama Isthmus or its unknown unknown equivalents. Because forcings from cosmic origins may be offset or amplified, depending on what biotic and abiotic forces are at play on and beneath earth's surface.

Looking at the stark contrast in climate pre- and post-Panama, Serbian polymath Milutin Milankovitch hypothesised about how particular perturbations catalysed transition points between ice ages. Deducing that earth's eccentricity, axial tilt, and precession occurred in cycles of 21, 40, and 100 millennia respectively, he then correlated these with transitions between glacial and inter-glacial periods. With each recurrence, earth's energy balance shifted from positive to negative, or vice versa. And with each shift, the world-as-it-was went and the *New World Coming* took its place.

Having calculated how susceptible climate was to these perturbations, Milankovitch was still stuck with the question of why his model only applied in the period following the formation of the Panama Isthmus. The same cycles have been occurring since time immemorial, but pre-Panama, they did not induce regime shifts. To boot, there was also the question of why the perturbations only amplified the onset and/or severity of glacial, and not inter-glacial, periods.

A mathematician, astronomer, climatologist, and geophysicist, Milankovitch founded the planetary climatology of our own backyard through to that of our planetary neighbours. In essence, he solidified the foundations for a developed sensibility toward the relationship between volatility (planetary motion), vulnerability (living individuals) and vitality (evolutionary adaptation). And he did so over a century ago.

Milankovitch's seminal paper outlining this sensibility – *About the Issue of the Astronomical Theory of Ice Ages* – was published in 1914, at the outbreak of World War One. Interred as a prisoner of war between Serbia and the Austro-Hungarian empire, Milankovitch described his first night in prison in his journal:

The heavy iron door closed behind me . . . I sat on my bed, looked around the room and started to take in my new social circumstances . . . In my hand luggage which I brought with me were my already printed or only started works on my cosmic problem; there was even some blank paper. I looked over my works, took my faithful ink pen and started to write and calculate . . . When after midnight I looked around in the room, I needed some time to realize where I was. The small room seemed to me like an accommodation for one night during my voyage in the Universe.⁹⁵

⁹⁵ Milutin Milankovitch, *Canon of Insolation of the Earth and Its Application to the Problem of the Ice Ages*, translated by Israel Program for Scientific Translation (Washington, DC: US Department of Commerce and the National Science Foundation, 1969), 111.

As it turned out, Milankovitch's prison room lasted only for one night of his voyage into the universe – shortly thereafter he negotiated his release. He kept his head in the clouds, probing the cosmos, while a rancour of inter-human state-sanctioned mass-murder unfolded around him (a rose by any other name is a euphemism). While the world went to war, he traced discernible trails between earth's changeable motion, the evolution of life on it, and determined by inference, that cataclysms are recurrent events, subject to the whims of passing planets mixed with orbital variations still carrying out from earth becoming earth. His work continued throughout World War One and into World War Two, scouring scholarship and performing calculations for decades after the nominal passage from war to peace and back to war again. His journal excerpt about when "the heavy iron door closed behind me" is from *Canon of Insolation of the Earth and Its Application to the Problem of the Ice Ages*, published in 1941, despite a bomb destroying the manuscript at the printers.

If we are to accept Nigel Clark's invitation to "the event of our time," which is to embrace the universal sigh that "climate is responsive to our nudges only because it is far more precarious than we ever dared imagine,"⁹⁶ we must also apologise for our tardy response. For the "event" has been running now for over a century, at least for the ilk of a Milankovitch.

Taking up Clark's invitation was something successfully thwarted in the century since *About the Issue of the Astronomical Theory of Ice Ages*. Thwarted by what? By the collective societal embrace of sheltered worldviews, and a society that chose to sing the 1842 version of *Three Blind Mice*, never mind the 1609 version. Instead of embracing a 1555-and-then-some fidelity to the cosmos, the collectively sheltered worldview fostered a new kind of prison, closed off to the cosmos and its random acts of gravitational kindness/cruelty, although the closure was in ignorance only. The actuality remained as open as earth to a Chicxulub.

The new kind of prison reigns so supreme that "the event of our time" inhabits a cage Max Weber warned against entering a century ago, in 1905:

No one knows who will live in this cage in the future, or whether at the end of this tremendous development entirely new prophets will arise, or there will be a great rebirth of old ideas and ideals, or, if neither, mechanized petrification, embellished with a sort of convulsive self-importance. For of the last stage of this cultural development, it might well be truly said: "Specialists without spirit, sensualists without heart; this nullity imagines that it has attained a level of civilization never before achieved."⁹⁷

96 Clark, *Inhuman Nature*, 31.

97 Weber, *The Protestant Ethic*, 181–182.

Nowadays we live "in this cage in the future" courtesy of the century of "tremendous development" since, when "entirely new prophets" did arise, though their dour visions remain as marginal as they are unpalatable. Harking back much further to the ghosts in our shell are the voices of older prophets who still permeate through us, though their antiquity has further suppressed any "great rebirth of old ideas and ideals." Having eschewed both of these, we instead underwent "mechanized petrification, embellished with a sort of convulsive self-importance." All and one blind to all which falls outside their narrow purview. Indeed, the twenty-first-and-last century, akin to Weber's "last stage of this cultural development" is one that "imagines that it has attained a level of civilization never before achieved."

Such is our self-perception. But, in their own way, even Arizona's petrified trees would have 'known' the first and third parts of the universal sigh. Not in our anthropocentric sense, but just in their own inimitable way, whatever that is, for we shall never be able to know their knowing. The eruption that subsequently buried them in ash would have alerted them to how "the world's climates are changing" via their elaborate sensory mechanisms. Like Stegosaurus upon his stage, they would have issued forth such proclamation, via their ability to communicate to one another through the so-called wood wide web, although, ironically, their chagrin would have been that 'the dinosaurs are taking over.'

On the more cerebral plane, the trees would have 'known' that they "all have a brain about the size of a walnut." The recent field of plant consciousness argues for such vegetal forms of cognition and comprehension, via staggering experiments that have revealed such behaviour. Our notions of words for such more-than-human thought are again poor proxies, just as our knowing cannot know their knowing.

So, against such delusions of civilisation, progress, and human exceptionalism, the Dour is the prophetic voice that throws a spanner into Weber's "mechanised petrification" by acquiescing to Sues's "naked facts" of a cosmos such as it is. In so doing the Dour eviscerates any notion of positive "development," whether of "entirely new prophets" or "a great rebirth of old ideas and ideals." Instead, the Dour declares that this "mechanised petrification" is the thing that broke the spanner, and not the other way around. It declares, contra Hume, that no philosophy can "improve the world" because the world never required any improvement, whether for the Stegosaurus, the coral of Teahupo'o, the trees of Arizona's Petrified Forest National Park, Lucy, LUCA, or, of course, us.

How then to break free the cage within which we live? No longer conflating myopic worldview for cosmic purview, nor manifesting Schopenhauer's man, who mistakes "the limits of his own field of vision for the limits of the world." No longer expecting predictability or periodicity, rhyme or reason. No longer abhor-

rent at the “cataclysm upstream,” but warming to its embrace. No longer conflating the morale of a story with the moral of a story. No longer rejoicing in civilisation so-called, but warming to its ever-tenuous and ever-contingent enmeshment in cosmic forces impervious to prisons, no matter how impenetrable a tyrant’s rampart. A civilisation unmasked as a hollow conceit against cosmic vicissitudes reveals something arising in its stead: a meek purview for equanimity between being and becoming petrified.

The Limited Sunset

Come, let’s away to prison.
We two alone will sing like birds I’ th’ cage.
– William Shakespeare, *King Lear* (1606)⁹⁸

How mutable are our feelings, and how strange is that clinging love we have of life even in the excess of misery!
– Mary Shelley, *Frankenstein* (1818)⁹⁹

If volcanoes bring earth’s fiery belly to its surface, and the sun brings gravitational centrifuge to earth’s shifting climates, then other stars bring both warmth and cold comfort to their captive planets. For though all that lies above and beyond incarceration may overshadow worldly predicaments, this cosmic purview does not so much break the cage free for escape, as obliterate it and its captives. Literature is for the living, just as obliteration is for those endlings who observe stars not just for the cold comfort of cosmology, but also in search of demeanours appropriate to living during a rupture of life on earth. The Dour is a demeanour premised on how stars cast perspective over a worldview that restricts itself to the world, and hypocritical societies that imagine themselves to be the world, rather than merely of the cosmos.

Oscar Wilde brought this demeanour into his 1895 play *Lady Windermere’s Fan* when he declared that “we’re all in the gutter, but some of us are looking at the stars.”¹⁰⁰ Given that “we live submerged at the bottom of an ocean of air”¹⁰¹ as does all terrestrially-bound life, it may appear that we have always been in the

98 William Shakespeare, *King Lear* (Oxford: Oxford University Press, 1957 [1606]), Act V, Scene III.

99 Shelley, *Frankenstein*, 311.

100 Oscar Wilde, “Lady Windermere’s Fan,” in *The Importance of Being Earnest and Other Plays* (London: Penguin, 1940 [1895]).

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

gutter. However, Wilde captured the something new under the sun of his time, contemporaneous with Weber's "tremendous development" and Suess' vision of the cosmos as "an image of unspeakable grandeur," and only a little before Milankovitch's "one night during my voyage in the Universe." Common to all is the human condition of a body horizontal in a guttural predicament, but with mind breaking free of this constraint: to look at the stars is to receive wave particles of light that have travelled across the cosmos, into your retina, to be decoded into the picture play that is your mind. This is what it means to live within the insufferable cage that imprisons the body by escaping it with the mind, because the mind is vulnerable and open to the cosmos to which it is hitched.

However, as with all romantic quests, a sleight of hand or a decoupling of mind from body makes only a fleeting escape from prison. Three years after Wilde wrote this adage, his guttural predicament became literal, imprisoned as he was for his homosexuality. Like Milankovitch, Wilde looked at the stars from behind a heavy iron door, though his sentence lasted much longer than just one night. Over a century later, sightlines to the stars are bygone, at least for most guttural vantage points. Those venerable light particles no longer penetrate retinas because they are blocked by pollution: light pollution to heavy pollution and everything in between.

Over a century ago, Suess decried how "prejudices and egoism . . . have placed barriers around each of us which constrict our view." Now, he could add a literal dimension of restriction, as concrete as Milankovitch's or Wilde's impoverished sightlines from their respective prisons. Should the electric lights be extinguished, and the sky cleared, these sightlines would become visible again. But from the human 'gutter', the only way this renewed vision might obviate imprisonment is if we follow Suess' precondition, to see further and "no longer to view the world from the base, self-centred perspective." Only therein does "the cosmos reveals to us an image of unspeakable grandeur."

Remaining with Suess, it is then also necessary "to admit the facts in their naked truth" in order to do away with seeing "advantages here, disadvantages there for us or our species." But what does this admission gain? The cosmos gives cold comfort, even if minuscule portions of the infinitive void – stars – radiate gifts that keep on giving. Starlight, stellar heat, the elements, molecules and atoms – born in furnaces burning at millions of degrees. Only to implode or explode when their thermonuclear reactions pass a critical threshold. Our own sun is itself a third-generation star, meaning even it has a ghost in its shell – harking back to origins of being born from the twice re-incarnated ashes of exploded stars. If the cosmos is regarded as the world, rather than this third rock from this sun, in this solar system, in this galaxy, at this moment in time, then it begs a worldview as empty as the void between stars.

From changeability, to its consequences, to comprehension of same: the world-as-idea and the world-as-cosmos are unified in their negation. The question remains as to how we are supposed to live in the resulting void, illuminated only by the clarity of a dour demeanour. Novelist Cormac McCarthy probes Weber's speculation that "no one knows who will live in this cage in the future" by responding with two candidates trapped within his novel *The Sunset Limited*. For White, one of the two characters, world-as-idea and world-as-cosmos coalesce because:

I don't regard my state of mind as some pessimistic view of the world. I regard it as the world itself. Evolution cannot avoid bringing intelligent life ultimately to an awareness of one thing above all else and that one thing is futility.¹⁰²

The Dour chimes in on all these notes, proclaiming that as a demeanour, it is neither pessimism, nihilism, or cynicism, but rather unified in fidelity with "the world itself." In short, it is a state of mind that is completely at one with the world itself. The Dour personified would make one riposte to White, however: while futility reigns supreme in this "awareness of one thing above all else," given a universe slated to end in either a cosmic crunch or universal heat death, a dour demeanour advocates fidelity to the vicissitudes of the cosmos precisely as an insurrection against any all-encompassing futility.

In matters closer to home, and nearer in time than the end of the universe, White espouses his dour worldview to Black – the only other character in the novel – in a back-and-forth exchange that takes place in one room of a small sparse tenement apartment in New York City. Black provides a counterpoint worldview that finds life worth living, in contrast to White, whom Black has just prevented from jumping in front of the Sunset Limited train. Black is now holding White in his apartment until he can be assured that the former will not attempt suicide again. To which White asks: "So what am I, a prisoner here?", only to be told: "You know better than that. Anyway, you was a prisoner fore you got here. Death Row prisoner."¹⁰³ The prison is not the room, the cage is not the mind. Rather the restraint is mortality, which no manner of mind-over-matter can circumvent.

In the larger sense, beyond the sole claustrophobic apartment setting, both characters are further imprisoned in a society that thinks the world of itself, rather than thinking of the world itself. White remains trapped in Weber's "cage in the future" and Wilde's "gutter," because he has closed himself off from "look-

¹⁰² Cormac McCarthy, *The Sunset Limited* (New York: Vintage International, 2008), 31.

¹⁰³ McCarthy, *The Sunset Limited*, 31.

ing at the stars” and their perennial “image of unspeakable grandeur.” The vision is as ultimately futile as the universe’s grandeur is fleeting, but the Dour maintains that fidelity makes a mockery of any notion of morality, and that once noted, any such pessimism, nihilism, or cynicism are rendered mute.

McCarthy’s own demeanour appears to heavily inform White’s monism that the world-as-idea is the world-as-cosmos. The philosophy that comes forth in his novels is premised on “admit[ing] the facts in their naked truth,” both of cosmic vicissitudes and of how humanity fails to live with commensurate fidelity to those vicissitudes. In an interview about his post-apocalyptic novel *The Road*, published in September 2006, one month before *The Sunset Limited*, McCarthy was questioned as to the cause of the civilisational and biosphere collapse described in the book. In *The Sunset Limited*, the reader is informed of the suicide attempt that catalysed the novel’s events, but in *The Road* the reader is never told what kind of catastrophe cast the two protagonists, a father and his son, along that road.¹⁰⁴

The fact that McCarthy’s response refuses to answer the question only serves to further imbibe another core quality of a dour demeanour: the by now familiar conditions of unknowability so essential to Clark. McCarthy replied to *The Washington Post* that

I don’t have an opinion. It could be anything – volcanic activity or it could be nuclear war. It is not really important. The whole thing now is, what do you do? The last time the caldera in Yellowstone blew, the entire North American continent was under about a foot of ash. People who’ve gone diving in Yellowstone lake say that there is a bulge in the floor that is now about 100 feet high and the whole thing is just sort of pulsing. From different people, you get different answers, but it could go in another three to four thousand years or it could go on Thursday . . .¹⁰⁵

In our journey down *The Road* we are not meant to know when it terminates, just as we can never know when the next bend will yield the *New World Coming*, nor which umpteenth layer of the World Turtle will yield an answer to whether Yellowstone’s next supervolcano eruption is a few days or a few millennia away.

McCarthy captures how the Dour is a demeanour that embraces, rather than braces, for impact. It is about how to live during a rupture of life on earth, because “the whole thing now is, what do you do?” Which is to say that the Dour does not embrace *the* impact, but rather embraces *for* impact. Just as there is no revelry in the sheer horror of a supervolcano eruption “on Thursday,” or a

¹⁰⁴ Cormac McCarthy, *The Road* (New York: Alfred A. Knopf, 2006).

¹⁰⁵ Cormac McCarthy, interview with John Jurgensen, “Hollywood’s Favourite Cowboy,” *The Wall Street Journal*, 20 November 2009, accessed 1 July 2019, <https://www.wsj.com/articles/SB10001424052748704576204574529703577274572>.

nuclear war, the Dour does not embrace any such end of this world. What it does embrace is a premise of an altogether different register: that *all* life has always been at the behest of cosmic vicissitudes, and that these are now coupled with the human capacity to unleash a rupture of life on earth.

How then can a stance of fidelity to such vicissitudes accommodate the inescapable moral abyss of human-caused ecocide? Volcanoes raining earth's fiery belly down on its surface make no calls upon morality, but humans raining down thermo-nuclear bombs on one another or directly causing mass extinction cries out for the same. The Dour acquiesces to just how inescapably part and parcel of the cosmos, and of the chaos therein, we are. Human violence – whether in the form of the wars through which Milankovitch lived, the inhumane imprisonment that Wilde endured, or the collective destruction of the planet that McCarthy imagines – are deplorable and unconscionable *in our own terms* because they originate from intention.

This time round there is no Chicxulub or Panama Isthmus to castigate. Though our capacity for destruction is not unique, just as *homo sapiens* are not unique. To believe otherwise is uphold the tyranny of human exceptionalism and self-importance. The Dour enfolds humans into history as just another disaster, in a cosmos where there is no moral to the story, and no rhyme or reason to what ends one world or heralds a *New World Coming*.

Above, below, within, and without, the cosmos is prone to going up in smoke, whether exploding novae above, erupting volcanoes below, irrupting pathogens within, or the inexorable passage of time without. We do not know when Yellowstone's next 'whenever' might be. The question is whether we do as Cranmer did upon the pyre, and resist the 'whenever' handed to us, at the cost of our fidelity. Fidelity by way of the dour demeanour requires humility that recognises all mortal beings are sentenced to death by their mortality.

Trying to outrun this is to live in a nursery rhyme, and a frightening one at that, where the farmer's wife is only ever barely outrun, but still looms behind us, brandishing her knife. Or do we acquiesce, as did Ridley and Latimer, and accept that 'whenever' has come, remaining level-headed, open-eyed and faithful to a reality in which our continued existence was always at the behest of the vicissitudes of the cosmos.

If cosmologies bequeath demeanours laying claim to be one and the same as the cosmos itself, then a dour demeanour is comfort both cold and warm. To accept the Dour's invitation "to seek fidelity to a story that puts the cataclysm upstream of our humanity, and not simply downstream where we can still dream of diversion"¹⁰⁶ is to become one-and-the-same with the world-as-it-is. Where the re-

106 Clark, *Inhuman Nature*, 31.

ward for answering yes to Clark’s question about “are we ready to be ‘true’” to this sombre dream is an ambivalent one.

But such rewards *are* highly ambivalent, given the comfort both cold and warm that they impart. When the tyrannical King Lear invites his daughter Cordelia to live out their remaining days together in prison he tells her that they will “take upon ’s the mystery of things/As if we were God’s spies . . . /In a wall’d prison . . . /That ebb and flow by th’ moon.”¹⁰⁷ The moonlight cannot convey the sun’s warm to their cell, but it can convey its reflected light, even in the dark of night. Then again, viewing the cosmos from this guttural vantage point, it was never really an invitation, given Cordelia was already imprisoned before Lear invited her, and our humanity was already hitched to the vicissitudes of the cosmos before there was such a thing as humans. So, there is Clark’s invitation to make sense of the world-as-it-is, and Lear’s invitation to use non-sense to cope with the way the-world-is-as-it-is, but only by taking up both invitations earnestly can any glimpse of equanimity between being petrified and becoming petrified be gleaned.

Two Days Before the Day After Tomorrow (after Trey Parker)

In a way, the film does have a happy ending.

– Lars von Trier, on *Melancholia* (2011)¹⁰⁸

The evolution of the Earth . . . is galactically controlled through a Rube-Goldberg-like chain of gravitational accidents: a hypothesis that is as exhilarating to most astronomers as it is preposterous to most geologists.

– Mike Davis, “Cosmic Dancers on History’s Stage? The Permanent Revolution in the Earth Sciences” (1996)¹⁰⁹

In a pursuit unusual for a novelist, McCarthy was a Writer-in-Residence at the Sante Fe Institute in New Mexico, from 1988 until his death in 2023. The private research facility studies complex adaptive systems in all shapes and sizes, from the comings and goings of Jupiter’s Great Red Spot and the uplift and carry of Saharan sands to Amazonian soils, to the cycling between water and air in Hans Haacke’s *Condensation Cube*. The Institute brings such an “inquisitive humour”¹¹⁰ to bear on empirical knowledge, say a Yellowstone nudging up against a barely

¹⁰⁷ Shakespeare, *King Lear*, Act V, Scene III.

¹⁰⁸ Lars von Trier, “Director’s Statement – Lars von Trier,” *Melancholia* Press Kit (Magnolia Pictures, 2011).

¹⁰⁹ Davis, “Cosmic Dancers on History’s Stage?”, 69.

¹¹⁰ Hume, *Dialogues Concerning Natural Religion*, 38.

still-sealed earth surface, as well as speculative thought, say a collision-course asteroid set in motion, where a Chicxulub comes unannounced around the bend.

The common thread to all these humours, whether scientific or literacy, is excess. Or rather, how all systems are intrinsically and inescapably open to the universe, even if a sheltered worldview tries to see them as self-contained. As Clark remarks:

The irruption that literally punctures the horizon of our planet – the impingement of a dynamic and unpredictable cosmos on earth processes – offers an extreme case of a remainder that cannot conceivably be contained, an asymmetry which is abyssal. And such excess is not simply an input that can be represented, accounted for or anticipated, for this would constitute an inclusion.¹¹¹

If a system cannot be closed off and accounted for as something discrete from something else, then at some point the sums will not square off. For “such excess” is shorthand for the disequilibrium of N-LSD: even in negative energy balance, when a deficit of solar radiation is retained within earth, it is still an excess, just one of cold rather than warmth.

While the list of inclusions is as unbounded as the universe is infinite, life on earth is arguably at the behest of a particularly local excess: our sun. Its intermittent explosions of electromagnetic plasma rain down deep into space, including, of course, on earth. Over the last half millennium that records of these solar flares have been made, their erratic occurrence shows no rhyme or reason. Underpinned by causal mechanisms that are stochastic and aleatoric, all we can know is that they will keep on occurring, but with no periodicity. The plasma takes three days to reach earth’s atmosphere – a small warning window for a civilisation hitched to encircling electromagnetic technologies in the form of satellites. Had a particular coronal ejection in 2012 happened one week earlier, earth’s location would have meant all near-earth orbiting satellites would have been directly hit, bringing every Hollywood disaster film on the subject into real time 3D.

As Clark remarks, “such excess” can never be counted, or countered, because that presupposes an ability to incorporate unknown unknowns into sums that never square off. Not that this requires anything as dramatic as a Chicxulub “that literally punctures the horizon of our planet.” The excess underpins events which affect, but never actually touch the planet, like the effect of orbital eccentricities on macroevolution. It is intrinsic to every star we observe, whether seeking insights into the human condition, like Wilde, or seeking the perspiration of earth’s climate, like Milankovitch. When Wilde looked to the stars, he was inspired to

¹¹¹ Nigel Clark, “Ex-Orbitant Globality,” *Theory, Culture & Society* 22, no. 5 (2005): 180.

place the burden of worldly predicaments into the weightless conditions of the cosmos. When Milankovitch looked to the stars, he was inspired to bring earth's climate into dialogue with its gravitational allegiances. Sadly for these two men, nowadays that same dialogue need heed a new reality: that the burden of worldly predicaments must remain weighted firmly down here on earth, because the energy imbalance that catalysed the unfolding rupture is decidedly a by-product of civilisation so-called.

For philosopher and writer Georges Bataille, one need look no further for the headwaters of the cataclysm upstream than our most immediate star. At all scales he frames the overwhelming excess of radiant energy received from the sun as precipitating cataclysms: both those intrinsic to evolutionary mechanics and those induced by human-forcing:

Solar energy is the source of life's exuberant development. The origin and essence of our wealth are given in the radiation of the sun, which dispenses energy – wealth – without any return. The sun gives without ever receiving.¹¹²

Precisely because of its excessive generosity, however, this gift without return also takes away without rhyme or reason. Bataille pondered how, given that solar ebullience is more generous than necessary for bare survival, excess accrues when less heat is radiated back into space versus absorbed around/within/on/in the planet itself. Seldom do the sums square off and earth obtains, let alone maintains, an energy balance.

Bataille saw the same entanglements with excess as intrinsic to a single organism, just as they are to a single planet, positing that:

The living organism, in a situation determined by the play of energy on the surface of the globe, ordinarily receives more energy than is necessary for maintaining life; the excess energy (wealth) can be used for the growth of a system (e.g., an organism); if the system can no longer grow, or if the excess cannot be completely absorbed in its growth, it must necessarily be lost without profit; it must be spent, willingly or not, gloriously or catastrophically.¹¹³

Stars, he remarks, embody “futility”: the same futility that McCarthy sees in the void of the world-as-idea/world-as-cosmos. They rain down their bountiful energy on their captive planets, precipitating excesses that render climates precarious. For Bataille, the cataclysm upstream flows from the sun – which, given it is a star already thrice reborn, means it is merely a portal to a universe that retrieves such gifts by completely obliterating, and then resurrecting them.

112 Georges Bataille, *Accursed Share: Volume 1: Consumption* (London: Zone Books, 1991), 28.

113 Bataille, *Accursed Share*, 21.

Bataille and Milankovitch both effectively support what is known as the Court Jester view of evolution. Namely, that abiotic forces are the main impetus for evolution. From solar energy excess or dearth, to the whims of passing planets and erupting volcanoes and asteroids, the Court Jester dances to “the impingement of a dynamic and unpredictable cosmos on earth processes.”¹¹⁴ In particular, under the auspices of the Court Jester hypothesis, an equilibrium punctuated with volatility means that evolution proceeds in relatively short bursts, akin to Clark’s “moments,” interspersed with much longer periods of stasis. Recall that here ‘short’ is measured at the scale of deep time, so that such ‘moments’ could be many millennia in duration.

For Anthony Barnosky, who coined the term in 1999,¹¹⁵ the Court Jester was a riposte to the then dominant evolutionary hypothesis of the Red Queen, named and proposed by Leigh van Valen in 1973.¹¹⁶ The Red Queen hypothesis holds biotic forces as being the main impetus for evolution. As co-evolving species drive one other to adapt, they enact an evolutionary arms race and form dependencies. Any two co-involved species, say a lion and an antelope, evolve in lock step with one another. As one adapts to outrun the other, the other steps up to keep in step, or dies trying. In the meantime, both co-evolve, undergoing genotypic and phenotypic change. The metaphor for such evolution is the Red Queen in *Through the Looking-Glass*, in whose race “it takes all the running you can do, to keep in the same place.”¹¹⁷ Except that to stop running is not to come to a standstill. It is to die.

Is there no end to the revolutions of the earth? Mike Davis captures this sense of never-ending revolutions of the earth versus understandings of it, in his 1996 article “Cosmic Dancers on History’s Stage? The Permanent Revolution in the Earth Sciences,” with 149 judicious footnotes pointing beyond, beneath, behind, and above the World Turtle. In it, he favours a catastrophist stance, one that is in keeping with Suess’ conditions for seeing “unspeakable grandeur,” by seeing ruptures as no longer having “advantages here, disadvantages there for us or our species.”¹¹⁸ Remarking on asteroids that explode in the atmosphere, Davis finds the Court Jester always has the last laugh:

114 Clark, *Ex-Orbitant Globality*, 180.

115 Anthony Barnosky, “Distinguishing the Effects of the Red Queen and Court Jester on Miocene Mammal Evolution in the Northern Rocky Mountains,” *Journal of Vertebrate Paleontology* 21, no. 1 (2001): 172–185.

116 Leigh van Valen, “A New Evolutionary Law,” *Evolutionary Theory* 1 (1973): 1–30.

117 Lewis Carroll, *Through the Looking-Glass, and What Alice Found There* (London: Macmillan, 1871).

118 Suess, in “Big Is a Thing of the Past,” 319–320.

Catastrophes are both condensations of temporal process – for instance, a million years of ‘normal’ environmental work condensed into hours, even seconds – and exponential escalations of the energy circulating through the planetary metabolism. In this dual sense, comet bombardments act as superchargers of geological and biological evolution.¹¹⁹

The supercharge he refers to is saltation: abrupt evolutionary change, whether an ascendancy of a new Animalia order following the clearing out of old, or more local affairs such as adapting to novel climate regimes courtesy of the Panama Isthmus formation. Excess is again at the heart of such affairs: as “exponential escalations” circulate not just “through the planetary metabolism” but through Bataille’s “living organism.” Setting aside debates as to their relative influence on evolution, the Court Jester and Red Queen play the ‘Immortal Game’ against one another on the chess board, as catastrophism v gradualism respectively. Their interplay only reveals further layers to the World Turtle, demonstrating how evolution throws up rules, exceptions, exceptions to the rules, and rules to the exceptions. For instance, the other principle mechanism of evolutionary change is spurred by cooperation rather than competition, when species are symbiotic with each other, such as zooxanthellae and coral.¹²⁰

Perhaps this cosmic menagerie is the “happy ending” that Lars von Trier wryly claims for his film *Melancholia*, which faces not the end-of-the-world but the end-of-the-planet, via impact from a fictional planet named Melancholia. While Bataille saw the sun as the upstream cataclysm’s headwaters, von Trier peeked behind what the sun conceals, to speculate on whether it could be harbouring a new Theia. Melancholia is the metamorphosis of a Chicxulub, or the next “whenever,” as it suddenly appears in the night sky, having evaded all astronomical detection due to the cover of the sun. Where a J002E3 illustrates how random acts of gravitational kindness/cruelty give rise to erratic orbital trajectories, and how such smaller-sized objects matter little for life on earth, a *Melancholia*-like rogue planet illustrates the difference between an extant earTheia and an melarTheia.

The film centres on two sisters, Justine and Claire, and their diametrically opposed postures when suddenly finding out earth is soon to be hit with another cosmic joke by way of the Court Jester. Justine epitomises a dour demeanour, as the avatar of von Trier, in the same way that White is the avatar of McCarthy in *The Sunset Limited*. While Justine is ill-suited to so-called normal society and exhibits suicidal tendencies, just like McCarthy’s White, her older sister Claire

119 Davis, “Cosmic Dancers on History’s Stage?”, 84.

120 Lynn Margulis, “Symbiogenesis and Symbiogenesis,” in *Symbiosis as a Source of Evolutionary Innovation Speciation and Morphogenesis*, eds. Lynn Margulis and René Fester (Cambridge, MA: MIT Press, 1991), 1–20.

thrives in the world when it is business as usual. Only when Melancholia is first detected do their true colours start to shine, as the qualities of those who possess a dour versus a dire demeanour.

For Justine, cosmic vicissitudes are final cause to inculcate equanimity. She faces the imminent obliteration of the world-as-idea/world-as-cosmos with both meanings of the term: “equal mind” and “calmness and composure, especially in a difficult situation.”¹²¹ It is not so much that she acquiesces, but rather that she discredits Claire’s dire demeanour, who panics in response to McCarthy’s question about “the whole thing now is, what do you do?” Whereas, Justine comes to terms with what to make of life when its abundantly clear that there is nothing to do but uphold the honesty that her “view of the world” was in fact “the world itself,” just like White in *The Sunset Limited*. However, the Dour makes a riposte to both Justine and White’s suicidal tendencies: if one can behold a “view of the world” that is “the world itself” then one has found the true beauty between the layers of paint and pain alike. Or, as John Keats put it: “Beauty is truth, truth beauty, – that is all/Ye know on earth, and all ye need to know.”¹²²

As the sisters respectively embrace and brace for Melancholia’s impact, they re-enact the universal sigh in Gary Larson’s dinosaur town hall meeting. Claire retreats into notional childhood innocence, and Justine comforts Claire’s son Leo and her sister by constructing a cage of sticks for both sisters and the child. As if returning voluntarily to imprisonment, but not that of a Wilde or a Milankovitch, nor even that of White’s entrapment in Black’s room, but rather Weber’s “cage in the future,” sheltering a worldview as obliterated as the world itself. Meanwhile, Justine is reluctant to face the grand finalé through a fantastical lens. She holds true to Wilde’s adage, in that the human is only born into, lives out, and dies in guttural predicaments. Nevertheless, she looks upon the end-of-the-world-cum-end-of-the-planet with an earnest ear toward wonder, notwithstanding an ungrateful chagrin at the inherent meaningless and futility of the universe. As von Trier wryly remarks in *Melancholia’s* press kit: “in a way, the film does have a happy ending.”

Begging the question: which way is that?

121 “Equanimity,” Oxford English Dictionary (Oxford: Oxford University Press, sixth Edition, 2007).

122 John Keats, “Ode on a Grecian Urn,” in *Annals of the Fine Arts for 1819, Volume 4*, ed. James Elmes (London: Sherwood, Neely, and Jones, 1820), 639.

The Sky is Falling in (Maybe Not)

A fire broke out backstage in a theatre. The clown came out to warn the public; they thought it was a joke and applauded. He repeated it; the acclaim was even greater. I think that's just how the world will come to an end: to general applause from wits who believe it's a joke.

– Soren Kierkegaard, *Either/Or: A Fragment of Life* (1992 [1843])¹²³

A sense of humour is the only divine quality of man.

– Arthur Schopenhauer, *The World as Will and Idea* (1907 [1818])¹²⁴

“In a way,” the cataclysm always already lies in wait: inconceivably far upstream, potentially ever-present, and incalculably consigned to eventuate by forces already set in motion at an undisclosed location. The danger in giving the cataclysm an amorphous quality is that it then threatens to subsume all events and likelihoods, from those that emanate through forces beyond the reach of blame, to those catalysed by humans, whether accidental or intentional.

For the contemporary nature writer Robert MacFarlane, a flat ontology like that in *Melancholia* is no means for obviating human guilt. In relation to his 2019 book *Underland: A Deep Time Journey*, he cautions:

There is a perilous comfort to be drawn from deep time. An ethical lotus-eating beckons. What does human behaviour matter when *Homo sapiens* will have disappeared from Earth in the blink of a geological eye? Viewed from the perspective of deserts or oceans, morality looks absurd, crushed to irrelevance. A flat ontology entices: all life is equally insignificant in the face of eventual ruin.¹²⁵

However, viewed from the perspective of the tortoise we have flipped onto its back, morality ceases to be absurd, and the Dour becomes embroiled in the imbroglgio of human destruction of the more-than-human world. The upturned tortoise in the desert is the “event of our time” – it is an actuality, not an eventuality of “eventual ruin.” Further, even the time taken to describe this event has borrowed from time we never had in the first place. It was a luxury that could be ill-afforded at the best of times, let alone now, when, as Greta Thunberg puts it “the house is on fire. I am here to say, our house is on fire.”¹²⁶

¹²³ Kierkegaard, *Either/Or: A Fragment of Life*, 43.

¹²⁴ Schopenhauer, *The World as Will and Idea*, 42.

¹²⁵ Robert MacFarlane, “What Lies Beneath: Robert Macfarlane Travels ‘Underland,’” *The Guardian*, 4 April 2019, accessed 1 July 2019, <http://www.theguardian.com/books/2019/apr/20/what-lies-beneath-robert-macfarlane>.

¹²⁶ Greta Thunberg, “Our House Is On Fire,” transcript of speech delivered at the World Economic Forum, Davos, Switzerland, 25 January 2019, accessed 6 May 2019, <https://awpc.cattcenter.iastate.edu/2019/12/02/address-at-davos-our-house-is-on-fire-jan-25-2019>.

Equanimity for MacFarlane is not found in the enticements of such a flat ontology. Immediately following, he stresses that “we should resist such inertial thinking; indeed, we should urge its opposite – deep time as a radical perspective, provoking action not apathy.”¹²⁷ While MacFarlane is talking about recognising human guilt in catalysing the unfolding rupture, a great danger lurks when conflating the agency that caused the rupture with the agency that seeks to remedy it. While the danger is eminently self-evident, the response to it determines who takes leave of the Dour, to adopt a dire mindset instead.

Those who resist a dour demeanour and the abandonment it implies in favour of a dire posture ask: what course of action could be remotely commensurate with the forces at play? What manner of human agency actually exists to send Melancholia on a trajectory to skirt earTheia, or suppress Yellowstone’s bulging magma from puncturing earTheia? At this late hour of an inherently meaningless and futile universe, has it not only ever been empty gestures? In essence, this is like McCarthy reacting equally to destructive forces as diverse as thermonuclear war or a supervolcano eruption with the same response: “the whole thing now is, what do you do?”

The answer that may and/or may not be serious harks back to the common denominator between Larson’s dinosaurs and their dour demeanour: comedy. Albeit with the same amorphous quality von Trier gives to his “happy ending”: it only exists “in a way.” In *The Comedy of Survival*, Joseph Meeker agrees with MacFarlane’s admonishment of morality, but still in a way resists the enticements of a flat ontology. Comedy, he argues,

is careless of morality, goodness, truth, beauty, heroism, and all such abstract values men say they live by. Its only concern is to affirm man’s capacity for survival and to celebrate the continuity of life itself, despite all moralities. Comedy is a celebration, a ritual renewal of biological welfare as it persists in spite of the reasons there may be for metaphysical despair.¹²⁸

But how can we celebrate continuity when extinction attests to so much discontinuity? Ironically, one of the few answers Darwin did not provide in *On the Origin of Species* is how species actually originate. Instead, he inferred such from how species transform into different species over time. Such a frame of reference cares little for Meeker’s “metaphysical despair” or MacFarlane’s “eventual ruin.” It does not kowtow to the Court Jester’ evolutionary chaos, but instead to the Red Queen’s evolutionary war games. After all, the Red Queen is there each and every day in every moment, whereas the Court Jester makes infrequent and un-

127 MacFarlane, “What Lies Beneath.”

128 Meeker, *The Comedy of Survival*, 33.

announced arrivals that may reset the game, but then leave the players to devise new rules in the struggle for existence.

Not only does Darwin mention “the struggle for existence” more than 40 times in *Origin of Species*, he also uses the phrase as the title of chapter three. Nine years prior to Darwin’s publication, Alfred Lord Tennyson expressed a similar demeanour, describing nature as “red in tooth and claw”¹²⁹ in his poem *In Memoriam A. H. H.* And two centuries prior to that, Thomas Hobbes surveyed the societal landscape of the House of Tudors, including Queen Mary’s reign, surmising in 1651 that human life outside the conventions of societies formed in the modern period would be “solitary, poor, nasty, brutish, and short.”¹³⁰

At the heart of all these appraisals is a deep pathos that claims the natural order of things is suffering and violence. These demeanours persist into contemporary evolutionary biology, with Richard Dawkins employing Tennyson’s “Nature, red in tooth and claw” in his 1976 book *The Selfish Gene*,¹³¹ to present a case of evolution as being survival of the fittest. More recently, in his 1995 book *River out of Eden*, Dawkins lays bare the playpen animal that life exists within:

The total amount of suffering per year in the natural world is beyond all decent contemplation. During the minute it takes me to compose this sentence, thousands of animals are being eaten alive; others are running for their lives, whimpering with fear; others are being slowly devoured from within by rasping parasites; thousands of all kinds are dying of starvation, thirst and disease. It must be so. If there is ever a time of plenty, this very fact will automatically lead to an increase in population until the natural state of starvation and misery is restored.¹³²

Dawkins is referring to an atemporal view of life. This still holds true during the tenure of *homo sapiens*, but we must now add that “the total amount of suffering” for animals is wilfully, callously, and exponentially increased by everything from hunting, fishing, and all other means by which humans devour the more-than-human-world, through to destruction and pollution of habitats and so-called civilisational psychopathologies such as factory farming, racing animals for sport, and zoos.

If there is comedy to be found in Dawkins’ atemporal view, it is only in the folly of continually projecting anthropocentric views onto life-at-large. True that

129 Alfred Lord Tennyson, *In Memoriam A. H. H.* (London: Edward Moxon, 1850), Canto LVI, line 15.

130 Thomas Hobbes, *Leviathan* (London: Bloomsbury Publishing, 2006 [1651]), 12.

131 Richard Dawkins, *The Selfish Gene: 30th Anniversary Edition* (Oxford: Oxford University Press, 2006 [1976]), 53.

132 Richard Dawkins, *River Out of Eden: A Darwinian View of Life* (London: Hachette, 2014), 154.

here, Dawkins attempts to decentre the anthropos in favour of a biocentric view. But he does not go beyond this to a zoocentric view, where the bios of “animals . . . being eaten alive” and “rasping parasites” make way for the zoe- of microbial life whose existential experience (which often takes place in conditions so extreme as to exclude every other form of life) is on a plane so utterly alien that all concepts of things like “suffering” must be put aside.

So, also setting aside the perennial quest to transcend the now in favour of the eternal, and the anthropocentric in favour of the zoocentric, we are recalled back to the present tense and recall that the cold comfort of a flat ontology was always an unaffordable luxury for that very same present tense. Thus far the story has been set in the safety net of the past, and in a version of the near present that has studiously avoided the extent of human culpability for catalysing the unfolding rupture. Suitably out of reach of the present tense, and thus only relevant insofar as it shows how we got this far. All other things being equal, our story could stop here in a present day that eschews the tortoise flipped by the cumulative consequences of human industrial activity.

But all other things are not equal, because now the question arises: would the Dour still be the default demeanour if the Dire and the Dice could be discounted? Or is it merely a comforting catastrophism, retrofitted to mask an abhorrence of the present tense, and the future horrors it is begetting? This is the continuation of the small journey sung in these pages, and in any eventuality, just as the past gives way to the present, the surprise arrival of J002E3, like that of the desert tortoise, brings the Dour into cold relief against the Dire.

When J002E3 showed up, it also showed up the conceit of expectations built around predictability and periodicity. In a nutshell: it should not have been. No new satellite was anticipated, because all had been shaken off by earth’s orbital perturbations. Not here, not now, and not with such eccentric behaviour. If the last time a given event actually happened was 4.34 billion years ago, then it is not expected to happen all that often in the timescale of a solar system, or even a galaxy, let alone a single planet. The question remained: *how on earth, on Earth* was J002E3 then becoming captive to earth’s orbit?

The answer revealed an all-too-human genesis for the wayward body: it was becoming geocentric because . . . we put it there. Albeit by wayward intention meeting ‘shift happens’: J002E3, aka the Saturn V booster rocket from the Apollo 12 moon mission. The intention, after it had successfully powered the 1969 moon landing, was to cast the booster into heliocentric orbit. However, a guidance system error meant the 10,000-kilogramme detritus instead orbited earth for two years, until escaping by becoming heliocentric.

When Saturn V was ejected from earth’s orbit, the trajectory modelling heavily discounted the probability of its return. 1971: we thought we had seen the

last of it. In the same year earth began trapping more solar heat than can be radiated back into space we also started waywardly throwing space junk at the sun. 2002: heralds the return of a wayward creation to confront its creator, like Frankenstein's monster, or *Bladerunner's* Roy Batty. Or perhaps, given the magnetic forces involved, something more comic, like the Return of the Son of Monster Magnet, spawn of Frank Zappa's band, The Mothers of Invention, on their album *Freak Out!*¹³³

In 1971, the *New World Coming* was catalysed. But even by the time J002E3 was discovered in 2002, few were willing to grasp the fact that this rupture had been unleashed. In this new world, wayward intentions come back to haunt us in ways that exceed our wildest expectations. So too in all worlds subject to cosmic forces outside our influence or control. Predictability and periodicity were never at home in any world, least of all in new worlds coming.

However, J002E3 did not turn out to be the next 'whenever' of a Chicxulub, nor *Melancholia* by another name. Nor did it harbour the patricidal rage of prodigal sons Roy Batty or Frankenstein's monster, returning to confront their respective makers. J002E3 is the rupture, the "Relentless/Invisible/Indefatigable/Indisputable/Udeniable" rupture writ large. Thom Yorke goes on to ask "So how come it looks so beautiful?/How come the moon falls from the sky?"¹³⁴

To answer his first question: the rupture may look "beautiful" because it is the awe-inspiring, uncanny, and sublime monster created as a by-product of civilisation so-called. Which, like Frankenstein's monster, we must somehow come to love, even though we find it abhorrent and now wish we had never created it in the first place. Making morals from the abysmal morale of that story will be the onerous task of the Dire. To answer Yorke's second question: "the moon falls from the sky" for the same reason the sun holds it up. Which is for no rhyme or reason at all. Shift happens, but our twofold challenge is to disambiguate the shift that has always happened, whose beauty mesmerises us with the power of a moonrise or sunset, from the shift that has happened because of us.

At first, we may have marvelled at J002E3's surprise arrival in geocentric orbit, and the surprise arrival of the tortoise's entrance into the desert. Now, however, we sombrely understand that both events happened with distinctly anthropogenic twists and turns. The unpredicted return of inert matter, whether rocks or rocket ships, barely hints at Clark's "conditions of unknowability." Yet the prospect of the prodigal sons returning shows how much more unpredictable matter becomes when it becomes alive. Saturn V is no less a monster, not because a 10,000-kilogramme metallic

133 The Mothers of Invention, *Freak Out!* (Verve Records, 1966), LP.

134 Thom Yorke, "And It Rained All Night," track 7 on *The Eraser* (XL, 2006), LP.

object can bring significant harm to bear, but because its behaviour throws into comic relief the conceit of periodic or probabilistic mindsets when reality is in fact stochastic processes all the way down. From little things, big things grow. From little things, big things growl.

Having eccentrically danced a 15-month lure around earth, on 14 June 2003, J002E3 was slungshot back out into deep space proper, into heliocentric orbit, returning back via Lagrange Point One, passing by at almost the exact same point above that it had traversed on its way in. (With the caveat that there is no such thing as above, just as there is actually no such thing as the same point in space over time.) Currently J002E3 is on hiatus somewhere on the yonder side of the sun, until it twists, turns, and re-returns to earth in 2041.

Our trajectory so far has charted a J002E3-like path, full of eclectic and eccentric twists and turns, and digressions into darkness and the eternal void of an inherently meaningless universe, only to turn back upon our home planet through flybys that delve deep into the subject of life itself. And then to be repulsed again, venturing away at a permanently insufficient escape velocity, only to be lured back in by the gravitational thuggery of earth itself.

That past is now done and dusted: ashes to ashes, dust to water. The Dour remains always ever present, but the Dire and the Dice turn instead to the present and future respectively. Act II concerns the period between when J002E3 left geocentric orbit in 1971 and returned in 2002, while Act III concerns the period between when it next left geocentric orbit in 2003, and will next return in 2041. The world J002E3 returns to will be radically re-configured in any eventuality, the only question is how, and by what? If the Dour is abandoned in favour of the Dire and thus the Dice, what J002E3 returns to in 2041 will be a planet heavily configured by radically experimental technoscientific conservation deployed in the meantime against the unfolding rupture.

“ . . . and you see a tortoise, it’s crawling toward you . . . ”



Fig. 7: New World Coming: Transporting Saturn S-IVB Third Stage, aka J002E3, for the Apollo 12 mission, United States of America, 1969.

ACT II: **THE DIRE**

IV

And Now for Something Completely Indifferent . . .

“ . . . you reach down, you flip the tortoise over on its back.”

In a nutshell:

The Limits to Growth v The Limits of Growth >

Humility v Hubris >

Global Warming v Global Warmongering >

The Abyss v The Abysmal >

Comedy v Tragedy >

Burst Bubbles



Fig. 8: Anthony Schongauer, *The Temptation of St. Anthony*, c. 1470–1475.

The Immortal Game

If we are indeed teetering on the edge of a massive change in how we live, in how human society itself is constructed, and in how we relate to the rest of the world, then we were led to this point by the stories we have told ourselves – above all, by the story of civilisation . . . What makes this story so dangerous is that, for the most part, we have forgotten that it is a story. It has been told so many times by those who see themselves as rationalists, even scientists; heirs to the Enlightenment’s legacy – a legacy which includes the denial of the role of stories in making the world.

– Paul Kingsnorth and Dougald Hine, *Uncivilization: The Dark Mountain Manifesto* (2009)¹³⁵

When Charlie Chaplin danced atop his desk as *The Great Dictator*, he threw a plastic inflated sphere-of-earth into the air in a song-and-dance routine of a tyrant reigning over the world as if it were his oyster.¹³⁶ The joke fell heavy on Chaplin’s contemporaneous audience, laughing, as it were, at a comedian satirising Hitler while World War Two played out in the background. The target of Chaplin’s satire is as unobvious as it is perturbing, but it misses the joke about how such tyranny ultimately acquiesces to, rather than circumvents, the vicissitudes of the cosmos.

True that tyranny posed an ever-imminent existential threat in both the subject of the film, as well as its 1940 time of creation, and that both the subject and the time were palpably dire. True that tyrants have been reigning with such flagrant disregard for life and limb since well before Queen Mary Tudor, but the publicity still for Chaplin’s tragicomedy captures a deeper truth that transcends the all-too-human focus of the film. Facing down the inflatable sphere as if it were a *Melancholia* approaching earth, his eyes happen to gaze directly at the map of Panama on the sphere, the site of the planet-altering rise of the Panama Isthmus and, there in the coast off Mexico, also the site where Chicxulub made landfall. In satirising the human-scale catastrophe of war that had thrown the whole world into panic, Chaplin gazed, just for a moment, straight at what an actual rupture on the planetary scale looks like.

The “upstream cataclysm” by way of the Panama Isthmus closure and all its cascading consequences, or Chicxulub’s descent in one fell swoop, speak to that which a dire demeanour ultimately denies, too preoccupied at it were with being petrified about human-scale disasters that threaten the social limits to life. Chaplin is not only looking at a political map that has divided the earth into named territories, but one which has no vertical or voluminous dimension: a caricature

¹³⁵ Paul Kingsnorth and Dougald Hine, *Uncivilisation: The Dark Mountain Manifesto* (Oxford: Dark Mountain Books, 2009), 10.

¹³⁶ Charlie Chaplin, director, *The Great Dictator* (United Artists, 1940), 35 mm.

of the planet touted by those who proclaim “My name is Ozymandias, king of kings/Look on my works, ye Mighty, and despair!”¹³⁷

Tyranny and the ceaseless wars it spawns in order to define which parts of the world fly under what tribal flags may seem all-consumingly dire. But the social limits to life, no matter how punitive and despotic, are ultimately only a subset of the biophysical limits to life. Social limits may confront us daily and seem to command an unflinching response from us: we stare them down in order to comprehend them, but this is a worldview that misses the joke entirely. As Paul Kingsnorth and Dougald Hine lament, “the story of civilisation” is precisely “so dangerous” because “for the most part, we have forgotten that it is a story.”

Act II: the Dire is the song-and-dance routine of remembering that civilisation is just a story. It deals with both that coming of age, and our coming to terms with coming of age in the moment when “the story of civilisation” becomes comprehended for what it is (a story) and civilisation becomes comprehended for what it is (a myth). The moment when the social limits to life that dominate a dire demeanour prostrate themselves before the biophysical limits to life that they were always beholden too to begin with. And to end with.

To sing the song of how the universal sigh acquired a distinctly human twist is to stare unflinchingly at this “pretty bleak” picture, composed as it is of us flipping the desert tortoise and making an earTheia that was already dour (unfathomably changeable, chaotic, and unknowable) dire to boot. The present tense finds us standing smack bang in the middle of an audience being told, as the dinosaurs gathered before Stegosaurus were, that the picture really is “pretty bleak”: after all, the composition in question paints us out of the picture altogether, just as Chicxulub did for Stegosaurus’ dinosaur audience. Then, the joke was on them. Now, the joke falls on us, though we are both the joke and the butt of it to boot.

This human twist to the tale tells of how the third and first parts of the universal sigh came to reveal just how dire the present tense is. First, through a sigh of comprehension, when our brain “about the size of a walnut” cracked open to the fact that the current destabilisation of the world’s climates was due to the consequences of human industrial activity. In this inhalation and exhalation of the universal sigh, though, the walnut-crack differs from the Stegosaurus’ lament that “the mammals are taking over,” because this time around one mammal has called game over for all and sundry.

The Dire is a posture that pits our walnut shell against the World Turtle in order to unfurl this human twist from the universal sigh. It is what happens when you not only reach down and “flip the tortoise over on its back,” but when

137 Shelley, “Ozymandias.”

you also comprehend that you flipped it, and with it, the World Turtle, amidst all manner of dour changeability and dire consequences for the more-than-human world. The Dire adds insult to the injurious revelations of The Dour, making it a *postcautionary* tale for three blind mice who come to realise *they* enraged an entity that they now cower before, and also realise rather too late that a *precautionary* principle must have passed them by-the-by.

That precautionary principle is then replaced by a worldview of human-caused problems begetting human-caused solutions: rather than the principle forsaken by the blind mice, this offers a ludicrous *precautionary* tale for a *postcautionary* crisis. As Wendell Berry cautioned in 1983, it is

always the assumption . . . that we can first set demons at large and then, somehow, become smart enough to control them. This is not childishness. It is not even ‘human weakness.’ It is a kind of idiocy, but perhaps we will not cope with it and save ourselves until we regain the sense to call it evil.¹³⁸

Whereas climatologist Wallace Broecker put it even more bluntly, way back in 1987: “if you’re living with an angry beast, you shouldn’t poke it with a sharp stick.”¹³⁹ Having unleashed Frankenstein’s monster or Tyrell’s replicant minions, the Dire chooses to misconstrue the truth of the situation, proposing to make a home on earTheia by playing house alongside these new bedfellows we created and the old bedfellows who evolved alongside us and are now dying in multitudes by our hand.

While the Dour celebrates how the universe is rife with its own demons, whether the ‘angry beast’ that is the intrinsic volatility of the climate, the Court Jester or Red Queen dancing aboard the chessboard of evolutionary mechanics, or any number of any number of Chicxulubs, the Dire and the Dice prefer to avoid looking at such naked truths. All three postures lament that civilisation so-called has poked the angry beast with a sharp stick, so that we quiver now like the three blinded mice in anticipation of our comeuppance. Though only the Dire and the Dice seek means to contain this beast or demon. The former believes it can placate the angry beast with soothing words, using the slow vocabulary of global environmental policy and governance. The latter wants to coax the demon back into a vessel of containment, by manipulating the biophysical environment itself, as if the demons can either be coaxed back inside earth, or exorcised out of the atmosphere through an uncorked hole in the sky that dissipates excess heat.

¹³⁸ Wendell Berry, *Standing by Words* (San Francisco: North Point Press, 1983), 65.

¹³⁹ Wallace Broecker, “Unpleasant Surprises in the Greenhouse?” *Nature* 328, no. 6126 (1987): 124.

While a dour demeanour is premised on fidelity to the full gamut of cosmic changeability and its consequences, a dire or dice demeanour seeks to wager with this premise, assuming we can “become smart enough to control” the demons. Meanwhile the Dour just continues to exhale and inhale the universal sigh in spades, because it refuses to endorse either posture *per se*, finding any and all to be nothing but empty gestures. Nor does it find any favour in the slimmest prospect of their success, resulting in a *Blade Runner* world of human survival on a ravaged planet filled with artificial animals to replace those that humans drove to extinction.

But the devil, as they say, is in the details, and this even applies to “demons at large.” Here, all the heady, intellectualising pontification of the Dour gives way to everyday experiences of the now, or at least living memory. If the Dour is the subtle details of the cosmos on phenomena largely imperceptible to our myopic sensibilities, the Dire is the blunt force trauma of everyday Western urban life, where the cosmos has appeared to fade into the obscurity of light pollution, amidst lives in all-too-human-dominated anthromes, meaning biomes where anthropos now dominates an ecosystem. And from these living and recently-lived moments the Dire’s purview of the social limits to life is folded into the biophysical limits to life, the dominion of the Dour. The plastic earth sphere in Chaplin’s tragicomedy of *The Great Dictator* is folded into the actual earth that it purports to map.

In Part IV the lived experiences that flesh out the Dire (not to mention the devil that lives within them) are set within New York City. The Big Apple makes for a telling stage for the story of how we wound up in the desert and flipped the tortoise. There in Manhattan we find our feet, aided by three stories that share the idea of a bubble: one tale of audacious architecture, another of nuclear holocaust satire, and finally, a sacrilegious situation comedy. Each vignette opens up part of the portal to how the tortoise got flipped, using the city which stands as the epicentre of capitalism as a stand-in manifestation of the flipping.

Together these Manhattan stories reveal how our present tense world came to be turned upside down over the course of three successive generations, represented by an architect/designer/engineer/inventor, a filmmaker, and a comedian (all white, all male, and all American, in keeping with the usual suspects for catalysing the rupture). Starting with architecture to encase the city in a glass bubble; onwards ever on war towards to a film that eviscerates a bomb capable of obliterating the bubble and with it, the world; and ending with a 1990s sitcom about a society that intelligently and deliberately forgot that an earth exists outside the intoxicating bubble of its narcissism.

These stories tease the demon out from its bubbles of containment, each by unearthing something about the sky: things that come from and are put into the sky, things that fall from the sky, and finally, how the demon’s escape into the sky

has transformed the atmosphere not only in the here and now, but also in time stretching far beyond the event horizon.

Just as the sky is the melting pot and the meeting point between local actions and global consequences, and between now and forever, Part V takes leave of the US, to consider global responses to the World Turtle once its flipping became a worldwide affair. Therein recounting attempts to “become smart enough to control the”¹⁴⁰ demons by word and deed, that is through international climate and environmental policy. Wherein the attempt to outwit the World Turtle via the third part of the universal sigh finds its full expression, riding up against the limits ushered in when Stegosaurus says “we all have a brain about the size of a [rockmelon, née] walnut.” This expression has telling repercussions for those who marry their comprehension of the world with a desire to intentionally shape its changeability.

Having thus established that the *we* concerned encompasses all solar subservient lifeforms on earth, the final Part VI of Act II: the Dire re-visits the social and biophysical limits to life, this time in a biosphere rendered precarious by civilisation so-called. Collectively, Act II charts the journey from Accident (we did not know what we were doing but we did it anyway); to Intention (we knew what we were doing and we did it anyway); and grappling with Intervention (we do not know what we are doing but we want to do it anyway). To begin in Manhattan, though, we must first find the demon contained (literally) in a bottle across the pond in England, with a microcosmic earth-within-a-house-built-upon-the-earth . . .

Life in a Glass Greenhouse

We are passing through a unique phase of human history when, for the first time ever, we consciously connect events that happen on vast, geological scales – such as changes to the whole climate system of the planet – with what we might do in the everyday lives of individuals, collectivities, institutions, and nations.

– Dipesh Chakrabarty, “Anthropocene Time” (2018)¹⁴¹

Events, we might say, are temporizing: they provide or give the experience of passing time . . . In this way, time – and the processes of becoming that are inherent to temporization – also involve a kind of violation: a rupture with preexisting states of affairs, pathways whose opening precludes other trajectories. If this intrinsic violence is constantly enacted in the minor but consequential durations of daily life, it can be truly cataclysmic once we scale up to

¹⁴⁰ Berry, *Standing by Words*, 65.

¹⁴¹ Dipesh Chakrabarty, “Anthropocene Time,” *History and Theory* 57, no. 1 (2018): 6.

the times and spaces of the Earth . . . That we experience eventful time as erupting, irrupting, interrupting suggests memories of those ruptures that our planet delivers now and again.
 – Nigel Clark, Alexandra Gormally, and Hugh Tuffen, “Speculative Volcanology: Time, Becoming, and Violence in Encounters with Magma” (2018)¹⁴²

On 17 April 1960 an electrical engineer and gardening enthusiast named David Latimer made a Do-It-Yourself terrarium for his home in Lancashire, England. He placed soil, water, and four plant species inside a ten-gallon glass sphere, which became a Closed Ecological System once he fastened a customised cork plug in the sole opening. It transpired that of the four plants, only the spiderwort could survive in the sealed bubble, giving it a monopoly for expanding into newly available ecological niches.

Latimer’s notionally self-sustaining terrarium scales down planetary limits to life to “the everyday lives of individuals” during a time that Chakrabarty terms “a unique phase of human history.” The limits reveal themselves in the domestic sphere of Latimer’s terrarium because, as its creator remarks, “it is the definition of low-maintenance. I have never pruned it; it just seems to have grown to the limits of the bottle.”¹⁴³ Yet the more pressing limits to growth, and thus limits to life, are not those imposed by the bottle, but those posed by matter and energy circulation at play in this microcosmic earth-within-a-house-built-upon-the-earth.

Having expanded to reach along the inside perimeter, spiderwort growth becomes limited by the supply of carbon dioxide emitted by soil bacteria as they break down oxygen emitted by living and composting leaves. Material exchanges are looping circuits between soil (as lithosphere), water (as hydrosphere), and air (as atmosphere). Circuitous exchanges between these spheres mean that growth by the living is conditional on myriad trade-offs with the non-living, and vice-versa. For the spiderwort, this means growth cannot outpace those nutrients, water, and gasses on offer in the surrounding litho/hydro/atmo-spheres.

Inside any closed system, whether Haacke’s *Condensation Cube* or Latimer’s terrarium, no additional water or oxygen can be created beyond that which was present at the moment the system was sealed. Except that including life within a closed system means that abiotic components may vary in volume via metabolic conversion, as bacteria and plant do. The spiderwort’s growth in Latimer’s closed system thus faces a host of limits, as do the bacteria, soil, water, and air.

¹⁴² Nigel Clark, Alexandra Gormally, and Hugh Tuffen, “Speculative Volcanology: Time, Becoming, and Violence in Encounters with Magma,” *Environmental Humanities* 10, no. 1 (2018): 276.

¹⁴³ Laurie Balbo, “50 Year Old Record-Busting Bottled Terrarium – And It’s Not from Dubai!”, *Green Prophet*, 29 May 2013, accessed 16 June 2016, <http://www.greenprophet.com/2013/05/terrarium-david-latimer>.

The energetic realm poses distinctly different limits to growth, because solar radiant energy passes through the sphere's membrane, whereas matter cannot. Incoming solar radiation is not a circuit of trade-offs like the material realm, but an incessant irruption from the world outside the sphere, to the world within. At play here is a microcosm of earth with its intrinsic circulations of living-to-non-living-matter-and-back-again, as well as its extrinsic entanglements with stellar energies.

Entering a house as sunlight, a stellar dimension streams through the membrane of a lounge room window, making the terrarium a microcosm of how Closed Ecological Systems are incessantly open to energetic flows from the cosmos. Just as a pebble thrown across the lounge room would bounce off the glass sphere, whereas a brick would shatter it into an Open Ecological System, so too does earth's atmosphere prevent material intrusions, unless they are so large as to penetrate the planet's membrane. Were a J002E3-sized object to make a straight course for terrestrial impact, it would disintegrate via atmospheric friction, whereas a Chicxulub would make it to (and through) the terrestrial surface.

Growth, and its limits, bring these entanglements to the fore: of energy disequilibrium between a sphere-as-container and that-which-it-is-contained-within, whether bubbles planetary or domestic. For Bataille, these entanglements express his second "Law of General Economy," titled "The Limits of Growth":

Life suffocates within limits that are too close; it aspires in manifold ways to an impossible growth; it releases a steady flow of excess resources, possibly involving large squandering of energy. The limit of growth being reached, life, without being in a closed container, at least enters into ebullition: without exploding, its extreme exuberance pours out in a movement always bordering on explosion.¹⁴⁴

While Latimer's terrarium renders this palpable, Bataille speaks of the limits of the biosphere – the "closed container" within which life "aspires . . . to an impossible growth."

So far this scenario is merely another manifestation of the Dour – Latimer's terrarium was indeed catalysed by human action, though the experiment presents no demons, as it instead sings of the limits to life in Open versus Closed Ecological Systems. The terrarium can, however, also be seen as a microcosm of the Dire when it is read through the lens of Bataille's work on planetary energy disequilibrium as a by-product of civilisation so-called.

After all, his "Laws of General Economy" herald from *The Accursed Share: An Essay on General Economy*, commenced in 1946 under the shadow of the "extreme exuberance" of the previous year's atom bombs, whose ebullient conversion of

144 Bataille, *The Accursed Share*, 18.

mass to energy indeed poured out in a movement that did not merely border on explosion.

In order to situate the human sciences in their cosmic context, Bataille analysed the political economy and the biosphere in relation to one another. He was, as Nigel Clark remarks, a “prophet of open and complex systems” that “do not settle into an equilibrium state,”¹⁴⁵ such as eviscerating restrictive economics into energetic flows at the “scale of the universe.”¹⁴⁶ For Bataille, such openness is here, there, and everywhere our worldview sees fit to comprehend: “What is before me is never anything less than the universe; the universe is not a *thing* and I am not at all mistaken when I see its brilliance in the sun.”¹⁴⁷

Bataille would probably have been less interested in the seeming closure of Latimer’s terrarium to the cosmos than he would have been in the ways that it, as synecdoche for life on earth, is periodically ruptured. Twelve years after its 1960 closure the terrarium experienced its first and only such “rupture with pre-existing states of affairs” in Clark, Gormally, and Tuffen’s sense of “eventful time as erupting, irrupting, interrupting,” when it was momentarily uncorked and watered in 1972, after which it has been kept closed, according to Latimer, “as an experiment.”¹⁴⁸ Aside from this one “kind of violation,” the only external variables have been exposing different sides to the sun through periodic rotation.

The same cannot be said for the planet on which the terrarium sits, which has experienced an irrevocable “rupture with pre-existing states of affairs.” Unlike Latimer’s terrarium, which has in effect maintained an energy equilibrium since it was last ‘reset’ in 1972, earth entered a *New World Coming* in 1971, courtesy of shifting into net positive energy imbalance. Scaling up from Latimer’s terrarium to the planet-on-which-it-resides, this momentary “eventful time” palpably illustrates how life’s “intrinsic violence . . . can be truly cataclysmic once we scale up to the times and spaces of the Earth.”

At play here is the microcosm of Latimer’s terrarium and his surrogate orbital spin of the globe, housed within the mesocosm of a domestic lounge room, housed within the macrocosm of the entire planet. All three herald from a cosmos that Bataille preached humility to, especially in dealings with ever incessant excesses of

145 Bataille, *The Accursed Share*, 33.

146 Georges Bataille, quoted in Asger Sorensen, “On a Universal Scale: Economy in Bataille’s General Economy,” *Philosophy & Social Criticism* 38, no. 2 (2012): 170.

147 Bataille, *The Accursed Share*, 57 (emphasis in original).

148 David Latimer, quoted in David Wilkes, “The Sealed Bottle Garden Still Thriving After 40 Years Without Fresh Air or Water,” *Daily Mail Online*, 24 January 2013, accessed 16 June 2016, <http://www.dailymail.co.uk/sciencetech/article-2267504/The-sealed-bottle-garden-thriving-40-years-fresh-air-water.html>.

solar energy (and in the absence of any leverage over the globe's orbital spin, or a cork to uncork the net positive energy imbalance from the atmosphere).

Latimer practiced the bare minimum of servicing for his microcosm: following planting, no pruning or other material interventions, save for that singular instance of watering in 1972. Bataille preached even less intervention, decrying that any civilisation grappling with solar energy would become tethered to the inherent excesses of cosmic forces. As with the spiderwort, pushing at the limits of its vessel of containment to seek out more sunlight, life on earth is the beneficiary of how the sun “gives without ever receiving”¹⁴⁹ in terms of the solar radiant energy that it rains down, as Bataille gently reminds us.

But there is also an opposing worldview at play here: the dire demeanour, premised on hubris rather than humility when dealing with scarcity and excess. This could apply to the microcosm of Latimer's terrarium, the mesocosm of his lounge room, or the macrocosm of Bataille's cosmos. In all cases, a dire mindset seeks to service the earth as if it were reducible to the elements of Latimer's terrarium. The Dire seeks a measure of control over that which is chaos: not just that which has been rendered chaotic by human industrial activity, but that which is chaotic in-and-of-itself.

This particular demon was set free in the Big Apple via a domestic bubble built to deal with scarcity and excess, as seemingly innocuous as spiderwort making its home in a terrarium. Though in actuality the domestic sphere was a mesocosmic earth-within-a-house-built-upon-the-earth, whose ethos heralds from the Cold War depths of Manhattan Project-inspired weather modification.

The Manhattan Project

There is no Plan B and the bubble, it turns out, is where we have been living all the while. The bubble is that delusion of isolation under which we have laboured for so long . . . The bubble is civilisation.

– Paul Kingsnorth and Dougal Hine, *Uncivilisation: The Dark Mountain Manifesto* (2009)¹⁵⁰

“Man,” I cried, “how ignorant art thou in thy pride of wisdom!”

– Mary Shelley, *Frankenstein* (1818)¹⁵¹

On 19 April 1960, two days after Latimer planted his terrarium, American designer/engineer/inventor Buckminster Fuller installed all the walls and the ceiling

¹⁴⁹ Bataille, *The Accursed Share*, 28.

¹⁵⁰ Kingsnorth and Hine, *Uncivilisation*, 7.

¹⁵¹ Shelley, *Frankenstein*, 364.

of a home for himself and his wife Anne Fuller in Carbondale, Illinois. The home, his first domestic geodesic dome, was based on a semi-permeable energy-matter membrane between the world-within and the world-without, like Latimer's terrarium. The structure obtained and retained maximal energy efficiency through both this membrane and its spherical shape, as Fuller's overarching design ethos was premised on energy scarcity, not excess.

Fuller's ethos stands in polar opposition to Bataille's "Limits of Growth," regarding the radiant solar energy surfeit in Latimer's terrarium-as-microcosm, or planet-as-macrocosm. Despite being born only two years apart, in 1895 and 1897, Fuller and Bataille viewed the accelerating social, cultural, economic, and technological calamity of the twentieth century in diametrically opposing ways, respectively preaching hubris versus humility, scarcity versus excess, and control versus chaos.

In contrast to Bataille, Fuller advocated for mediating in stellar energetic forces, not only in terms of Fichte's notion of how "we build our houses on the earth" that rests on the World Turtle, but in how "we build . . . the earth" itself. Five months after building his geodesic dome home, Fuller unveiled his most provocative and infamous design for such mediation, created in collaboration with Japanese architect Shoji Sadao. *Dome Over Manhattan* proposed a 3.2-kilometre-wide and 1.6-kilometre-high hemispherical dome to encase the city between the East to the Hudson rivers along the midtown breadth, running from 21st to 64th Street along the peninsula.

Commencing at the height of an average skyscraper and tethered to the ground by cables, the tensegrity structure of wire-reinforced shatterproof glass would have been lighter than surrounding air, making it float skyward due to the push from warmer air within. Energy efficiency was again a dictate, wherein the greenhouse effect would create one uniform microclimate that centrally heated or cooled the entire area inside. Through such a membrane and its spherical shape Fuller laid claim to not only save further energy combustion by obviating all individual building heating and cooling, but to also reduce air pollution in so doing.¹⁵²

Unveiled in the *Visionary Architecture* exhibition at the New York Museum of Modern Art (MOMA) from 29 September to 4 December 1960, the work was represented by aerial photographs showing the dome superimposed over Manhattan. Barriers between fact and fantasy became blurred all the more by the exhibition sighting, since the depicted structure would have enclosed the MOMA building it was presented in. Through a *Dome Over Manhattan* the world-as-artefact becomes a world-as-artwork. Moreover, the-world-as-artefact falls under the hubris of

152 Alden Hatch, *Buckminster Fuller: At Home in the Universe* (New York: Hatch, 1974), 230.

human intention: the press release described *Dome* as a “controlled climate.”¹⁵³ Latimer’s terrarium responds to this statement by questioning who is controlling this climate, while Bataille might have added: by what means?

Two days after *Visionary Architecture* opened, the conflation between artefact and artwork came into effect when a smaller-scale biosphere was unveiled at Missouri Botanical Garden, on 1 October 1960. The dome was a landmark in the history of geodesic architecture, and the first to be used as a conservatory. Although not designed by Fuller, the architects Murphy and Mackey acknowledge “incorporating the principles of R. Buckminster Fuller” as “inventor of the geodesic system.”¹⁵⁴

The conservatory is a hybrid of Latimer’s microcosmic terrarium and Fuller’s planetary scale *Dome*. Inside an enclosed sphere a veritable ark of cultivated biodiversity uses the greenhouse effect to foster a tropical jungle simulacrum in temperate Missouri. Ironically, this ostensibly Closed Ecological System also featured the world’s first completely air-conditioned greenhouse. The architects went so far as to trademark their design *Climatron* in order “to emphasize the climate-control technology of the greenhouse dome.”¹⁵⁵

This is how the demon escapes such seemingly Closed Ecological Systems, because controlling the climate internal to the sphere required a destabilisation of the planet’s climate external to the sphere, via fossil fuel combustion to provide the energy for air-conditioning. Thus, the remainder of this equation is the fact that a mesocosm *Climatron* collectively induces an out-of-control climate in the macrocosm it exists within.

The Dire springs forth from this released demon, following a breadcrumb trail that leads all the way from the “controlled climate” delusion of *Climatron* and *Dome* to a mechanistic and managerial mindset of human relations to earth. In his 1969 *Operating Manual for Spaceship Earth* Fuller extends the vision of *Dome over Manhattan* to the entire planet, arguing that

our spaceship is . . . a mechanical vehicle, just as is an automobile. If you own an automobile . . . you know that you’re either going to have to keep the machine in good order or it’s going to be in trouble and fail to function. We have not been seeing our Spaceship Earth as an integrally-designed machine which to be persistently successful must be comprehended and serviced in total.¹⁵⁶

153 Elizabeth Shaw, *Visionary Architecture* Press Release (New York: New York Museum of Modern Art, 1960), 2.

154 Missouri Botanical Garden, “Climatron: Geodesic Dome Conservatory,” *Missouri Botanical Garden*, accessed 16 June 2016, <http://www.missouribotanicalgarden.org/gardens-gardening/our-garden/gardens-conservatories/conservatories/climatron.aspx>.

155 Missouri Botanical Garden, *Climatron*.

156 Buckminster Fuller, *Operating Manual for Spaceship Earth* (Carbondale: Southern Illinois University Press, 1969), 16.

Compelled by fear and denial of the fundamental chaos of the cosmos, the Dire's worldview seeks to manage that which the Dour declares to be unmanageable. Yet, when all is said and done, no matter how desperate the situation, a dire mindset is ultimately answerable to the moment when the machine itself is not going to "keep . . . good order." Trouble and failure are as much embedded in the *modus operandi* of "our spaceship" as any notional ease or success. And what happens when the "mechanical vehicle" is uninterested in proprietary claims? Or, worse still, when the vehicle in question has always been owned by forces and processes in radical excess of any sovereign claims made by a lifeform that thinks it owns the vessel, but in fact only ever hitched a short ride?

Nor are Fuller's terms neutral: for spiderwort, the fact that the other three plant species "fail[ed] to function" inside Latimer's terrarium just meant more success for it. Nor is "good order" a recipe for success. J002E3's wayward orbit may spell a disturbing omen for an industrial civilisation predicated on periodicity and predictability, but had *The Moon* not bestowed such wayward orbit in its early genesis, then its massive tidal fluctuations would not have repeatedly stripped nutrients from mineral-rich dry surfaces into the oceans, providing sustenance fundamental to the watery origins of life on earth. Minerals which arrived by way of hundreds of millions of years of asteroid and comet collisions.

After all, is Chicxulub not part of "the machine" too? And where *on Earth* is Theia in this *Operating Manual for Spaceship earThia*? All aboard. Abhor nothing. This is a spaceship which has not only crashed multiple times over the course of history, but which was born of an inter-planetary crash itself. But this is precisely that which we have such trouble comprehending. As Timothy Morton puts it: "The current ecological disaster, which we only know about because of very sophisticated interdisciplinary science, has torn a giant hole in the fabric of our understanding."¹⁵⁷

Fuller designed more ambitious devices and structures for material and energy scarcity over the decade following his Illinois dome home, culminating in the climate-controlled artificial ark of the *Montreal Biosphere* in 1967, again in collaboration with Sadao. On the one hand, his stated motivation reveals one element of the dire mindset: Fuller presciently recognised scarcities of certain materials and energy sources that could prove dire to his contemporary industrial society.

157 Timothy Morton, *The Ecological Thought* (Cambridge, Mass: Harvard University Press, 2012), 14.

On the other hand, his approach to combatting this perceived dire situation reveals a scaling up of his fantasy of human control from the *Dome over Manhattan* to the level of a *Spaceship Earth*, maintained and regulated in total via human expertise. In relation to the first global oil shortage, in 1973, Fuller declared that “there is no energy crisis, only a crisis of ignorance.”¹⁵⁸

In this way, Fuller revealed two faces of the Dire: because he was incapable of cracking open his anthropocentric scale and worldview he submitted to his sense of scarcity of resources as a disproportionately ‘dire’ problem. But then he coupled this with a managerial mindset completely lacking in humility when it came to grappling with such scarcity, or indeed any other ‘mechanical trouble’ aboard his planetary ‘vehicle.’

Fuller’s scaling-up of such control to a “Spaceship Earth . . . comprehended and serviced in total” came to fruition when he proposed the ethos of *Dome Over Manhattan* to the globe itself. In December 1971 – the year earth’s net energy balance changed from negative to positive – he re-exhibited *Dome*, but this time under the new title *Save Our Cities*, for the *Save Our Planet* exhibition at the Whitney Museum in Manhattan. The same model photograph appears as exhibited in 1960, yet now with a top banner proclaiming “SAVE OUR PLANET” three times in capital letters, and a bottom banner reading “save our cities” in lower case. Unlike the 1960 MOMA exhibition, the site of this exhibition sat just outside *Dome’s* proposed perimeter. And in stark contrast to 1960, Fuller’s contribution was no longer a provocation from a radical outsider: this time he was commissioned by a multinational corporation, namely Olivetti.

In Fuller’s managerial mindset, the quest to *Save Our Planet* begets technofix responses: from a city saved by a glass bubble, to a *Spaceship Earth* saved by being serviced “just as is an automobile.” Yet any desired efficiency dividends for mediating in solar radiant energy can never square off. For philosopher Clive Hamilton, “grasping the scale of what is happening requires not only breaking the bubble but also making the cognitive leap to Earth System thinking,”¹⁵⁹ hence Bataille’s precautionary principle about the interstellar scale of such energetic entanglements. For Timothy Morton, there are further breakages required to make this leap from faith to fidelity, after all, the unfolding rupture has “torn a giant hole in the fabric of our understanding.”

158 Buckminster Fuller, quoted in Victoria Vesna, “Introduction to Buckminster Fuller,” *Buckminster Fuller Institute*, accessed 16 June 2016, <https://bfi.org/about-fuller/biography/introduction-buckminster-fuller>.

159 Clive Hamilton, *Defiant Earth: The Fate of Humans in the Anthropocene* (Cambridge: Polity Press, 2017), 2.

In a nutshell, a myopic worldview cannot encompass always excessive forces irrupting through the cosmos. Twenty years before Fuller's *Spaceship Earth* manifesto, Bataille had cautioned that

an immense industrial network cannot be managed in the same way that one changes a tire . . . It expresses a circuit of cosmic energy on which it depends, which it cannot limit, and whose laws it cannot ignore without consequences. Woe to those who, to the very end, insist on regulating the movement that exceeds them with the narrow mind of the mechanic who changes a tire.¹⁶⁰

Bataille's mechanic changing a tyre and Fuller's *Spaceship Earth*, serviced like a beloved automobile, are both expressions of potential relationships between "an immense industrial network," and the "circuit of cosmic energy" upon which it depends. Materials circulate within Latimer's terrarium, driven by solar energy. A circuit of chemical energy, produced by combusting fossil fuels, drove the *Climatron's* air-conditioning, maintaining the climate within its bubble at the eventual cost of the climate without. It is woeful, in Bataille's sense, that Fuller chose automobile maintenance as his analogy for human control over the planet, given cars also express a circuit of fossil fuel energy that collectively scuttle the already precarious and capricious climate of *Spaceship Earth*.

Ironically, energy as a phenomenon is absent from the six *Save Our Planet* posters, which represented water, air, wilderness, wildlife, people, and cities. Energy, the only phenomenon that can simultaneously shape all six ecological concerns, was omitted. An omission all the more dire, given *Save Our Planet* appeared the year earth's energy balance went from negative to positive. Nascent ecological concerns were oblivious to how Fuller's vision had become both an urgent necessity and a hollow conceit, in light of Bataille's caution against "the narrow mind of the mechanic who changes a tire."

Thus, the real time flipping of the tortoise was obscured by worldviews oblivious to the oblivion unfolding all around, and instead focused on demarcating parts of the globe that could, at least in the popular imagination, be compartmentalised and controlled, providing bubbles of safety, as if it were Chaplin's plastic earth sphere. Moreover, the collective act of flipping the tortoise was also obscured by a myopic ignorance of a simple fact: a restricted economy is always a subset of Bataille's General Economy, by which he means an "economy at the scale of the universe."

Though energy entered the equation when the landmark findings on *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of*

¹⁶⁰ Bataille, *The Accursed Share*, 25.

*Mankind*¹⁶¹ were first presented, in the same year as the *Save our Planet* exhibition. The text was published the following year to contentious reception, even though the modelled consequences of exponential population and economic growth were offered in modestly non-conclusive academic terms:

It is not known how much we can perturb the natural ecological balance of the earth without serious consequences. It is not known how much CO₂ or thermal pollution can be released without causing irreversible changes in the earth's climate.¹⁶²

In keeping with truth being no stranger to fiction, the aptly titled *Universe Publishing* house that produced the book was located in Manhattan, just inside the perimeter of Fuller's proposed *Dome*. Although admirable in some ways, this was not a worldview that applied the by-laws of human constructs onto Bataille's immutable "Laws of General Economy," because of one difficult truth: any cosmology premised on a "natural ecological balance of the earth" fails to recognise that the cosmos only ever provides temporary states of balance amidst the changeability and consequences of the Court Jester and Red Queen dancing to their own drums, which we cannot even strive to hear, let alone comprehend. Meaning that despite their apparently forward-thinking intentions, both Fuller and *The Club of Rome* remained trapped in the category of those who "insist on regulating the movement that exceeds them with the narrow mind of the mechanic who changes a tire." Woe, indeed. Then to them. Now to us.

The Limits to Growth drew from the longest running continuous measurement of atmospheric carbon dioxide, commenced in March 1958 on Mauna Loa volcano in Hawaii. Comically, the report authors could also have simply looked to Hollywood that year. In February 1958, a month before climatologist Charles Keeling started tracking carbon dioxide from Mauna Loa, Hollywood director Frank Capra broadcast his educational film *Meteora: The Unchained Goddess* on national US television.

The episode was one of four Capra wrote and produced for The Bell Laboratory Science Series, which became mainstay documentaries for US classrooms throughout the 60s. In the conclusion to the hour long *Meteora* episode a character called Mr. Scientist explains to an actor playing a journalist:

Even now, man may be unwittingly changing the world's climate through the waste products of his civilization. Due to our release through factories and automobiles every year of more than six billion tons of carbon dioxide, which helps air absorb heat from the sun, our atmosphere seems to be getting warmer.

¹⁶¹ Donella Meadows, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe, 1972).

¹⁶² Meadows, *The Limits to Growth*, 80.

To which the journalist responds: “This is bad?”¹⁶³ A question that befits the absurdity of the collective response, which manifestly failed to improve, despite our unwitting alteration of the climate entering the popular imagination soon thereafter.

When Clark remarked in 2010 that “academic science, popular science writing and Hollywood cinema have all warmed to the idea of sudden threshold transitions in climate systems” he refers implicitly to the first mainstream film on topic: *The Day After Tomorrow*, from 2004.¹⁶⁴ The film brought the rapidity of “sudden threshold transitions” into popular culture through fable, rather than fidelity to the palaeoclimatological record. In keeping with Hollywood disaster conventions, the cautionary tale of human-induced abrupt climate change became subsumed beneath an incredulous plotline wherein weakening thermohaline circulation of the gulf stream induces a rapid-onset ice age.

Despite the fantastical science, the gulf stream has since shown signs of weakening, drawing the world-as-artwork unnervingly close to the world-as-artefact. This gulf stream, another inheritance from the closure of Panama, has undergone “sudden threshold transitions,” though “sudden” here is akin to the earlier image of Panama closing over a handful of decades as synecdoche for the real closure, which took a few million years.

South Park parodied the film one year later, in 2005, in their episode *Two Days Before The Day After Tomorrow*.¹⁶⁵ The joke being that scientists were such scaremongers as to predict climatic change due to occur on the same day they begin to predict it. As a litmus test for how far popular culture has “warmed to the idea of” human-induced abrupt climate change since the mid-2000s, South Park clearly felt compelled to issue a rare *mea culpa* in 2018, in a double episode acknowledging that the satirists had vastly underestimated both intrinsic climatic precarity, as well as the propensity for existing anthropogenic forcing to unleash abrupt climate change.¹⁶⁶ With disastrous effects increasingly materialising all around them, panellists assemble on a TV show-within-the-show, to address “Should We Start To Worry?”, where one panellist declares:

163 Frank Capra, “*Meteora: The Unchained Goddess*,” *The Bell System Science Series*, episode 4, director Richard Carlson, aired National Broadcasting Corporation, 12 February 1958.

164 Roland Emmerich, director, *The Day After Tomorrow* (20th Century Studios, 2004), 35 mm.

165 Trey Parker, director, *South Park*, Season 9, episode 8, “Two Days Before The Day After Tomorrow,” aired Comedy Central, 19 October 2005.

166 Trey Parker, director, *South Park*, Season 22, episode 6, “Time to Get Cereal,” aired Comedy Central, 7 November 2018.

I don't think there's any more room for not considering underestimating the importance of beginning to start the process of mulling over the conceptualisation of starting to worry. And the time to do it is . . . very soon.¹⁶⁷

The comedians depict a society that has only gotten so far – petrified at the prospects, and unable to do anything other hold town hall forums titled “When Should I Start To Worry?”

To boot, such awakenings come more than half a century after Hollywood first brought anthropogenic climate change into classrooms across the US in the form of Capra's documentaries. This begs the question: how could Hollywood declare that “man may be unwittingly changing the world's climate” in 1958, only for the ‘civilisation’ in question to go about wittingly and willingly flipping the tortoise for six decades thereafter? Why did the tortoise still end up in front of us, on its back, with its belly baking in the hot sun?

The problem is, ‘why’ questions are slippery. They are Cheshire cats compared to ‘how’ questions. How the tortoise was flipped into this predicament is dead simple: the intoxicating ideology of a ‘civilisation’ bent on emancipating itself from earth's vicissitudes through modern conveniences, only for those involved to discover that “the waste products” of their civilisation had exposed them to the N-LSD and intrinsic precarity of the Earth System.

The answer to the ‘why’ question may however be found in two vastly different meanings of ‘unwittingly’: *without being aware*, that is without knowledge, and *unintentionally*, or without intent. Given how the vast majority of humanity neither intended to cause this rupture, nor actively contributed to it, it is the dearth of wit that speaks volumes as to why *on earth* this particular shift happened. But to unmask the role of unawareness in perpetuating a half century lapse between Hollywood disclosure of anthropogenic climate change, and acknowledgment of same, one must turn to what preoccupied this ‘civilisation’ so much that it turned a blind eye to the looming catastrophe caused by its own “waste products.”

In another part of New York City, another group of schoolchildren were being shown a different film, featuring another turtle. Unlike the desert tortoise before us, this one was animated, anthropomorphised, and named Bert. Star of the 1952 Civil Defence Film *Duck and Cover*, Bert is less concerned with rupture on the temporal and spatial scale of earth and far more concerned with a distinctly smaller and more human threat.¹⁶⁸ The Cold War period and the mentality

¹⁶⁷ Trey Parker, director, *South Park*, Season 22, episode 7, “Nobody Got Cereal?”, aired Comedy Central, 14 November 2018.

¹⁶⁸ Anthony Rizzo, director, *Duck and Cover* (Archer Productions, 1952), 16 mm.

it fostered were an antithesis to the nascent concerns about impending ecological crisis, saturating an entire generation's capacity for awareness of their own mortality with the immediate, concrete, politically definable threat of nuclear war.

Not only did this make for a compelling distraction from the more insidious destruction happening under the nose of this generation, it also spawned an entire genre of nursery rhyme propaganda that disseminated the fantasy of sheltering from a nuclear holocaust. When a nearby monkey explodes a stick of dynamite, Bert drops to the ground and retreats into the shelter of his shell. The film then shows New York City schoolchildren similarly ducking and covering while a voice-over instructs how to do likewise if an atom bomb drops out of the sky.

The hollowness of such a conceit of shelter against massive energetic forces extended well beyond the classroom. Fuller's *Dome* was also supposed to shield Manhattan against radioactive fallout, given its coveted status as a prime strike target. Just as *Duck and Cover* simply ignored that fact that neither a desk over a fragile human body nor the marvellous mechanics of a turtle's inbuilt protective shell would provide the slightest protection against a radioactive blast, so too did Fuller fail to mention why *Dome's* squat mushroom shape is in fact almost the exact size as Hiroshima's severe blast damage radius: a hemisphere 3.2 kilometres in diameter. Fuller's protective shield to "save our cities," even when scaled up to "SAVE OUR PLANET" as per his *Operating Manual for Spaceship Earth*, now appears as a ghost in the shell, a manifestation of a concrete fear: that of a bomb similar to the ones America chose to drop on Hiroshima, exploding over Manhattan. Suffice to say, *Dome* would have been as efficacious in protecting Manhattan as its "controlled climate"¹⁶⁹ would have been in fending off human-induced global heating.

Duck and Cover is typical of the Cold War mentality: a cheery nursery rhyme sung to collectively reassure a petrified society that there is a bubble, there is shelter, and civilisation will protect them. The political gaming of this period distracted world leaders everywhere from giving sufficient attention to the warning signs of an ecological crisis far more dangerous than any bomb. Instead, learning to live with the threat of annihilation meant singing nursery rhymes of safety and security that were all too easily transferred to the Warm War, when the Cold War ended. A warm war of protracted existential annihilation via human-induced climate change versus a cold war premised on the constant threat of instantaneous existential annihilation.

After all, as Kingsnorth and Hine reminds us in their *Uncivilisation* manifesto: "we were led to this point by the stories we have told ourselves – above all, by

169 Shaw, *Visionary Architecture*, 2.

the story of civilisation . . .”¹⁷⁰ How, then, can we learn to see the present tense through eyes of those contemporaries not distracted by threat of the Cold War? Eyes through which we can see how the tortoise before us got flipped – from Fuller’s hubris of “seeing our Spaceship Earth” being “serviced in total,” to Bataille’s humility and understanding that an “immense industrial network” cannot be “managed in the same way that one changes a tire.”

The answer again lies in Manhattan, the premise again lies in The Bomb, but the approach differs again, deviating into comedy. This time, a comedy of nuclear holocaust.

How I Yearned to Stop Worrying and Love the Abomination

Cynicism, loss of spiritual values, two world wars, the communist disillusionment, psychoanalysis, has forced the 20th century writer to keep his hero uninvolved, detached, burdened with problems relating to life . . . If the modern world could be summed up with a single word it would be ‘absurd.’ The only truly creative response to this is the comic version of life.

– Stanley Kubrick, handwritten note card (1962)¹⁷¹

Just tell Stanley that New York does not see anything funny about the end of the world as we know it.

– Message to Stanley Kubrick from unnamed US Government war official, via Mo Rothman of Columbia Studios (1963)¹⁷²

Downtown from where Fuller’s *Dome* would have hovered, towards the southern tip of Manhattan, lies the birthplace of Stanley Kubrick. Having grown up in the Bronx, then lived and worked in Greenwich Village, it was with reluctance that he quit the US altogether in 1961. So petrified was Kubrick about the prospects of a New York City nuclear attack that he planned to move in 1962 with his family to Perth, Australia, deeming the city far enough away from nuclear fallout.¹⁷³ Instead, temporary UK bases while making *Lolita* in 1961 to 1962, and *Dr. Strangelove: Or How I Learned to Stop Worrying and Love the Bomb*, in 1963 to 1964,

¹⁷⁰ Kingsnorth and Hine, *Uncivilisation*, 10.

¹⁷¹ Stanley Kubrick, handwritten note card, Archive file SK/11/1/21, University of the Arts London, 1962.

¹⁷² Terry Southern, cited in Rob Ager, *The Essence of War: An in depth analysis of Stanley Kubrick’s Dr. Strangelove*, 2015, 12, accessed 16 February 2021, <http://www.collativelearning.com/downloadables/Dr%20Strangelove%20analysis%20-%20chapters%2001-04.pdf>.

¹⁷³ Mick Broderick, *Reconstructing Strangelove: Inside Stanley Kubrick’s ‘Nightmare Comedy’* (New York: Columbia University Press, 2017), 11.

became permanent when his family subsequently moved over, and Kubrick never again returned to the US.

Knowing no place lies out of the line of nuclear fire, Kubrick remained haunted by having relinquished his beloved Manhattan to sidestep an ever-present threat of nuclear holocaust. While the prospect remains close to home for every terrestrial organism on earth, Kubrick had the added proximity of the Manhattan Project, which was established downtown in 1942 and run from that location while Kubrick attended high school uptown between 1941 and 1945.

When he began work on *Dr. Strangelove* in 1960, it was his attempt to grapple with the existential predicament beholden to Cold War ideologies. As this stage it was a serious drama, whose truth kept making mockery of the fiction he attempted to draw from it. Kubrick found the gravity of the situation did not hold up to such earnestness, giving rise to his

idea of doing it as a nightmare comedy came in the early weeks of working on the screenplay. I found that in trying to put meat on the bones and to imagine the scenes fully, one had to keep leaving out of it things which were either absurd or paradoxical, in order to keep it from being funny; and these things seemed to be close to the heart of the scenes in question.¹⁷⁴

The “heart” he refers to is the Cold War doctrine of Mutually Assured Destruction (MAD), whereby multiple parties deter one another from using their respective nuclear arsenals by maintaining equal firepower and therefore mutualising the threat: in this instance it was USSR v US. Though in actuality, this doctrine adds up to the respective Self Assured Destruction (SAD) of both parties, since any detonation of the deterrent bombs would of course unfold in a scaled up version of Latimer’s terrarium: in other words, *on earth*. Since the contamination of a nuclear attack on a targeted region of the globe inevitably circulates back in greater or lesser quantity to the nation state that launched an attack, we can safely state that SAD+SAD=MAD.

From this “modern world” which Kubrick summed up as “absurd” comes a comedy of such repute that even stalwart institutions like the American Film Institute voted it the “3rd Funniest American Movie of All Time”¹⁷⁵ in their ‘100 funniest American films of all time’ compilation. The repute is uniquely twofold: sheer hilarity of the-end-of-the-world-as-it-currently-is, brought about by eviscerating the

¹⁷⁴ Stanley Kubrick, quoted in *Macmillan International Dictionary of Films and Filmmakers Volume 1*, ed. Christopher Lyon (New York: Firethorn Press, 1984), 126.

¹⁷⁵ “3rd Funniest American Movie of All Time,” *AFI’s 100 years . . . 100 laughs: The 100 Funniest American Movies Of All Time*, accessed 25 July 2024, <https://www.afi.com/afis-100-years-100-laughs>.

roll call of postwar US ideology, politics, sexuality, and culture. As *Guardian* film critic John Patterson remarks (while declaring it the 6th best comedy film of all time):

There had been nothing in comedy like *Dr. Strangelove* ever before. All the gods before whom the America of the stolid, paranoid 50s had genuflected – the Bomb, the Pentagon, the National Security State, the President himself, Texan masculinity and the alleged Commie menace of water-fluoridation – went into the wood-chipper and never got the same respect ever again.¹⁷⁶

In seeking the ‘usual suspects’ responsible for flipping the tortoise, there is no need to go further than this line up. A white American, male, managerial, military-industrial mindset so impervious to the conceit of hubris as to disregard Mr. Scientist’s 1958 revelation that anthropogenic climate change is occurring in Capra’s film. Or even to follow up on Mr. Scientist’s answer to the journalist’s query as to whether “this is bad?” A disdain all the more cognitively dissonant, given Mr. Scientist cannot help but equate human-induced climatic change with “the gods before whom the America of the stolid, paranoid 50s genuflected,” declaring the consequences “in weather” to be akin to “not only dealing with forces of a far greater variety than even the atomic physicist encounters, but with life itself.”¹⁷⁷

Schoolchildren prescribed *Duck and Cover* nursery rhymes were presented with a hollow conceit for surviving an atomic blast, in the same way schoolchildren prescribed *Meteora* were presented with a *fait accompli* for already-induced climate change. Therein lies the relevance of *Dr. Strangelove* to the present tense. Unable to breach the inner sanctum of the military-industrial complex and its willingness to put the world to rights in defence of consumerist and capitalist ideologies that the complex required, Kubrick instead used comedy as catharsis for a petrified *zeitgeist* between similarly hapless civilians.

There were no windows for a proverbial Kubrick to throw pebbles at in *Dr. Strangelove’s* War Room (and thus no opportunity for him to attract the attention of the president locked inside). And our nightmare comedy likewise lacks windows for a proverbial Kubrick to throw pebbles at. Because the windowless room is designed to ignore thrown pebbles and withstand atomic blasts, courtesy of its triangular shape dug deep beneath the ground, providing contemporary rulers with a kind of inverted architectural kinship with historical and fictional tyrants like Tyrell or Queen Mary atop their societal pyramids.

¹⁷⁶ John Patterson, “Dr. Strangelove: No 6 Best Comedy Film of All Time,” *The Guardian*, 18 October 2010, accessed 16 February 2021, <https://www.theguardian.com/film/2010/oct/18/dr-strangelove-kubrick-comedy>.

¹⁷⁷ Capra, *Meteora*.

Barred from the inner sanctum for deciding about preventing or accentuating human-induced planetary scale cataclysm, Kubrick invites us into a fictitious parallel version of the War Room sanctum. We watch the US President telephone the Russian Premier, to inform him of the imminent unprovoked nuclear attack:

Hello, Dimitri? . . . It's good that you're fine and I'm fine. I agree with you. It's great to be fine. [Laughs] Now then Dimitri. You know how we've always talked about the possibility of something going wrong with the bomb. The bomb, Dimitri. The hydrogen bomb. Well now what happened is . . .¹⁷⁸

With Kubrick playing Court Jester to present us with chaos framed in humour, we laugh off the absurdity of how SAD+SAD=MAD inside this parody of the real-world sanctums at the very peak of the social limits to life. Thus revealing another dimension of how the tortoise got flipped: those excluded from inner sanctums of power, whether tyrannical or nominally democratic, have largely had to resign themselves to their powerlessness in the face of policy, and found themselves reduced to empty gestures of ducking and covering under a desk in the event of exploding bombs, or feebly protesting economic and power structures that drive the feedback loop of human-induced climate change. War Room-like enclosures are designed to be impervious to the concerns of lay citizenry, as are the ideologies that enshrine such power structures. Nor were the laughs cheap, in this case: the Cuban Missile Crisis had brought the world to the brink of nuclear war 15 months before the film's release in January 1964.

Guilt, and its relevance, are born of agency, and they die of it too. When the agency lies beneath, behind, above, or beyond us, the laughs come especially cheap. To the extent that, speaking of *Melancholia*, von Trier declared that “in a way, the film does have a happy ending,”¹⁷⁹ because it alleviates collective human guilt of having unleashed cataclysms that did not have to be. This film embraces the dour wholeheartedly in this way, proposing that all human action, whether positive or negative, is thoroughly belittled in the face of a random cosmic event that has no concept whatsoever of just or unjust, guilty or not guilty. The rogue planet *Melancholia* does not judge humanity. It ignores it, then destroys it.

However, the guilty pleasure of irrelevance is eviscerated when the agency lies firmly within human intention. Other genres imagine endings that are all the more dire, as they are rife with guilt. *Dr. Strangelove's* comedic approach to the end of the world is especially remarkable, given it was partly inspired by *The Day*

178 Stanley Kubrick, director, *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb* (Columbia Pictures, 1964), cited in “Dr. Strangelove: A Continuity Transcript,” *The Kubrick Site*, accessed 16 February 2021, <http://www.visual-memory.co.uk/amk/doc/0055.html>.

179 von Trier, *Melancholia* Press Kit, 2011.

the Earth Caught Fire, the 1961 film about earth's orbit being dislodged by hydrogen bomb testing, sending the planet on a collision course with the sun.¹⁸⁰ In such hands, the end of the world was no laughing matter, whether a guilt-less or guilt-ridden ride.

Melancholia heralds a “cataclysm upstream” that annihilates the entire planet, whereas *The Day the Earth Caught Fire* agonises over human forcing which pushes the planet's trajectory toward annihilation. But be it manslaughter from without or murder from within, the destruction is assured in either eventuality. An unassailable chasm spans the gulf between a guilt-less or guilt-ridden end of a world, but the consequences play out the same regardless.

Given the gravitas of the subject matter and the agency of the subject within it, *Dr. Strangelove* features no such happy ending. Although Kubrick did film a slapstick-like alternate ending where all the military personnel descend into a pie fight in the War Room, replete with faces completely covered in pie. However, the released version ends in a way that is unequivocal as regards the guilt of its protagonists, with all non-subterranean life being extinguished when the unprovoked attack by a mad US general unleashes the USSR's Doomsday Device, a series of self-automated nuclear detonations that reduce earth back to its Hadean origins, not unlike the state following earTheia's genesis. Perhaps the ultimate confluence of being petrified and becoming petrified, as the near-instantaneous annihilation of terrestrial life consigns one for all and all for none into the fossil record. In this reading, *Dr. Strangelove* is a stand in for those who take a dire mindset to the currently unfolding rupture, in that the Dire mistakenly tries to consider what is most definitely a form of ‘long emergency’ without discernible beginning, middle, or end, as if it were comparable to instantaneous binary catastrophes at the flick of a switch. As if the question were simply *to bomb or not to bomb* . . .

Leaving guilt aside, then, *Dr. Strangelove* is the film that comes closest to capturing the two states of petrification, in light of Joseph Meeker's study on *The Comedy of Survival*:

Man's high moral ideals and glorified heroic poses are themselves largely based upon fantasy, and are likely to lead to misery or death for those who hold them. As comedy sees it, the important thing is to live and to encourage life even though it is probably meaningless to do so. If the survival of our species is trivial, then so is comedy.¹⁸¹

Appropriating the film as a proxy for the present tense, though, does beg the question of who precisely the “I” in the subtitle “*How I Learned to Stop Worrying*

¹⁸⁰ Val Guest, director, *The Day the Earth Caught Fire* (British Lion Films, 1961), 35 mm.

¹⁸¹ Meeker, *The Comedy of Survival*, 13.

and Love the Bomb” stands for? It is evidently not Dr. Strangelove, the mad scientist who thrives on the doctrine of MAD, because a pivotal conjunction lies between his name and the subtitle: “*Dr. Strangelove: Or . . .*” Is the “I” perhaps Kubrick, telling us he has *Learned to Stop Worrying and Love the Bomb* through a comedy about tyrants who destroy civilisation and the biosphere?

No matter who the ‘I’ was originally intended to be, it now constitutes a ‘we’ that may learn to stop worrying and love the present tense, even if that present tense is one of an ever-imminent destruction of civilisation and the biosphere. This includes learning to love the scale of the crisis, alongside the woeful inadequacy of the response, a love that can only live amidst the sheer *Comedy of Survival*. In the film’s finalé, ‘we-are-all-one’ becomes ‘we-are-all-none’ as the Doomsday Device springs into action, represented by stock footage of actual US atomic tests, while Vera Lynn’s World War Two anthem play in the background, declaring that “we’ll meet again”, provided we

Keep smiling through
Just like you always do
’Til the blue skies
Drive the dark clouds far away.¹⁸²

It is apt that the idea of using the baselessly optimistic *We’ll Meet Again* over the montage was suggested to Peter Sellers by Spike Milligan, a fellow comedian, collaborator, and friend whose World War Two active duty gave rise to his own prognosis that only comedy is commensurate with a modern world summed up by the word ‘absurd.’ Given the present tense is orders of magnitude more ‘absurd’ than the Cold War world, we must turn to the lay civilians who never sought to breach the inner sanctum of their respective societies, to understand how the postwar generation drifted towards a far more insidious *New World Coming* during the intervening years: years typified by mankind “unwittingly changing the world’s climate through the waste products of his civilisation.”

The answer again lies in New York City, the premise again lies in a bubble, the approach lies again in comedy. This time, of the dubious innocence of the “unwitting . . . civilisation” itself.

¹⁸² Ross Parker and Hughie Charles, *We’ll Meet Again* (Michael Ross Limited, 1939).

The Show About Nothing Must Go On

The longer the bomb is around without anything happening, the better the job that people do in psychologically denying its existence. It has become as abstract as the fact that we are all going to die someday, which we usually do an excellent job of denying. For this reason, most people have very little interest in nuclear war. It has become even less interesting as a problem than, say, city government, and the longer a nuclear event is postponed, the greater becomes the illusion that we are constantly building up security, like interest at the bank. As time goes on, the danger increases, I believe, because the thing becomes more and more remote in people's minds.

– Stanley Kubrick, interview with Jeremy Bernstein (1966)¹⁸³

A generic diner stands on Broadway, the street on which the Manhattan Project was established, and two kilometres north of where Fuller's *Dome* would have hovered. Its name beams onto the street frontage in large red emblazoned neon lights that run above its floor to ceiling glass windows. Otherwise unremarkable, Tom's Restaurant became famous as the real-world exterior location of the fictional Monk's Cafe in the 1990s sitcom *Seinfeld*.

Inside-Monk's-inside-Tom's (the interiors were actually filmed in-studio) the four main characters whiled away many an hour in what co-creators Larry David and Jerry Seinfeld termed a "show about nothing."¹⁸⁴ The two Jewish comedians are New Yorkers through and through – born and raised in Brooklyn, a generation later than Kubrick in the Bronx. Like Kubrick, New York culture remained a preoccupation throughout their lives, even though they, like Kubrick, quit the city: in their case, for Los Angeles. *Seinfeld* was even reported to have provided a lifeline for Kubrick's lifelong love of New York Jewish humour, with home-made videotapes of local US broadcasts posted weekly to England, so he could relish their riotous love affair with the Big Apple from afar.¹⁸⁵

David and Seinfeld summarised the show's ethos as "no hugging, no learning"¹⁸⁶ – their characters never show empathy or compassion, and never learn from their mistakes. Instead, their characters repeatedly fall into folly, which

183 Stanley Kubrick, quoted in Jeremy Bernstein, "How About a Little Game?", *The New Yorker*, 5 November 1966, accessed 5 December 2015, <https://www.newyorker.com/magazine/1966/11/12/how-about-a-little-game>.

184 Larry David, quoted in Edward Kosner, "No Hugging, No Learning: The 'Seinfeld' Credo," *The Wall Street Journal*, 12 August 2016, accessed 16 February 2021, <https://www.wsj.com/articles/no-hugging-no-learning-the-seinfeld-credo-1471032667>.

185 Tim Cahill, "The Rolling Stone Interview: Stanley Kubrick in 1987," *Rolling Stone*, 7 March 2011, accessed 16 February 2021, <https://www.rollingstone.com/movies/movie-news/the-rolling-stone-interview-stanley-kubrick-in-1987-90904>.

186 David, quoted in Kosner, "No Hugging, No Learning."

they then dissect in Monk's Cafe. Proverbial storms-in-a-coffee-cup, played out between personalities ranging from narcissistic to nihilistic to neurotic and back again: selfish, superficial, facile, and oh-so-hilariously funny.

The sitcom reverberated in popular culture unlike any other since, and continues to resonate through *ad nauseam* reruns still syndicated 25 years after it ended. Not only because of its tenaciousness in shamelessly centring on such anti-heroes, or encapsulating the 1990s *zeitgeist* for prosperous western liberal democracies. Life in that Big Apple shared none of the concerns espoused by Fuller's 1960 *Dome over Manhattan*, or even its 1971 *Save Our Cities* version. Nor did it share the concerns espoused by Kubrick's 1964 *Dr. Strangelove*, or even his observation about the intervening years, during which "the longer a nuclear event is postponed, the greater becomes the illusion that we are constantly building up security, like interest at the bank."¹⁸⁷

In the fictional world of *Seinfeld* the only storms are those in a coffee cup: reflections beamed back to a society of itself, basking in its own bubble. Before I myself came of age to the "collapsing of multiple chronologies – of species history and geological times into our very own lifetimes,"¹⁸⁸ I came from an age delightfully oblivious to such petrification, relishing the delights of mining further comic layers of this entirely inward-looking fictional world by taping every single episode on VHS, pausing each and every advertising break in order to construct an archive for diving into, again and again. Trivial though this tidbit of trivia is, it is my springboard: one individual example of awakening from a sheltered worldview to a revelatory cosmology.

Monk's Cafe may have been fictional, but the physical location of its real-world exterior revealed a twist that juxtaposed it with something tellingly real. Tom's Restaurant occupies the entire street level of the Broadway and West 112th Street corner, above which all floors are closed to the public: no visitors or tours, with entry subject to US government security regulations. This is the premises of the Goddard Institute for Space Studies (GISS), a collaboration between the Earth Sciences Division of NASA's Goddard Space Flight Centre and the Columbia University Earth Institute.

Since its formation in 1961, GISS has conducted high level research on planetary change affecting our planet and our neighbours in the solar system. The research ranges in scale from the solar system over billions of years (such as unearthing ancient climates on Mars and Venus) to cycles of change that periodically effect

187 Kubrick, quoted in Bernstein, "How About a Little Game?"

188 Chakrabarty, "The Human Condition in the Anthropocene," 180–181.

vast regions of Earth (such as the El Niño Southern Oscillation), all the way through to relatively ephemeral changes produced by single volcanic eruptions.

Given the institute is part of NASA, it is unsurprising that the dozens of researchers working there had been concerned largely with phenomena occurring on spatiotemporal scales that far transcend the here or now. Following the appointment of James Hansen to Director in 1981, GISS refocused its attention back down onto earth. Originally an atmospheric physicist, Hansen's prior research had been comparative planetology between atmospheres on Venus and Earth, conducted at NASA from 1967 to 1980.

Over the course of those 13 years he discovered how Venus ended up with current surface temperatures of 400°C, even though some billions of years ago it had a vaguely earth-like composition and climate, replete with oceans and clouds made from water vapour, rather than the sulphur dioxide composition they have now. Hansen came to realise that the cumulative impact of contemporary industrial activity could be enough to push earth into runaway climate change that would take the planet on a long-term trajectory towards the same state as Venus. So, in 1980 he “resigned as principal investigator on our Venus experiment because a planet [earth] changing before our eyes is more interesting and important” as “its changes will affect all of humanity.”¹⁸⁹

The following year Hansen initiated this earth-ward redirection of focus, beginning with a study of US air temperatures between 1880 to 1980. By the mid-1980s he had amassed sufficient evidence to calculate that industrial activity was already changing the climate. On 23 June 1988 he gave the first high profile congressional testimony concerning this matter, delivered to the US Senate Energy and Natural Resources Committee. His testimony brought human-induced climate change into the public domain like nothing prior, declaring unequivocally that earth's climate was demonstrably changing, and the cause was accumulated greenhouse gasses from industrial activity. This may seem unremarkable, given Capra's declarations three decades prior in *Meteora*, however Hansen was concerned with the socio-political uptake of such revelations, whereas Capra eschewed such uptake.

Hansen's testimony ran front page on the following day's *New York Times*, with the heading “Global Warming Has Begun, Expert Tells Senate.”¹⁹⁰ The Dire,

¹⁸⁹ James Hansen, “Why I Must Speak out about Climate Change,” paper presented at TED Conference, Longbeach, US, 28 February 2012, accessed 13 December 2015, https://www.ted.com/talks/james_hansen_why_i_must_speak_out_about_climate_change/transcript?language=en.

¹⁹⁰ Philip Shabecoff, “Global Warming Has Begun, Expert Tells Senate,” *The New York Times*, 24 June 1988, accessed 13 December 2015, <http://www.nytimes.com/1988/06/24/us/global-warming-has-begun-expert-tells-senate.html>.

it would seem, had left the margins, and entered the mainstream. Only to encounter backlash from politicians and journalists that refused to recognise it for what it actually was, with one article standing out in particular. During the (notably mild) summer of 1989, the same summer that saw the premier of *Seinfeld*, science journalist Nicholas Wade wrote an op-ed piece, also published in the *New York Times*. Wade declared that 1988 had been a “a summer’s heat wave” within the realm of “the climate’s natural variability,” and argued that Hansen had capitalised on this to mistakenly tell Congress that global warming had begun. Beyond this, Wade argued that “even another sweltering summer won’t mean the greenhouse warming has begun” and thus that “crying wolf on greenhouse warming will not work.”¹⁹¹

Wade’s op-ed, “Crying Wolf in the Greenhouse”, foregrounded Aesop’s fable about *The Boy Who Cried Wolf*¹⁹² to instil an instantly recognisable analogy for a false alarm. *Seinfeld* premiered on US television to massive success, and the seamless bubble of self that the show represented began to play out in the café beneath Hansen’s facility. Little wonder that a society enraptured with comedy that shrank reality to literally create a show about nothing was primed for the denial of a dire demeanour. Hansen responded to Wade with his own op-ed piece, entitled *Wolf in the Greenhouse*. He used the same metaphor to acknowledge “the danger of crying wolf too soon” due to the fact that natural variability may mean that the general public cannot recognise climate change anecdotally.

Nevertheless, he closed his op-ed with the argument that “the time to cry wolf is here,” due to the complexities arising when human values, systems, and failings are factored into the immutable biophysical laws governing the planet:

A greater danger is to wait too long. The climate system has great inertia, so we have realised only part of the climate change that will be caused by gases we have added to the atmosphere. Add to this the inertia of the world’s energy, economic and political systems, which will affect any plans to reduce greenhouse gas emissions.¹⁹³

At long last, a sentiment mired in Fuller’s scarcity ethos, but still open to Bataille’s humility toward incessant excess, where human forcings are “only part of the

¹⁹¹ Nicholas Wade, “Crying Wolf in the Greenhouse,” *The New York Times*, 3 July 1989, accessed 13 December 2015, <http://www.nytimes.com/1989/07/03/opinion/the-editorial-notebook-crying-wolf-in-the-greenhouse.html>.

¹⁹² Aesop, “The Boy Who Cried Wolf,” in *Aesop’s Fables: Timeless Moral Stories* (The Child’s World, Inc., 2022).

¹⁹³ James Hansen, “Wolf in the Greenhouse,” *The New York Times*, 1 August 1989, accessed 13 December 2015, <http://www.nytimes.com/1989/08/01/opinion/l-let-s-not-count-on-the-earth-to-heal-it-self-wolf-in-the-greenhouse-972189.html>.

climate change” that turn ‘good’ planets (good for us and our fellow inhabitants) into ‘bad’ planets, just as the once earth-like Venus became the present tense Venus. The universal sigh is now saddled with a human twist. The rupture is unleashed. Meanwhile “the world’s energy, economic and political systems” wait to be reformed in response, with the managerial mindset of a Fuller proposed as the means for so doing. A society sufficiently narcissistic and inward-gazing to make *Seinfeld* a multi-million-dollar success fuelled the Dire, with its entirely human scale, to become the dominant posture for coaxing the demon of anthropogenic climate change back into the bottle: the bottle that this same society broke in the first place.

When I'm 1964

I very deliberately tried to avoid the irresistible temptation of a lot of satire to level with the audience at some point and tell them what you really think . . . If you really want to communicate something, even if it's just an emotion or an attitude, let alone an idea, the least effective and least enjoyable way is directly. It only goes in about half an inch. But if you can get people to the point where they have to think a moment what it is you're getting at, and then discover it . . . the thrill of discovery goes right through the heart.

– Stanley Kubrick, interview with Joseph Heller (1964)¹⁹⁴

Seinfeld premiered at the height of that seemingly mild 1989 summer, on 5 July, two days after Wade’s “Crying Wolf in the Greenhouse” op-ed. Having conceived the show in November 1988, David and Seinfeld wrote and produced the first season in the interim between Hansen’s testimony and its incipient backlash: a backlash that roundly demonstrated the accuracy of Kubrick’s 1964 statement about the ineffectiveness of direct communication. Despite reading the daily news over coffee each morning in Monk’s Cafe, no mention is made over the sitcom’s nine-season run of climate change, or even generic environmental change. Only the bleedingly obvious transition between television seasons that follow Spring, Summer, Winter, Autumn, or, nowadays: “Sprumer, Sumumn, Auter, Winting.”¹⁹⁵

The characters in Monk’s cafe sat intoxicated with their coffee cup reflections, while Hansen and his GISS colleagues toiled away upstairs from the cafe’s real-world exterior unearthing the devastating consequences of climate change – both across the inconceivable expanses of geological time and in the “fierce

¹⁹⁴ Stanley Kubrick, quoted in “Stanley Kubrick and Joseph Heller: A Conversation, 1964,” in *The Stanley Kubrick Archives*, ed. Alison Castle (Cologne: Taschen, 2005), 364.

¹⁹⁵ Fallot, *Golab Waminrg* poster.

urgency of now.”¹⁹⁶ That a comedy should play out on street level while the unfolding rupture is revealed upstairs shatters the idea that comedy = tragedy + time, because the “inconvenient truth”¹⁹⁷ that was unearthed upstairs, while those downstairs limited their horizon of interest to playing reassuring fictions, was that there would be no time for this particular tragedy to transmute into comedy.

The fiction really falls apart, however, when we turn our attention to an even more foreboding phenomenon that occurred over this same timeframe and was revealed three years after *Seinfeld* finally drew to a close. It is a phenomenon literally obscured by clouds, foreshadowing a *bona fide* crisis, rather than all other so-called ‘crises’ which compete for the human-scaled attention of a dire demeanour: terrorism, war, sovereign debt, pestilence, yada yada. While the halcyon *Seinfeld* era might have basked in a self-awarded reprieve from engaging with or recognising the extreme that would soon after become the New Normal, the same cannot be said for this other phenomenon, because it continues, and continues to be obscured by clouds even today.

The key to this phenomenon once again lies in New York City, because the extent of its global presence was unearthed through events occurring at another site in downtown Manhattan. This unearthing could be called a side-effect, resulting from an event that set the tone for the twenty-first-and-last century: a discovery made by means of tragedy. Immediately following the 11 September terrorist attacks in 2001, all flights over the US were grounded for 48 hours. Such a closure had never happened before in aviation history. Air traffic pollutes unlike any other form of human transport, but ironically, aircraft contrails also mask the effects of that pollution, by creating a heat shield that prevents us from reading the true temperature of the atmosphere from the surface of the planet.¹⁹⁸

With US skies temporarily clear of all aircraft, climate scientists grabbed an otherwise unobtainable chance to disentangle signal from noise, by unmasking the masking caused by aircraft contrails. The signal is the rate, velocity, and trajectory of intrinsic climatic change. The noise is all interference caused by other anthropogenic forcings, particularly contrails. The global dimming caused by these trails could be measured within the 48-hour flight ban, because they evaporate within hours. While the human crisis of the attacks unfolded below, scientists pierced

196 Martin Luther King Jr., “I Have a Dream,” transcript of speech delivered at the Lincoln Memorial, Washington, DC, 28 August 1963, accessed 6 May 2019, <https://www.americanrhetoric.com/speeches/mlkhaveadream.htm>

197 Al Gore, *An Inconvenient Truth*, director, Davis Guggenheim (Paramount Classics, 2006), DVD.

198 D. Lee et al., “Transport Impacts on Atmosphere and Climate: Aviation,” *Atmospheric Environment* 44, no. 37 (2010): 4678–4734.

through the clouds and revealed that surface air temperatures over the US increased an average of 1°C in those 48 hours.¹⁹⁹ Crudely speaking, this means that the terrestrial US climate is actually already 1°C warmer than it appears at surface level, masked as it is by the shielding effect of contrails.

While this figure will differ markedly for regions that have much less air traffic, it still reveals how the warming that existed in 2001 was already much closer to exceeding the nominal guardrail of limiting global average temperatures to 2°C relative to pre-industrial levels. This was the original target set by the United Nations in concert with the usual suspects of global diplomatic negotiations. The figure was revised down in 2018, to state that 1.5°C of increase was actually the maximum that would not precipitate runaway climate change. It is clear that we require the most minimal interference possible in order to determine actual-versus-apparent warming, and yet it was already revealed in 2001 that we are massively interfering with the signal, making the actual extent of the crisis opaque. What point is there then in restraining the existing world order to stay within the 1.5°C guardrail if we may already be committed to exceeding it due to the *existing momentum* of historical emissions? Or, rather what point is there in believing the dire demeanour of trust in human-scale responses will provide the mechanisms, as well as the motivation, to steer a *Spaceship Earth*?

The meteorological measurements taken during the post-September 11 flight ban not only greatly exceeded expectations of how much warming was being masked, they also revealed how responses to ecological crisis are muddled in Clark's "conditions of unknowability." Conditions, it turns out, that we have been labouring under for some time, at least since global industrial activity began masking the true extent of anthropogenic climate change with global dimming caused by sulphur dioxide (aka pollution) over the 1940s and 1950s. Following the rise of Western environmentalism in the 1960s, legislation and policy were introduced to reduce pollution, which led to a discernible increase in average global temperatures, now that the sulphur clouds of the prior decades were curbed.

Even the very recent knowability of the true extent of contrail masking is retrospective, in that the delay between cause and observable effect means we cannot possess such insight about the entanglements that play out in the present. The epistemological difficulty of disentangling signal from noise has long pervaded reconstructions of historical climates, and nowadays grows even more complex as increasing noise masks the muted signal all around. Nowadays, the difficulty of disentangling signal from noise carries as much socio-cultural baggage as the

¹⁹⁹ David Travis, Andrew Carleton, and Ryan Lauritsen, "Contrails Reduce Daily Temperature Range," *Nature* 418 (2002): 601.

notional separation of humans from nature. Moreover, such lines of inquiry open portals to N-LSD whether we want to look through them or not, to a perspective where we see how the chaos and complexity of the World Turtle reigns alongside the dead simple causality of the greenhouse effect.

Smoke and mirrors obscure such phenomena behind clouds – whether the actual heat shield of air pollution causing global dimming, or the cultural imaginary that could celebrate a Fuller’s *Dome* offering an illusory shield against nuclear catastrophe and climate change. Direct observation, like Kubrick’s direct communication, only penetrates the proverbial half an inch. The phenomena in question are in fact far more easily observed in Latimer’s terrarium-as-microcosm, which opened back up to the planet-as-macrocosm only once, when he opened and watered it for the last time in 1972.

When he did so, he not only briefly turned the Closed Ecological System into an Open Ecological System, he also reset the energy balance between the glass sphere interior and exterior, as the heat built up within was able to escape much more readily through the opened cork hole than the glass. This reset happened in Year 1 of the *New World Coming*, when earth entered net positive energy balance. A half century later, a search of utter desperation is underway for any means to uncork the excess heat of our planetary sphere and dispel it beyond earth’s outer atmosphere.

Latimer’s terrarium was unveiled in 2013 when he sent a photograph to BBC Radio 4’s *Gardeners’ Question Time* to ask them if it was “of scientific or horticultural interest.”²⁰⁰ So began its worldwide fame, being the oldest known terrarium in existence. Now 89, Latimer plans to bequeath it to his children when he dies. While the cork remains steadfast and life continues on within his Closed Ecological System, the genie is well and truly out of the bottle for the biosphere it is contained in. In today’s *postcautionary* tale an important *precautionary* principle passed by the by unheeded.

The Simpson’s Movie satirised this cautionary tale of being able to place civilisation so-called under a bubble: instead of protecting ‘civilisation’ against the elements, this bubble was designed to protect the biosphere against one particular example of that dubious civilisation. Having incurred one too many breaches of the Environmental Protection Act, the town of Springfield is encased in a giant bubble that resembles *Dome over Manhattan*, although the bubble seals the town at the surface of the earth, making it much more like Latimer’s terrarium. Within the satire lies an earnest message conveyed by Grandpa Simpson when he cries

200 Latimer, “Sealed Bottle Garden.”

out “Eeepaa! Eeepaa! Eeepaa!”²⁰¹ over and over again. The town claims he has had an episode of insanity, whereas the film later reveals that he was prophetically spelling out “EPA!”: the Environmental Protection Agency acronym.

In this way, the movie unsubtly promotes the main normative mechanism for preventing the demon from escaping further, through regulatory bodies that possess state-of-emergency powers to encase regions of the globe in giant glass bubbles. An Environmentally Destructive Civilisation erects an Environmental Protection Agency. The “story of civilisation” thrives on its gospel, to “first set demons at large and then, somehow, become smart enough to control them.”²⁰²

The make-believe world of *The Simpson's Movie* juxtaposed with Fuller's dome demonstrates how the “story of civilisation” is premised on building bubbles, whether it is bubbles that protect us, or bubbles to contain our demons . . . or, indeed, bubbles to contain the “waste products” of human civilisation that *Meteora* referred to in 1958. Three months after *Meteora* was broadcast, the US left behind the last of its “waste products” in the Pacific Ocean on 6 May 1958, in the form of the Cactus nuclear test crater on Enewetak atoll. Over the preceding 12 years, the US had created 67 such craters across Bikini and Enewetak atolls in the Marshall Islands, courtesy of their atomic and hydrogen bomb tests.

Cactus held a dubious distinction – since it was here that the US combined all the surrounding nuclear waste and buried it inside the crater, sealing it in 1980 with a 46 centimetre thick concrete dome, 115 metres in diameter, creating what they called Cactus Dome, or what local Marshallese Islanders less affectionally termed The Tomb. Nowadays, the rising seas lap at the dome edge, and, when eventually inundated, the contents will spill out through the oceans, dispersing the radiation across ocean currents for an unfathomable number of years.

The Dire is a demeanour that builds bubbles and sings nursery rhymes about shelter. It is not that this demeanour fails to acknowledge the rupture, but that it truly fails to recognise its extent and accept the beyond-human scales of time and space within which it is occurring. The Dire reacts in prevacation, terror-induced procrastination and slow or outright denial. It seeks urgent fixes for problems that will already persist into the unimaginable scales of geological time and promises of safe haven during ruptures from which there can be no shelter.

Should the Tomb on Enewetak atoll open, there will be no shelter or containment that can prevent the demons inside from running their course. Yet the Dire still believes in containment and haven. Whether *Melancholia's* cage of sticks to sit in while the world ends, Fuller's *Dome over Manhattan*, or the notion that

201 David Silverman, director, *The Simpson's Movie* (20th Century Fox, 2007), 35 mm.

202 Berry, *Standing by Words*, 65.

either a schoolchild's desk or a 46-centimetre-thick concrete dome can protect us from radiation, the dire demeanour refutes the blank truth that the civilisation that caused that cataclysm will not exist for long enough to see the consequences of its actions.

Contrary to all the cold comfort of Bataille, the dour “prophet of open and complex systems,”²⁰³ the dire demeanour seeks a world of Closed Ecological Systems, rather than the open book that is the cosmos, and a world of simplified systems, rather than the complexity of the cosmos itself. With closure and simplicity comes hubris, a hubris that mistakes the drowning nuclear waste repository for a problem that can be regulated, at least according to the story they tell in “the bubble, [which] it turns out, is where we have been living all the while,” where it turns out that “the bubble is civilisation.”²⁰⁴



Fig. 9: Charlie Chaplin, *The Great Dictator* (United Artists, 1940).

²⁰³ Clark, *Inhuman Nature*, 33.

²⁰⁴ Kingsnorth and Hine, *Uncivilisation*, 7.

V

A Brief History of Running Out of Time

*“ . . . The tortoise lays on its back, its belly baking in the hot sun,
beating its legs trying to turn itself over . . . ”*

In a nutshell:

(The return of) The Show About Nothing >

Fact v Fantasy >

Sense and Insensibility >

Semblance of Stability >

Risk v Reward >

Reversal of Misfortune



Fig. 10: 2880 Broadway, Manhattan, Tom's Restaurant/*Monk's Café*, United States of America, 20 November 2019. Photograph by author.

No Manhattan Is an Island

Whole areas of our planet could be subject to drought and starvation if the pattern of rains and monsoons were to change as a result of the destruction of forests and the accumulation of greenhouse gases.

– Margaret Thatcher, Speech to the UN General Assembly,
UN Building, New York, 8 November 1989²⁰⁵

We're not scaremongering
This is really happening
Happening
We're not scaremongering
This is really happening
Happening.

– Radiohead, “Idioteque” (2000)

Hansen and his GISS colleagues could easily descend their office stairs into Tom’s Restaurant, but had they also been able to step across the line between fiction and reality into Monk’s Café, their message to the *Seinfeld* cast would have fallen on deaf ears. Not so for those attuned to the rising seas submerging The Tomb on Enewetak atoll in the Marshall Islands, for whom alarm bells resonated amidst a burgeoning international movement then assembling to prevent the turtle being flipped. Five months after Hansen’s June 1988 Senate testimony, while David and Seinfeld were starting to write their sitcom, the UN held their first Intergovernmental Panel on Climate Change (IPCC) meeting, followed a month later by a General Assembly meeting at the UN headquarters in Manhattan, and its resolution titled the *Protection of Global Climate for Present and Future Generations of Mankind*.²⁰⁶

The effectiveness and potency of these assemblies and resolutions is a side note to this song, and one that does not require anything beyond a cursory brush stroke. Thirty-two years later, with 20/20 hindsight in 2020, the abject failure to identify, manifest, and implement effective measures at the relevant scale is blatantly self-evident. That such bodies, representing deeply economically invested and often conflicting governmental units, are good for agreements that look good on the page, and incredibly ill-suited to drastic global intervention is as obvious

²⁰⁵ Margaret Thatcher, “Speech to the United Nations General Assembly (Global Environment),” transcript of speech delivered at the United Nations Building, New York, 8 November 1989, accessed 6 May 2019, <https://www.margarethatracher.org/document/107817>.

²⁰⁶ UN General Assembly (43rd session: 1988-1989), *Protection of Global Climate for Present and Future Generations of Mankind* A/RES/43/53 (New York: United Nations, 1989).

as their use of the stage is poor. Yet perhaps the far more fundamental problem was the demeanour with which the issue itself was approached.

Twelve months after the UN assembly, Margaret Thatcher gave a speech on the main stage of same room, proclaiming that human-induced climate change was underway. Her speech was a veritable update to the Stegosaurus delivering the universal sigh, except that this human twist to the sigh deliberately dropped the third part: admitting that “the world’s climates are changing” and that “the mammals are taking over” but steadfastly refusing to accept that “we all have a brain about the size of a walnut.”

In other words, her speech assumed our capacity to understand what we had inflicted, and moreover, to understand the world upon which we had inflicted it and the cosmos to which that world was hitched. Climate change was just another challenge, a mechanical problem to be overcome by the architecture of postwar global governance, as exemplified by the United Nations itself. The two decades of massive social change and upheaval between Fuller’s *Spaceship Earth* and Thatcher’s speech had achieved little in terms of outlook: despite recognising the rupture unfolding, the human world still chose to approach that rupture with Bataille’s “narrow mind of the mechanic who changes a tire.”

Thus, for all the lofty rhetoric of this most public airings of the (human twist) to the universal sigh, an honest banner hung behind Thatcher’s podium would have proclaimed that *It’s all Fun and Games Until Someone Loses an Island* . . . Her utterance of the universal sigh may have noted that “the accumulation of greenhouse gases”²⁰⁷ could result in some of the lowest-lying lands on earth (namely numerous Pacific Islands) being lost to the rising seas. And further, she recognised the immediacy of the risk, which could indeed manifest while her ilk played their fun and games of dithering and prevarication.

But if we imagine Thatcher standing at the prow of a ship, we note that despite her descriptions of the deleterious consequences of both the vessel’s direction and speed of travel, any real, meaningful change of course did not enter the horizon. The image of a ship describes the future surroundings of the very stage on which Thatcher stood, for it was also highly susceptible to sea level rise. After all, no Manhattan is an Island, for this famous chunk of civilisation so-called also stands to be lost to the rising seas, and with it the United Nations headquarters, on the banks of East River, and only ten metres above the harbour’s current sea level.

Amidst all this hot air and rising water, across the Atlantic French philosopher Michel Serres was building an alternate view of the “Protection of Global Climate,” and of the world order now assembling to grapple with it. His 1992 book

207 Thatcher, “Speech to the United Nations General Assembly.”

The Natural Contract presciently considered whether the 1988 that Wade termed “a summer’s heat wave”²⁰⁸ was natural variability, or human-caused climate change. The opening gambit titled *Climate* offered “two equally plausible interpretations” of that unseasonable season, firstly as natural variability:

A similar sequence of hot dry days could easily be found in the decades for which we have records, or inferred for the millennia beyond human memory. The climatic system varies greatly, and yet fairly little, being relatively invariant in its variations: quick and slow, catastrophic and mild, regular and chaotic. Rare phenomena are therefore striking, but they shouldn’t surprise us.²⁰⁹

Alternatively, he posited that the “summer’s heat wave”²¹⁰ of 1988 could also be interpreted as

something new under the sun, something rare and abnormal, whose causes can be evaluated but whose consequences cannot: can it be acclimated by standard climatology? At stake is the Earth in its totality, and humanity, collectively. Global history enters nature; global nature enters history: this is something utterly new in philosophy.²¹¹

Something utterly new for the human world as well: the first mainstream proclamations of a *New World Coming* through human “causes” were now being “evaluated” as yielding unknown “consequences” due to eventuate anywhere between some new world “just around the bend,” or in many-a-bend to come.

As a philosopher, Serres was concerned not with adjudicating between “equally plausible interpretations” for unseasonable seasons, but with formulating a philosophy of law for human relations with a more-than-human world now manifestly perturbed by human activity. Hence the title: *The Natural Contract*. Even then he perceived the IPCC’s theatrically good intentions amounted to an ill-conceived fable, due to their insufficient recognition of the nature of the planet upon which we had inflicted our industrial bombardment: from this perspective, their failing was in fact a lack of fidelity to the workings of the Earth System.

This is not due to a dearth of science, but rather a surfeit of scientific world-views increasingly at odds with the world itself, as revealed by the then-emergent discipline of Earth System Science. The human relationship to climate change has, up to this point, rather brutally reflected the three universal sighs of changeability, consequence, and comprehension (or lack thereof) of the same. A journey akin to discovering how something works by accidentally breaking it, only to find

²⁰⁸ Wade, “Crying Wolf in the Greenhouse.”

²⁰⁹ Serres, *The Natural Contract*, 3.

²¹⁰ Wade, “Crying Wolf in the Greenhouse.”

²¹¹ Serres, *The Natural Contract*, 4.

this discovery reveals the now-broken object (in this case a planet) to be more fragile than we could have imagined, and more impossible to put back together than we could ever have suspected. Inspecting the fractured components in detail also reveals that the object has in fact broken many a time before, making it something that can never be put back together, because there is no original 'back' to go back to, and there was no 'together' to begin with. Kubrick never returned to Manhattan under the threat of nuclear war, and there will be no island to go back to once the island is lost to its own fun and games.

The scientific worldview admonished by Serres represents a mentality pervasive to Western thought since the Enlightenment. An obsessive compulsion to dissect the world's disorder by piecemeal comprehension, as if an apparent order of pieces and their subsequent worldviews could be recombined into a whole. The Enlightenment went hand-in-machine with the contemporaneous Industrial Revolution, which provided newly efficient means to desecrate the world, even as we dissected it down to human scale.

Together, the Enlightenment and the Industrial Revolution yielded a society that thoroughly conflated its worldview of man dissecting, studying and understanding the world with the world itself, meaning it mistook its worldview for objective reality. Thus, enmeshed with a society's experience of the physical world, this worldview breeds hubris if the conflation becomes a fable of human control, guardianship and maintenance, as per a Fuller. But it breeds humility, if the conflation is humbled by what it observes, and faithfully acknowledges its vulnerability to the vicissitudes of the cosmos, as per a Bataille. We know that the fable of human rationality conquering the chaos of nature became the dominant conflation, but even during the Enlightenment scholars such as David Hume and Johann Fichte preached humility, not hubris, in attempts to outwit the World Turtle. In his *Dialogues Concerning Natural Religion*, Hume mediates upon the relationship between the part and the whole, both in terms of the world and ones' worldview:

Look round the world: contemplate the whole and every part of it: You will find it to be nothing but one great machine, subdivided into an infinite number of lesser machines, which again admit of subdivisions, to a degree beyond what human senses and faculties can trace and explain. All these various machines, and even their most minute parts, are adjusted to each other with an accuracy, which ravishes into admiration all men, who have ever contemplated them.²¹²

And there amidst all the detail lies the devil, the final step to Hume's argument that is self-evident for a dour demeanour, though not for a dire one: the greatness

212 Hume, *Dialogues Concerning Natural Religion*, 19.

of the machine is beyond question, but its infinite regressions will, for us, never cohere into “one great machine” that can be “serviced in total” as per Fuller’s vision for *Spaceship Earth*. We are only ever at its service, even if we may think that we can “contemplate the whole and every part of it.”

The sheer impossibility of ever so doing was not lost on early conservationists such as John Muir, who declared in 1911 that “when we try to pick out anything by itself, we find it hitched to everything else in the Universe.”²¹³ Hence the danger in conflating the idea of an earTheia that we can service with the idea that we are at this planet’s service, just as it is at the service of the cosmos within which it is situated. Whether looking outwards, into the infinite cosmos, or inwards to the ever-more minute connections between myriad lifeforms on this planet: going up or down in scale, it is always just turtles all the way down. Hence the extreme relevance of Bataille’s comparison to an immense industrial network that “cannot be managed in the same way that one changes a tire.”

Neither Hume’s revelry at the “great machine” or Bataille’s humility toward it could shake the reductive narrative of human ingenuity overcoming all obstacles that has been dominant since the Enlightenment. The intervening centuries were as disinterested in such heresy as the *Seinfeld* cast was in the GISS research occurring above the real-world site of their beloved cafe. For a situation as grave as anthropogenic climate change, the continuation of this entirely inappropriate, abstracted, human-scaled and reductionist mindset has consequences all the more dire, as Serres lamented:

Until this very morning nature eluded us: either we limited it to the local experience of the little hay field, or else we made it an abstract concept, sometimes applied to man. And if we studied it, in the sciences, we cut it up into even smaller plots; one of the crises in our knowledge comes from its inability to function without these divisions and from the need to solve the problems posed by their integration.²¹⁴

The fate of heretics who claim that we have fundamentally misunderstood both ‘nature’ and our place within it shows that a linear, incrementalist, reductionist mindset cannot be undone in the space of a generation. With only a brief history of running out of time behind us, and a far briefer history of running out of time ahead of us, we still claim we can “solve the problems” posed by our superimposition of a wayward worldview upon the actual world. And this, in less than a generation. The Dour notes with patience that the linear, incrementalist, reductionist mindset that pervades endeavours like the IPCC was never going to yield to a

213 John Muir, *My First Summer in the Sierra* (Boston: Houghton Mifflin, 1988 [1911]), 10.

214 Serres, *The Natural Contract*, 110.

non-linear, chaotic, holistic mindset just because Earth System Science had burst the delusion of a *Spaceship Earth*.

The Natural Contract makes for no mere navel-gazing on the history and philosophy of science, or pontificating on the philosophy of law. Rather, Serres offered a worldview that saw through the hollow conceit of the international edifice assembling to counter ecocide by a society unleashing mutually assured destruction via global warming, rather than global warmongering. He recognised that the parties assembling could never suffice because their mentalities and remit extended to being able to

slow down the processes already under way, legislate reductions in fossil-fuel consumption, massively replant the devastated forests . . . all fine initiatives, but together they amount to the image of a ship sailing at 25 knots toward a rocky bar on which it will inevitably be smashed to pieces, and on whose bridge the officer of the watch advises the engine room to reduce speed by a tenth without changing direction.²¹⁵

However, this is neither nihilistic nor fatalistic critique. It merely extends the faulty logic underpinning the present onto hazards that have appeared on the horizon, where shipwreck is a *fait accompli* so long as a worldview extends only to “reduce speed . . . without changing direction.” The question then becomes: who gets to be the “officer of the watch,” issuing commands? And who labours in “the engine room” turning those commands into actions?

Throwing a Spanner in the Post-Industrial Works

In every system of morality, which I have hitherto met with, I have always remarked, that the author proceeds for some time in the ordinary way of reasoning . . . when of a sudden I am surprised to find, that instead of the usual copulations of propositions, is, and is not, I meet with no proposition that is not connected with an ought, or an ought not. This change is imperceptible; but is, however, of the last consequence.

– David Hume, *A Treatise of Human Nature* (2009 [1739])²¹⁶

Even during the Enlightenment, Hume articulated how deriving is-from-ought is always fraught and tenuous. For the unfolding rupture, Bruno Latour has reworked this into the difficulty of deriving Matters of Concern from Matters of Fact.²¹⁷ And

²¹⁵ Serres, *The Natural Contract*, 31.

²¹⁶ David Hume, *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects* (Auckland: The Floating Press, 2009 [1739]), 714.

²¹⁷ Bruno Latour, “Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern,” *Critical Inquiry* 30 (2004): 225–248.

we shout ‘Land ho!’ A Matter of Fact declares our ship to be, as Serres puts it, heading at “25 knots toward a rocky bar on which it will inevitably be smashed to pieces.” Something got lost in translation though, leaving mute a Matter of Concern that tells us we ought to change direction.

While the reason for the discrepancy between is and ought, or Matters of Fact and Matters of Concern can be identified, is-ought and Fact-Concern chasms remain unreasonable: they cannot be reasoned with. And those who take heed of heretical philosophies suggesting a change of course are almost always marginal to those who command according to the managerial mindset of a Fuller aboard *Spaceship Earth*. Those who issue commands to the engine rooms, whether a collective inner sanctum of War Room assemblage, such as *Dr. Strangelove*, or the lonely inner sanctums of tyrants such as Tyrell or Queen Mary Tudor, are seldom versed in heretically humble philosophies from a Hume or a Serres.

Yet they are also unwilling to comprehend the discoveries of scientists like Hansen at the GISS, whose work entails fidelity to scales of time and space that far outstrip the human scale of contemporary governing bodies or individuals. And beneath tyrant or government there stand all of those who wield limited leverage in deciding the speed via control of the engine room, but none at all in deciding the direction of the ship.

Assembled in 1992, the same year Serres’ *The Natural Contract* was published, the United Nations Framework Convention on Climate Change (UNFCCC), has been the principal engine room for taking the empirical proclamations of scientists like Hansen over the is-ought chasm as described so eloquently by Hume. Every year since, the UNFCCC has met to implement its global mechanism for mitigating human-induced climate change. And yet, atmospheric carbon dioxide has gone from 352 Parts Per Million (PPM) in 1992 to 426 PPM in 2025. Even at the time the UNFCCC was assembled, carbon dioxide concentration was already above 350 PPM, the notional maximum concentration that would not eventually precipitate runaway climate change.

The principal reason for such abject failure is that the IPCC and UNFCCC are restricted to tempering climate change consequences, rather than climate change causes. Such bodies can change the engine speed of our ship headed for the rocks, but not its direction. The Matters of Fact identified in the 1972 report *Limits to Growth* were eponymous with its title – it detailed problems of overpopulation, unsustainable consumption, and equally unsustainable resource use – but this never translated into Matters of Concern sufficiently effective to dramatically curtail the growth fetishism that underpins capitalism.

Thus, global climate and environmental policy were never going to be able to change the ship’s direction of travel, but had to settle for the lesser aim of decreasing its speed. And even that modest aim proved beyond their power to fulfil.

The final destination is no longer a distant speculation upon the horizon, because the consequences have long since shifted into the foreground, drawing ever closer as the ship increased rather than decreased its speed toward that “rocky bar on which it will inevitably be smashed to pieces.” Small wonder that subtlety was one of the first overboard for some, with philosophy on the topic exemplified in titles like Dale Jamieson’s *Reason in a Dark Time: Why the Struggle Against Climate Change Failed and What It Means for Our Future*, from 2014.²¹⁸

Serres had already grasped the insoluble nature of the situation via the anthropogenically modified climate of that 1988 “summer’s heat wave,”²¹⁹ remarking before the UNFCCC was even formed that any so-called “solution to a long-term, far-reaching problem must at least match the problem in scope.”²²⁰ A catastrophic or demonic problem thus usually requires a catastrophic or demonic solution, which begets new problems requiring new solutions until it’s turtles all the way down . . .

Ignorant of our own limitations, we fell through the floor of N-LSD when we flipped our tortoise over, never understanding that having the power to flip it one way means nothing for gaining the power to flip it back, but rather everything for opening portals to limitless repercussions. A hammer will crack open any refined and complex object, but it will not help you put it back together, nor will it help you understand what it was you broke in the first place.

Having embraced the scope of the problem at the moment when “global history enters nature [and] global nature enters history” Serres sought to develop a worldview for what Chakrabarty calls “epochal consciousness,”²²¹ as first articulated by German philosopher Karl Jaspers in his 1963 book *The Atom Bomb and the Future of Man*. For Chakrabarty, anthropogenic climate change has long ceased to be about problem solving, since epochal consciousness

cannot be charged with the function of producing solutions for an epochal crisis because all possible concrete solutions of an epochal problem . . . will be partial or departmental . . . Epochal consciousness is ultimately ethical. It is about how we comport ourselves with regard to the world under contemplation in a moment of global crisis; it is what sustains our horizon of action.²²²

²¹⁸ Dale Jamieson, *Reason in a Dark Time: Why the Struggle Against Climate Change Failed and What It Means for Our Future* (Oxford: Oxford University Press, 2014).

²¹⁹ Wade, “Crying Wolf in the Greenhouse.”

²²⁰ Serres, *The Natural Contract*, 30.

²²¹ Chakrabarty, “The Human Condition in the Anthropocene,” 143.

²²² Chakrabarty, “The Human Condition in the Anthropocene,” 145–146.

This “horizon of action” was envisaged by Chakrabarty in 2015, in full acquiescence to how imminent the rocky bar then loomed in the foreground.

In *The Atom Bomb and the Future of Man* Jaspers could only allude to the kind of “epochal consciousness” he sought to inculcate, because the new worldview he proposed was rather preoccupied by the never-ending task of eviscerating the prevailing worldview. Worldviews do not alter easily, even over multiple generations. Whether the doctrine of MAD, the tenets of our now global Industrial Revolution, or the legacy of Enlightenment thinking, a dominant mindset does not yield just because a few heretical thinkers or rampant court jesters throws stones at the stalwart and windowless inner sanctums of power. As Jaspers declared:

The purpose of this book is not to take a ‘departmental position,’ as, for example, from the viewpoint of philosophy as an academic discipline. I mean to address that part of man which is above departments. We have special fields in science, organized departments in administration, a diversity of specialists in politics; we defer to the authority of expert knowledge, of professional standing, of official position, of membership in groups, nations, states. But all divisions presuppose the unity of the whole. Departments have a limited meaning. The whole which unites them also limits their realm of validity; it is their source and their guidepost. The whole, on the other hand, is common to all and belongs to no one or everyone.²²³

Unsurprisingly, those beholden to narrow compartments of departmental worldviews are unreceptive to pleas toward the whole or the commons. No ship direction can be changed via the same instrument that fuelled the dire direction to begin with. Instead, those in the present tense engine room remain intent on bridging the gulf between what is and what ought to be, by claiming that they can and will contain the demon via global environmental policy. Late modern capitalism drives the dire fantasies of control: both those in power and the ones who live beneath them share the belief that climate change and ecological crisis can be controlled by human mechanisms, without changing the fundamental structures of human existence on this planet.

This fundamental misconception means that no ‘ought to be’ can be realised, because it means that any and all policies are restricted to slowing our ship’s speed, but not changing its direction. Australian artist Tega Brain brings this is-ought and Fact-Concern discrepancy to the fore in her 2015 artwork titled *The*

²²³ Karl Jaspers, *The Atom Bomb and the Future of Man*, translated by Ernst Ashton (Chicago: University of Chicago Press, 1963), vii.

Intergovernmental Panel on Capitalism which replicates official IPCC websites and reports, but replaces each mention of “Climate Change” with “Capitalism.”²²⁴

While Serres was critiquing the first months and years of such frameworks, Brain calls into question the relationship between policy and politics a quarter of a century later. Though, being a philosopher and artist respectively, they are akin to Kubrick throwing stones at the windowless War Room of *Dr. Strangelove*. If artists, intellectuals, and filmmakers are powerless, what then from the mouth of one who has been at the coal face, not only of the science of climatology, but of formulating international energy policy commensurate with throwing a spanner in the post-industrial works?

Extraordinary Popular Delusions and the Madness of Crowds

Let us not, in the pride of our superior knowledge, turn with contempt from the follies of our predecessors. The study of the errors into which great minds have fallen in the pursuit of truth can never be uninformative. As the man looks back to the days of his childhood and his youth, and recalls to his mind the strange notions and false opinions that swayed his actions at the time, that he may wonder at them; so should society, for its edification, look back to the opinions which governed ages that fled.

– Charles MacKay, *Extraordinary Popular Delusions and the Madness of Crowds* (2012) [1841]²²⁵

Thatcher’s address at the United Nations headquarters in Manhattan and the dinosaurs in Larson’s “Pretty Bleak Picture” are both Town Hall meetings, when collectives of concerned citizens assemble in the same place at the same time, united by shared concern in what each speaker unearths. Whether a village in a jungle, a town by the way, a port by the river, or a city by the bay, Town Hall meetings are for all and one concerned: *with open mouth wide the Stegosaurus ushers the universal sigh to its fellow beings . . .*

Town Halls have fallen by the wayside in the present tense of twenty-first-and-last century megalopolises, though ever so occasionally groups amass to manifest the same ritual, despite all obstacles toward the fractured present and its fractured presence. Kevin Anderson presented all three parts of the universal sigh to one such meeting on 6 November 2012 at the University of Bristol, on the topic of “Real Clothes for the Emperor: Facing the Challenges of Climate Change.” His expertise drew a capacity audience, being one of the world’s foremost climate

²²⁴ Tega Brain and Sam Lavigne, *Intergovernmental Panel on Capitalism*, 2015, accessed 13 December 2015, <http://intergovernmentalpaneloncapitalism.org>.

²²⁵ Charles MacKay, *Extraordinary Popular Delusions and the Madness of Crowds* (London: Simon and Schuster, 2012 [1841]), 336.

scientists, who has also strayed into the politics and policy of energy, as Professor of Energy and Climate Change at the University of Manchester.

With open mouth wide he ushered in the universal sigh to his fellow beings:

I think the Emperor's streaking in front of us naked while most of us are saying "aren't they beautifully attired," including many scientists. I think actually if you stand up and say that the Climate Change Emperor is naked most people will shut you down. They do not want to hear that however obvious it may be.²²⁶

Over the following hour he repeatedly invoked Hans Christian Andersen's fable about *The Emperor's New Clothes*²²⁷ to eviscerate how the IPCC and UNFCCC significantly downplay the extent to which the trajectory is toward a 6° increase by 2100,²²⁸ rather than the fabulist 2° target that this particular extraordinary popular delusion is still beholden to. In a tone by turns conversational and confrontational, he spoke on graph after graph of past, present, and projected warming rates per emission rates, pointing out the "void"²²⁹ between what we would have to do for 2°, versus what is actually being done. This is a worldview mired in a dire mindset, but with equal measure of acceptance for the Dour, in that closing that void hinges on whether the social limits to human life can learn to live meekly within the biophysical limits to life-at-large, rather than pretend those limits are endlessly plastic to human manipulation.

Anderson's presentation further eviscerated global climate policy, decrying "the delusion that climate change can be addressed adequately through rhetoric, financial fine-tuning and piecemeal incrementalism."²³⁰ In riposte, his presentation declared that only a collective 'ah ha!' acknowledging the Emperor's nakedness would suffice to expose this void between what is necessary, and what is actually being done. Yet, as Charles MacKay reasoned in one of the first studies on crowd psychology, from his 1841 tome on *Extraordinary Popular Delusions and the Madness of Crowds*, people "think in herds; it will be seen that they go mad in herds, while they only recover their senses slowly, one by one."²³¹

226 Kevin Anderson, "Real Clothes for the Emperor: Facing the Challenges of Climate Change," paper presented at The Cabot Institute, University of Bristol, 6 November 2012, accessed 13 December 2015, <http://www.bristol.ac.uk/cabot/events/2012/194.html>.

227 Hans Christian Andersen, "The Emperor's New Clothes," in *Fairy Tales Told for Children* (Copenhagen: C.A. Reitzel, 1837).

228 Kevin Anderson and Alice Bows, "Beyond 'Dangerous' Climate Change: Emission Scenarios for a New World," *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 369 (2010): 20–44.

229 Anderson, "Real Clothes for the Emperor."

230 Anderson, "Real Clothes for the Emperor."

231 MacKay, *Extraordinary Popular Delusions and the Madness of Crowds*, 4.

Assuming fideliou climate science is the child to burst the Emperor's bubble, the watching crowd may only finally "recover their senses" in the face of what Anderson elsewhere describes as the "brutal numbers and tenuous hope" of "climate change going beyond dangerous."²³² There is no safe refuge to recover ones senses, for the numbers are "brutal" and the "hope" is delusional rather than "tenuous."

The "brutal numbers" referred to here are the empty gestures of IPCC projections for global heating over the remainder of the twenty-first-and-last century: Two degrees by 2050, Four degrees by 2100 and so on. This is, in part, the problem: the rupture is still disproportionately perceived in terms of linear climate change, while abrupt non-linear climate change is at best ignored, and at worst denied. These numbers are less expressions of actual inherent and anthropogenic climatic precarity, as they are expressions of a global order that still believes signal can be disentangled from noise, reducing the Earth System to Input A of Emissions B from Country C who contributed Proportion X of Warming Y in Timeframe Z.

This is a worldview that would never dare answer Clark's question, which is itself the subject of the Dour:

What is the point of drawing attention to forces outside our control, at this moment when we are struggling so hard to come to terms with events that we do have some sway over? Why, when a willingness to shoulder responsibility for triggering changes in the global environment still seems so tenuous and tentative, should we take up a concern with a different set of disturbances, with another kind of excessiveness that might well undermine these nascent sensibilities?²³³

Policies derived from such a sheltered worldview are liable to face the same criticism Clark extends to responses from the humanities and social sciences: namely, such policy and responses downplay how the biophysical world works, both irrespective of human influence, and when inundated with human influence. The woefully inadequate framing of climate change, not only in science, but in policy and politics, shows how ill-equipped postwar international frameworks are when faced with fidelity to the enmeshed social and biophysical functioning of the planet.

Following a presentation brimming with statistics, graphs and data, Anderson concluded his lecture with a quote that he claims to "always finish off with,"²³⁴ by the Brazilian philosopher and politician Roberto Mangabeira Unger: "at every

²³² Kevin Anderson, "Climate Change Going Beyond Dangerous: Brutal Numbers and Tenuous Hope," *Development Dialogue* 61 (2012): 17.

²³³ Clark, *Ex-orbitant Globality*, 179.

²³⁴ Anderson, "Real Clothes for the Emperor."

level the greatest obstacle to transforming the world is that we lack the clarity and imagination to conceive that it could be different.”²³⁵ Therein, the summary of how we ended up in the desert *this time*, and how we took our turn to flip the tortoise onto its back.

Those aghast at exhaling the universal sigh sought further clarity during question time, before filing out into the unseasonably warm 10° winter night, already 2° above the Bristol average for that time of year.²³⁶ The 2° guardrail is meant to represent an aggregate for the globe, averaged over the three-decade duration sufficient for when temperature becomes climate. Meanwhile, how many days must exceed the guardrail before we understand the tortoise is well and truly “laying on its back, its belly baking in the hot sun” while we stand and do nothing to help it?

Pop Goes the Bubble

I may die; but first you, my tyrant and tormentor, shall curse the sun that gazes on your misery. Beware; for I am fearless, and therefore powerful. I will watch with the wiliness of a snake, that I may sting with its venom. Man, you shall repent of the injuries you inflict.

– Mary Shelley, *Frankenstein* (1818)²³⁷

On 6 November 2012, the lack of “clarity and imagination” to conceive that this world could be different, and the ultimate obstacle it posed to transforming the world manifested itself on an altogether different register: while Anderson was on stage in Bristol delivering the universal sigh, the US was voting between Barack Obama and Mitt Romney for President. The 2012 election showed how Hume’s is-ought dilemma freezes effective action, or indeed any action at all, in that it was distinguished as the first election in a generation where neither the Democrats or Republicans mentioned ‘climate change’ or ‘global warming’ in any campaigns or presidential debates. This contrasted starkly to the subject’s presence, notable as far back as Jimmy Carter’s 1980 campaign. But perhaps not without good reason: arguably Carter lost because his proposed energy and climate policy refused to

²³⁵ Roberto Mangabeira Unger, quoted in Anderson, “Real Clothes for the Emperor.”

²³⁶ Bristol Airport, day and night temperature records for 6 November 2012, accessed 10 June 2016, <https://weatherspark.com/h/y/39587/2012/Historical-Weather-during-2012-in-Bristol-United-Kingdom>.

²³⁷ Shelley, *Frankenstein*, 303.

pretend the Emperor was clothed,²³⁸ and so the ‘extraordinary popular delusions and the madness of crowds’ punished his honesty.

Newspaper reports of the 2012 campaign frequently lamented both candidates’ self-censorship,²³⁹ with one such *Guardian* headline titled *US Election 2012: Romney and Obama Avoid the Climate Change Elephant*.²⁴⁰ The elephant-in-the-room only breached that censorship a week before the vote, through the unprecedented magnitude of Hurricane Sandy making US landfall. Newspaper headlines then bluntly declared both Emperors-to-be to be in fact naked, exemplified by CNN three days before the vote: *Sandy Reminds us of Climate Change and Other Forgotten Campaign Issues*.²⁴¹

Despite Sandy’s imposing presence, both Emperors-to-be continued to excise climate change from their political campaigns, even while this ignored and rampaging elephant eviscerated dreams and delusions of shelter from the Big Apple to its hinterlands. The hurricane’s force would have shattered Fuller’s *Dome over Manhattan*, and with it his managerial mindset for controlling *Spaceship Earth*. A Manhattan now directly in the line of fire of intense and volatile weather previously restricted to the tropics would not demand new *Seinfeld* storylines but a new worldview altogether. A Manhattan finally hit by this Bomb would issue the punchline undermining Kubrick’s yearning to *Learn to Stop Worrying and Love the Bomb*. Perhaps the great director would have seen Hurricane Sandy as a portent of the Doomsday Device, for it was not a singular explosion, but a manifestation of the everywhere-all-the-time explosion of global heating.

238 Georgiana Banita, “Voting for American Energy: Elections, Oil, and US Culture,” in *Electoral Cultures*, eds. Georgiana Banita and Sascha Pohlmann (Heidelberg: Heidelberg University Press, 2015), 101.

239 Representative examples of this contemporaneous coverage include: Bryan Walsh, “Why Climate Change Has Become the Missing Issue in the Presidential Campaign,” *Time*, 23 October 2012, accessed 10 June 2016, <http://science.time.com/2012/10/23/why-climate-change-has-become-the-missing-issue-in-the-presidential-campaign/>; John Broder, “Nearly Absent in the Campaign: Climate Change,” *The New York Times*, 25 October 2012, accessed 10 June 2016, <http://www.nytimes.com/2012/10/26/us/politics/climate-change-nearly-absent-in-the-campaign.html>; and Abby Week, “How Obama Softened on Climate Change,” *ABC News*, 2 November 2012, accessed 10 June 2016, <http://abcnews.go.com/blogs/politics/2012/11/barack-obamas-evolution-on-climate-change-a-brief-history>.

240 Leo Hickman, “US Election 2012: Romney and Obama Avoid the Climate Change Elephant,” *The Guardian*, 24 August 2012, accessed 10 June 2016, <http://www.theguardian.com/environment/blog/2012/aug/24/us-election-2012-romney-obama-climate>.

241 Dan Merica, “Sandy Reminds Us of Climate Change and Other Forgotten Campaign Issues,” *Cable News Network*, 30 October 2012, accessed 10 June 2016, <http://www.cnn.com/2012/10/30/politics/forgotten-campaign-issues/index.html>.

Sandy was an event that burst many bubbles of imagined shelter, reducing dreams of ‘managing’ climate change to rubble, and screaming over the top of nursery rhyme versions of reality. Sandy was, in some ways, the first impact of the ship’s prow on that rocky bar, driven by human failings (rational, conceptual, political, and scientific) that prevented any change in its direction. Marx cautioned “all that is solid melts to air”²⁴² in the end game pursuit of industrial capitalism. The hurricane brought the shipwreck not only into the foreground of prosperous Western countries, but onto their most prized real estate, dumping the consequences of an anthropogenically perturbed Northern Polar Jet Stream onto Manhattan Island.²⁴³

Sandy’s trajectory, unprecedented in modern human history, was just the tip of the iceberg in terms of how “all that is solid melts to air,” as anthropogenic destabilisation of the climate has increased the propensity, intensity, and distribution of phenomena such as the Northern Polar Vortex.²⁴⁴ Whereas the Northern Polar Jet Stream used to confine the Polar Vortex to Arctic regions back in the halcyon Holocene days, nowadays anthropogenically induced jet stream destabilisation increasingly brings Arctic weather into the longitude between 40° and 50° North – that is, to Europe and the US.²⁴⁵

But a once-in-a-millennium event becoming a once-in-a-decade event is apparently also insufficient to induce either US or global acknowledgment that the climate change Emperor has been naked all along. Three years after the 2012 election, the UNFCCC and heads of state gave themselves a standing ovation for the accord reached at their annual Conference of Parties meeting in Paris. Kevin Anderson watched on in horror that they still praise the Emperor’s new clothes, remarking that “it is pantomime season and the world has just gambled its future on the appearance in a puff of smoke of a carbon-sucking fairy godmother.”²⁴⁶

That is: their standing ovation proclaimed that the demon would be coaxed back into its bottle of containment by developing Negative Emissions Technologies, which would suck such carbon out of the atmosphere. Rather than change our ship’s direction, we now claim we can make the rocky bar disappear altogether

242 Karl Marx and Friedrich Engels, *Manifesto of the Communist Party* (Chicago: CH Kerr and Company, 1906 [1848]), 18.

243 Charles Greene, Jennifer Francis, and Bruce Monger, “Superstorm Sandy: A Series of Unfortunate Events?” *Oceanography* 26, no. 1 (2013): 8–9.

244 Judah Cohen et al., “Recent Arctic Amplification and Extreme Mid-Latitude Weather,” *Nature Geoscience* 7, no. 9 (2014): 627–637.

245 Jennifer Francis and Stephen Vavrus, “Evidence Linking Arctic Amplification to Extreme Weather in Mid-Latitudes,” *Geophysical Research Letters* 39, no. 6 (2012): 1–6.

246 Kevin Anderson, “Talks in the City of Light Generate More Heat,” *Nature* 528 (2015): 437.

in a puff of (non-carbon) smoke. Alas, even the desultory conservatism of august global governance bodies continues to sing nursery rhymes of avoidance and shelter, intoning *Three Blind Mice* with scant regard for the bloody breadcrumb trails leading back to the sadistic violence behind the rhyme.

It seems fitting to imagine Charles MacKay watching in horror from beyond the grave, he who lamented in 1841 how “nations, like individuals, cannot become desperate gamblers with impunity. Punishment is sure to overtake them sooner or later.”²⁴⁷ One hundred and forty seven years later in 2015 Anderson was forced to lament that the Dire “has just gambled its future,” meaning that the comeuppance is definitely now due sooner, rather than later. As Stephen Schneider, then Professor of Environmental Biology and Global Change at Stanford University remarked in 2007, shortly before his death:

Hell, we buy fire insurance based on a 1% chance . . . If we're going to be risk averse . . . we cannot dismiss the possibility of potentially catastrophic outliers and that includes Greenland and West Antarctica (ice sheets breaking up), massive species extinctions, intensified hurricanes and all those things. There's at least a 10% chance of that. And that to me for a society is too high a risk . . . My value judgement when you're talking about planetary life-support systems is that 10%, my God, that's Russian roulette with a Luger.²⁴⁸

The analogy between anthropogenic climate change and Russian roulette is a long-standing motif, though Schneider's punchline about the traditional revolver having been replaced with a semi-automatic Luger pistol drove home the escalation seen at the beginning of the twenty-first-and-last century. But even 30 years before Schneider's statement, Wallace Broecker declared in 1987 that

The inhabitants of Earth are quietly conducting a gigantic experiment. So vast and sweeping will be the consequences that, were it brought before any reasonable council for approval, it would be firmly rejected. Yet it goes on with little interference from any jurisdiction or nation . . . We play Russian roulette with climate, hoping that the future will hold no unpleasant surprises. No one knows what lies in the active chamber of the gun.²⁴⁹

Broecker's declaration occurred a year before the IPCC was formed and the UN General Assembly ushered in their hollow conceit about their *Protection of Global Climate for Present and Future Generations of Mankind*. Meaning that the stakes and rules for the game of chance being played with our only home have been a

²⁴⁷ MacKay, *Extraordinary Popular Delusions and the Madness of Crowds*, 51.

²⁴⁸ Stephen Schneider, quoted in Liz Minchin, “Scientist's ‘Russian Roulette’ Climate Warning,” *The Age*, 29 January 2007, <https://www.theage.com.au/national/scientists-russian-roulette-climate-warning-20070129-ge43g4.html>.

²⁴⁹ Wallace Broecker, “Unpleasant Surprises in the Greenhouse?”, *Nature* 328, no. 6126 (1987): 124.

long time in the (un)making. Given that the risks are being judged by “desperate gamblers,” the rules require an understanding commensurate with a brief history of running out of time. Anderson, Broecker, and MacKay, though spread over nearly two centuries, all allude to the way risk ties in with notions of potential futures, where outcomes of gambling today may beget vastly different tomorrows.

Before summarising these rules and stakes in terms of Anderson’s statements and how they relate to a dire demeanour, it is first necessary to consider the backstory to the ideas of gambling that MacKay observed in the previous century. The reason for this is quite straightforward: on closer examination, the international order of an IPCC or an UNFCCC owes more to the concept of gambling than it does to the contemporaneous revelations unleashed by N-LSD or Earth Systems Science.

This Is Not a Pipedream

In the risk society . . . the ability to anticipate and endure dangers, to deal with them biographically and politically acquires importance . . . How do we handle ascribed outcomes of danger and the fears and insecurities residing in them? How can we cope with the fear, if we cannot overcome the causes of the fear? How can we live on the volcano of civilisation without deliberately forgetting about it, but also without suffocating on the fears – and not just on the vapours that the volcano exudes?

– Ulrich Beck, *Risk Society: Towards a New Modernity* (1986)²⁵⁰

The Tigris and Euphrates are the two great rivers of Mesopotamia, and, between them, constitute one of the proverbial cradles of civilisation. The details of where and when civilisation first emerged have been lost to time. Only fragments remain – though the valley between the two rivers is a mighty fragment, and, mythical origins aside, has witnessed the rise and fall of many an empire. The city of Mosul, one of the oldest in the world, stands on the banks of the Tigris, 50 kilometres downstream from Mosul Dam.

The dam’s design, engineering, and construction involved an exceptional trade-off between resources and risk, leaving not only Mosul but also other major downstream cities, such as Baghdad, at the behest of a 110-metre wall of water held back by a 113-metre wall of cement. Whereas Fichte traced our “houses on the earth” three levels down, to an elephant, a tortoise, then “the tortoise again,” the team of German and Italian geophysicists left no mystery as to what bedrock lay beneath the proposed dam, what lay beneath the bedrock, and so on. The

250 Ulrich Beck, *Risk Society: Towards a New Modernity* (London: Sage, 1992 [1986]), 76.

particulars of the site's geology literally began to undermine the dam no sooner than its construction was completed in 1986. It has since provided the city with hydroelectricity, and irrigation for the arid desert surrounds. Having hitched the city to the dam, the sunk costs have required constant injections of material ever since, to shore up leaks and to reinforce the base.

Following more than a decade of alarming reports, in 2016 a team of Iraqi and Swedish geologists and engineers published an article titled the "Mystery of Mosul Dam, the Most Dangerous Dam in the World: Dam Failure and its Consequences."²⁵¹ Co-authored by some of the original dam engineers, including the former chief engineer, Nasrat Adamo, the article sought greater certainty about the probability of dam collapse through refined modelling. While the word "mystery" is never mentioned outside of the title, Adamo elaborated on this "mystery" in a *Guardian* article titled "Mosul dam engineers warn it could fail at any time, killing 1m people." Therein Adamo concluded that "nobody knows when it will fail. It could be a year from now. It could be tomorrow."²⁵² In light of the report, Iraq's Prime Minister Haider al-Abadi and the US embassy in Baghdad issued statements on the perceived state of heightened risk, obfuscating their inability to attend or alleviate the risks for those downstream of the potential cataclysm.

Bursting "the bubble of civilisation"²⁵³ is a mere metaphor for many, but for those downstream from Mosul Dam it is a literal, everyday affair. For those already downstream, beyond where "we can dream of diversion and escape," to reprise Clark,²⁵⁴ this human-scaled cataclysm is a literal affair that may eventuate "a year from now" or "it could be tomorrow," even if it still appears as a metaphor for those who believe themselves to live upstream of the dam wall.

Mosul Dam may indeed be miniscule and insignificant on the scale of the planet, let alone the cosmos. Yet because of its volatility and incapacity for repair it stands as a particularly telling scaled-down version of the unfolding rupture: abrupt climatic cataclysm could happen at any 'moment', and the alternating panic, denial, or fantasies of management that support a dire demeanour will be

251 Nadhir Al-Ansari et al., "Mystery of Mosul Dam, the Most Dangerous Dam in the World: Dam Failure and its Consequences," *Journal of Earth Science and Geotechnical Engineering* 5, no. 3 (2015): 95–111.

252 Nasrat Adamo, quoted in Julian Borger, "Mosul dam engineers warn it could fail at any time, killing 1m people," *The Guardian*, 2 March 2016, accessed 1 May 2017, <https://www.theguardian.com/world/2016/mar/02/mosul-dam-engineers-warn-it-could-fail-at-any-time-killing-1m-people>.

253 Charlotte Du Cann, Anthea Lawson, and Tom Smith, "Introduction," in *Dark Mountain: Refuge – Ten Years on the Mountain* (Oxford: Dark Mountain Books, 2018), 5.

254 Clark, *Inhuman Nature*, 31.

empty gestures when the time comes, just as panic, denial, or fantasies about ‘solving’ the ‘problem’ are no help to the inhabitants of Mosul and Baghdad.

The dam cannot be comprehensively strengthened while the water is within, for how could the wall be accessed? The dam cannot be drained, for where would the water go while the wall is repaired or rebuilt? And even if it could be drained, where would the cities and farmlands get their water meanwhile? And where would the water come from to refill an empty dam? Neighbouring countries are not prone to letting precious water leave their borders. The dam cannot be deconstructed: in a society no longer used to such standards of living, a city with water tanks on every rooftop does not a habitable city make. The cities cannot be permanently evacuated, for where do cities go when there is no available land to be moved to?

The concrete cannot be coaxed into stronger tenses: what was laid down is literally set in stone. The laws of geology cannot be muted because they are immutable: strata will compose and recompose, just as plate tectonics play out irrespective of activity on earth’s surface. The laws of chemistry cannot be muted because they are immutable: water will dissolve concrete foundations, just as it does the karst bedrock beneath. The laws of physics cannot be muted because they are immutable: the wall of water will exert its pressure come ruin, revelry or revolution. The language of law, liability, regulation, and policy can only mask the cracks for so long – once they are visible to the naked eye of the layperson, the Kafkaesque absurdity of modern bureaucracy is laid bare, just like the naked Emperor’s body in the *Emperor’s New Clothes*.

The chasm between known knowns and known unknowns about whether one’s world will collapse “tomorrow” or “a year from now” is what sociologist Ulrich Beck termed a “Risk Society” in 1986 – the same year Mosul Dam was completed. Industrial civilisation lives in the shadow of existential risks inherited from the past, whether a dam wall, MAD nuclear deterrence policy, or human-induced climate change. And these risks only compound all those unknown unknowns residing in the “cataclysm upstream” of humanity.

The dam, the Bomb, the Tomb in the Enewetak Atoll, and the changed climate have already been brought into the world. Critiquing the myopia that gave rise to such short-sighted choices is as futile as trying to revise history. It does not yield a lesson for how to do things better next time round, because there is not going to be a next time during which a civilisation will notionally get it right. Just as F. Scott Fitzgerald declared “there are no second acts in American lives,”²⁵⁵ there are no second acts in the unfolding rupture.

255 F. Scott Fitzgerald, *The Last Tycoon* (New York: Charles Scribner’s Sons, 1941), 163.

There is only the dam as it stands: an edifice crumbling at the seams, plugged with thumbtack-level solutions, where each thumbtack pushed in presses the dam water to find another passage through the cancerous concrete. There is only the world as it stands: today, and the cataclysmic tomorrow that could come “a year from now”²⁵⁶ or in the morning.

Trade-offs between today and tomorrow are one and the same as between resources and risk. Should you bank on strength X to withstand force Y over time period Z? And what when force Y has deviations both standard and stochastic? To live in the “Risk Society” is to live on “the volcano of civilisation,”²⁵⁷ wherein we build houses to create the illusion of stability and safety despite the fact that we are building on the back of a fundamentally unstable World Turtle, into whose working we have thrown our sticks, stones, and radioactive waste, thus rendering something already unstable now completely volatile. Mosul Dam is an obvious candidate for a volcanically-hitched civilisation: the result of deliberate human intervention based on false conceptions of the stability of the rock beneath our feet and our own capacity for control and regulation, now yielding a precarious, unpredictable, and cataclysmic entity that can come crashing down “a year from now” or “tomorrow.”²⁵⁸

Yet even if all societies – ancient, modern, and industrial – were pitched on a volcano of some sort or another, we cannot acquit ourselves simply by claiming we perched our civilisation on a volcano: this mistakes the smoke for the fossilised trees of Petrified Forest National Park in Arizona. Civilisation *is also* the volcano that has exacerbated the planet’s intrinsic volatility and enhanced its destructive potential via its ‘civilised’ means of production. Exhuming energy and heat from the subsurface of earth, civilisation has acted like a volcano, drawing up and combusting fossil fuels to channel the heat and energy into the atmosphere. The exhausted man-made mines are like siblings to the volcano caldera left behind after an eruption, once a volcano’s contents have erupted into the atmosphere. In a nutshell: civilisation manifests existential risks which are self-manufactured.

All civilisations have existed perched atop a volcano, courtesy of the cosmic vicissitudes to which all life is behest. But only the present civilisation can claim to be a *volcano perched atop a volcano*. The difference lies in what precepts and conceits have been inherited from when civilisations did not build dams, only to

256 Adamo, quoted in Borger, “Mosul Dam Engineers Warn It Could Fail.”

257 Beck, *Risk Society*, 76.

258 Adamo, quoted in Borger, “Mosul Dam Engineers Warn It Could Fail.”

live in fear in their shadow, but whose houses, built more feebly on the earth, were nonetheless a trade-off between resources and risk.

When the Indonesia volcano of Krakatoa erupted in 1883 it unleashed a 40-metre-high tsunami on West Java, the landmass closest to the eruption. One of the most formidable structures to be obliterated by the tsunami was the 40-metre-high Cikoneng lighthouse on the West Java sea shore. Only for it to be rebuilt two years later, an impressive 18 metres higher, and 50 metres back from the shore. But despite the new lighthouse then being one of the tallest in the world, all design can only be measured against its correlate: the vicissitudes of the Earth System. Just as all human intentions can only be measured against the radical asymmetry and contingency of life on earth to the cosmos to which it is hitched. After all, disaster originally meant an ‘ill-starred event’ – where earthly outcomes were ascribed their cosmic origins. As Clark writes, this event is one

that we cannot simply turn into an object of knowledge – for such is its force and shock that it dismantles the very platforms from which we apprehend reality. And yet, even as the disaster overwhelms our taken-for-granted senses and sensibilities, it also challenges us to try and begin sensing, thinking, acting in new ways. It ends the world, and begins it turning anew.²⁵⁹

The lighthouse, seeking to ward ships from shipwreck, obliterated by a volcano-cum-tsunami. The fiery origins of the disaster lie deep in the belly of the earth and resist all attempts to “simply turn [them] into an object of knowledge,” just as lighthouses, as “platforms from which we apprehend reality,” are obliterated in the aperiodic wake of such events. The old platform base of the destroyed lighthouse stands next to its replacement, which shows that prior disasters only mildly challenge us “to try and begin sensing, thinking, acting in new ways.”

Singular instances of a contemporary Iraqi dam or an historical Indonesian lighthouse may appear poor proxies for Anderson and MacKay’s respective cautions about climate change risks played by nation state gamblers. But they only appear impoverished because both are proximal: one dam collapse or tsunami, and the rest of the show soldiers on. As distal phenomena, true ruptures are inexorably more complex, as are their spatial and temporal repercussions. Only a rupture “ends the world, and begins it turning anew” as per the changeability and consequence that comprise the first and second parts of the universal sigh, uttered by Stegosaurus on his endling podium.

Though singular instances still provide a portal into how proximal phenomenon become distal disasters. The Great East Japan Earthquake of 11 March 2011

²⁵⁹ Nigel Clark, “Geo-politics and the Disaster of the Anthropocene,” *The Sociological Review* 62, no. 1 (2014): 21–22.

was one of the most powerful ever recorded. It lasted six minutes, and in that time it moved the coastline of Honshu, shifted the earth on its axis by up to 25 centimetres, and minutely increased the rotational speed of the planet.²⁶⁰ But it also unleashed a tsunami that ruptured the Fukushima nuclear power plant, spreading nuclear radiation across oceans and throughout food-chains. The disaster displays the spatial and temporal scale of climate change in several ways, but the planet cannot be reset upon its axis, nor the radiation genie put back into the fusion reactor bottle, rather different parts of it will dissipate over millennia of millennia throughout the globe.

Over the decade prior to the Fukushima accident external and internal reports to the energy company argued that the height of the sea-wall was vastly insufficient for a proverbial once-in-a-millennium tsunami.²⁶¹ But to budget for the once-in-a-blue moon requires exorbitantly more resources: thicker, taller, stronger sea-walls, dams, and lighthouses. The economic comparison of risks to resources makes tomorrow's budgeting look like squandering today. Yet the nuclear meltdown continues to be read as a lesson for how to do things better next time round – where next is no longer another millennium, as the bubble of a once-in-a-millennium periodicity has been burst by the breach. Just as the UNFCCC still refuse to acknowledge their Emperor is naked, so do their Japanese counterparts, though in relation to risk and resources for generating energy.

Differentiating between proximal and distal phenomena has a bearing on our present tense, because moments that have repercussions for the entire planet beg their distinction. We act in the proximal, just as we live in it. It is how the world is mediated: the proximal is literally only ever right here and right now, wherever and whenever those happen to be. But the cumulative effects of collective human action now extend to the realm of the distal. Despite this, the dominant worldview regards the predicament as a proximal one, like viewing Cook and Tu'i Malila's arrival in Tonga as the origin of the cataclysm upstream. Such a worldview encompasses only the most obvious and instantaneous, with scant regard for the insidious.

Instead, we now need to live in the distal, given it is the domain that we invited ourselves to play in: having attained distal agency, we can no longer afford to remain cowering in the sheltered conceit of the burst proximal bubble. Beck describes the precarity of so doing in his *Risk Society* thesis as *Living on the*

²⁶⁰ Heiner Igel et al., "Observations of Earth's Toroidal Free Oscillations with a Rotation Sensor: The 2011 Magnitude 9.0 Tohoku-Oki Earthquake," *Geophysical Research Letters* 38, no. 21 (2011): 1–5.

²⁶¹ Noriko Behling et al., "Aftermath of Fukushima: Avoiding Another Major Nuclear Disaster," *Energy Policy* 126 (2019): 411–420.

Volcano of Civilisation – The Contours of the Risk Society. This title to the first part of his thesis features a heading of “Dealing with Insecurity: An Essential Qualification,” wherein Beck asks, somewhat rhetorically:

How can we live on the volcano of civilisation without deliberately forgetting about it, but also without suffocating on the fears – and not just on the vapours that the volcano exudes?

Given that all forms of shelter just continually reveal their hollow conceits, the answer to “how can we live on the volcano . . .?” can only come from radically new notions of our expectations: of risk, of danger, of predictability, of probability, of periodicity, and, most importantly, of tomorrow and all subsequent tomorrows to come.

Seven Decades of Minutes to Midnight

The era of procrastination, of half-measures, of soothing and baffling expedients, of delays is coming to its close. In its place we are entering a period of consequences.

– Winston Churchill, Debate on the Address, United Kingdom Parliament, 12 November 1936²⁶²

In the dark times

Will there also be singing?

Yes, there will also be singing

About the dark times.

– Bertolt Brecht, “Deutsches Lied” (1976 [1939])²⁶³

The persistent background hum of pestilence has been running for so long that the clock appears to have stopped. In 1947, the year the Cold War started, the *Bulletin of the Atomic Scientists* unveiled their *Doomsday Clock*, expressing how many minutes to midnight remained within the margin of error of human-caused global cataclysms. The clock started at seven minutes to midnight: however ominous the dire straits that Chaplin satirised in *The Great Dictator* in 1940, the measure of desperation had shifted to a whole other register a mere seven years later.

²⁶² Winston Churchill, “Debate on the Address speech in United Kingdom Parliament,” transcript of speech delivered at United Kingdom Parliament, HC Deb vol 317 cc1081-155, 12 November 1936, accessed 6 May 2019, <https://api.parliament.uk/historic-hansard/commons/1936/nov/12/debate-on-the-address>.

²⁶³ Bertolt Brecht, “Deutsches Lied,” in *Bertolt Brecht, Poems 1913-1956*, eds. John Willett, Ralph Manheim, and Erich Fried (London: Eyre Methuen, 1976), 320.

This particular clock, the one that measures a brief history of running out time, while not even keeping time, was conceived by Manhattan Project scientists who formed the *Bulletin* in 1945, aghast at the Hiroshima and Nagasaki atom bombs. During the Cold War the clock hovered around five minutes to midnight, and with the *Bulletin* now folding in human-caused climate change into the cataclysms mix, it stands at 90 seconds to midnight.²⁶⁴

While Nicholas Wade was epistemically incorrect to accuse Hansen of “crying wolf on greenhouse warming”²⁶⁵ in his 1989 *New York Times* op-ed, he was correct in saying that crying wolf will not work. The alarm bells have been ringing for so long they have become subsumed into the background noise of civilisation. Time has stood still for the past seven decades, while the clock of our crisis has drawn ever closer to the end game. In any event and any eventuality, whether it is five, two, one, three, or four minutes to midnight matters not: when we speak in minutes to midnight, it is already too late.

It is clearly not 1pm, when the greenhouse effect in earth’s atmosphere was first experimentally proven in 1861 by UK physicist John Tyndall.²⁶⁶ Nor is it 1:30pm, when the anthropogenic influence of fossil fuelled energy combustion on global climate was first made public in 1896 by Swedish physical chemist Svante Arrhenius.²⁶⁷ Nor is it 4pm, when the term ‘global warming’ was first used in Wallace Broecker’s 1975 article “Climatic Change: Are we on the Brink of a Pronounced Global Warming?”²⁶⁸ Nor is it 11pm when Bill Clinton declared that “unless we act now, we face a future in which the sun may scorch us, not warm us; where the change of season may take on a dreadful new meaning.”²⁶⁹ That ‘now’ was Earth Day 1993.

The list goes on and on but the number of hours on the clock hand do not. The hour is at hand. When the clock striketh 12 it has one of two places left to go. No clock face can resist gravitational forces – its hand must fall clockwise on toward 1, or anticlockwise backward to 11. A revolution is anything that comes full

264 Bulletin of the Atomic Scientists, “Doomsday Clock,” *Bulletin of the Atomic Scientists* 100 seconds to midnight, accessed 30 November 2024, <https://thebulletin.org/doomsday-clock>.

265 Wade, “Crying Wolf in the Greenhouse.”

266 John Tyndall, “The Bakerian Lecture: On the Absorption and Radiation of Heat by Gases and Vapours, and on the Physical Connexion of Radiation, Absorption and Conduction,” *Philosophical Transactions of the Royal Society* 151 (1861): 1–36.

267 Svante Arrhenius, “On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground,” *Philosophical Magazine and Journal of Science* 5, no. 41 (1896): 237–276.

268 Wallace Broecker, “Climatic Change: Are we on the Brink of a Pronounced Global Warming?,” *Science* 189, no. 4201 (1975): 460–463.

269 Bill Clinton, “Remarks on Earth Day, 21 April 1993,” transcript of speech delivered at US Botanic Gardens, 21 April 1993, 630, accessed 6 May 2019, <https://www.govinfo.gov/content/pkg/WCPD-1993-04-26/pdf/WCPD-1993-04-26-Pg630.pdf>.

circle. Midnight is no matter of concern – it will be a passing face of deep darkness, which will be drawn inexorably onwards or backwards into another *New World Coming*. And, in the deeper eventuality of time, the clock-hands of that world(s) will settle at six – where no gravitational force will be able to shift them onwards, by the same principle of the second law of thermodynamics, which will inevitably submit this clockface to universal heat death.

Finally, we have arrived home, by way of Stuart Kauffman's *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. Home, if it is to be anywhere, can only ever be found in a dour demeanour, and its absolute fidelity to the inhospitable nature of the cosmos. It is cold comfort, but comfort nonetheless:

The second law of thermodynamics has been thought to be rather gloomy. One almost imagines the grave headlines: UNIVERSE RUNNING DOWN. HEAT DEATH HEADED OUR WAY. DISORDER IS ORDER OF THE DAY. How far we have come from the blessed children of God, at the centre of the universe, walking among creatures created for our benefit, in a garden called Eden. Science, not sin, has indeed lost us our paradise.²⁷⁰

Kauffman speaks of how the entropy of all that is and ever was, whether cell or solar system, can only increase. All roads lead to Rome, and all Romes lead to ruination.

While the Dour maintains that the radioactive waste from The Tomb on Enewetak Atoll will inevitably all leach out eventually, just as all the oceans will dissipate into space, the Dire draws a line that states the entropy of human-released demons must be countered with control. Most notably, the Dire is preoccupied with the most ominous outstanding question of what the contemporary threshold is for crossing critical tipping points, most notably runaway climate change. And, more disturbingly, whether that particular one has already been crossed, given that the jet-lag between cause and effect in climate change means the event may only become known after the fact, by which point it is too late to remedy.

Against such known unknowns lies the known known: that this roughly five-decade inertia of the climate system is such that the climate unravelling now is due to emissions released into the atmosphere when Nina Simone released *New World Coming* in 1971. This is coupled with signal masking through airplane contrails, air pollution, and shipping pollution. So, it seems safe to hazard a guess that substantial climatic destabilisation has already been committed. Even if all releases ceased today, the act has taken place.

²⁷⁰ Stuart Kauffman, *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (Oxford: Oxford University Press, 1995), 10.

In their above quotes Churchill and Brecht both refer to the rise of Nazism and the trajectory toward war. In 1936 Churchill was already lamenting that time had run out to forestall either. Brecht too had seen the writing on the wall, having gone into exile from his German homeland on 28 February 1933, one month after Hitler became Chancellor and one day after the Reichstag fire. The times have been dark for quite some time, and there has been “singing/About the dark times” for quite some time too. The *Doomsday Clock* has been running far longer than the Doomsday Device satirised in *Dr. Strangelove*. Which is to say that the twentieth-and-second-last century gave good for setting up present tense existential anxiety. Roll the roll call: World War One, World War Two, Fascism, Communism, Korea, Vietnam, the ‘Spanish flu’, Cambodia, Chernobyl, AIDS, Rwanda, Afghanistan, Ebola, Coronavirus, “The Bomb, Dmitri, The Bomb . . .”

While the unfolding rupture truly suffers no comparison in its consequence or magnitude, we twenty-first-and-last-centurians might be thankful in a way to the twentieth-and-second-to-last. Rather than all other things being equal, imagine all other things being other: no world wars, no modern plagues or genocides, no Bomb, no nuclear accidents. The rest of society otherwise much the same (inequality, corruption, nepotism, chicanery, and introverted narcissism), but without any of the above conflicts or catastrophes to warm us up for a truly planetary crisis, or an ever-present potential for near instantaneous self-annihilation.

Along comes the ecological crisis. We would have little-to-no reference point. A world that was not already on the razor’s edge of volatility, even if it was only social, economic, political, military volatility, would have no reference point for how to live in turbulent times. The benefit of the last century’s inheritance is not overt. Perhaps that is asking too much: a benefit confers a benefit. Conversely, the mindset of the Dire has been so pervasive for such a long time that ratcheting up the minutes-to-midnight from five to two barely registers a murmur. Leaving nothing to be done, before two becomes one and then none, but to consider the age-old question of what is life (at the end of empire)?



Fig. 11: 270 Broadway, Manhattan, site of the original Manhattan Project HQ during World War Two, United States of America, 20 November 2019. Photograph by author.

VI

What is Life (at the End of Empire)?

“... but it can't, not without your help ...”

In a nutshell:

Goodbye Bygone Eras >

Goodbygone Eras >

Goodbye Gone Eras >

Unchartered Waters >

On War Ever Onwards >

The Buck Shot v The Buck Stop

Askew Cows Come Home to Jump Over the Moon

The weight of this sad time we must obey,
 Speak what we feel, not what we ought to say.
 The oldest have borne most; we that are young
 Shall never see so much, nor live so long.
 – William Shakespeare, *King Lear* (1606)²⁷¹

Has the light gone out for you?
 Because the light's gone out for me
 It is the twenty-first century
 It is the twenty-first century.
 – Radiohead, “Bodysnatchers” (2007)²⁷²



Fig. 12: *Cows Often Sit Down Carefully. Perhaps Their Joints Creak?* Cretaceous–Paleogene boundary, 66 million years ago, Geulhem, the Netherlands, 16 November 2013.

Answering the perennial question of what is life, changes according to the season. When Schroedinger asked *What is Life?* in his eponymously titled 1944 book, notions of ecological precarity or even the civilisational precarity of World War Two were absent from his inquiry. His was not a line of inquiry for finding one’s

²⁷¹ Shakespeare, *King Lear*, Act V, Scene III.

²⁷² Radiohead, “Bodysnatchers,” track 2 on *In Rainbows* (XL 2007), LP.

feet amidst falling bombs, but rather to probe properties fundamental to life at the microbial scale.

A half century later a team of renowned biologists and cognate scientists published a homage to Schroedinger's foray, unearthing what the intervening years had yielded on the perennial mystery. *What is Life? The Next Fifty Years: Speculations on the Future of Biology* had a future focus too: looking ahead to the first half of the twenty-first-and-last century.²⁷³ In the same year, 1995, Lynn Margulis and Dorion Sagan published their book *What Is Life?*, also reflecting on Schroedinger's foray, though with renegade marvel at the majesty of the microbial world.²⁷⁴

Yet concerns of ecological or even civilisational precarity were still absent from both 1995 works, as if the intervening half century had posed no rejoinder: what is life (when living during a rupture of life on earth)? Travelling *On the Road* with Jack Kerouac in 1947 was a celebratory affair of US excess and hedonism,²⁷⁵ whereas travelling along Cormac McCarthy's *The Road* in 2007 was a harrowing affair of collapse in terms of both civilisation so-called and the biosphere. Unsurprising, given the *Doomsday Clock* started the year *On the Road* was published, and had already well rundown by the time *The Road* came out in 2007. Meaning that nowadays, asking 'what is life?' is a question that need heed the season, as per the 2007 documentary *What A Way To Go: Life at the End of Empire*.²⁷⁶

Husband and wife documentary makers Timothy Bennett and Sally Erickson bring the perennial wonder of *what (on earth) is life*, to bear *on Earth* undergoing a rupture. They reveal how empire, aka civilisation so-called, is tempted by a dire demeanour that insists there is still time to avert the cataclysm downstream. They also demonstrate how all that really remains is the abhorrent *Way To Go* offered by *Life at the End of Empire*. At least, this is all that reasonably remains for those of the dour Bishop Ridley or Bishop Latimer ilk, who acquiesce to their death sentence rather than pleading as Cranmer did, desperate to live longer under the empire, no matter what the conditions.

Whether remaining in the dour demeanour of Ridley and Latimer, or switching to the dire mindset of Cranmer, all three would have likely felt petrified. So too for any sentient mortal creature coming to terms with its imminent mortality.

273 Luke O'Neill and Michael Murphy, eds. *What is Life? The Next Fifty Years: Speculations on the Future of Biology* (Cambridge: Cambridge University Press, 1995).

274 Lynn Margulis and Dorion Sagan, *What Is Life?* (New York: Simon & Schuster, 1995). See also Ed Regis, *What Is Life? Investigating the Nature of Life in the Age of Synthetic Biology* (Oxford: Oxford University Press, 2009).

275 Jack Kerouac, *On the Road* (New York: Viking Press, 1957).

276 Timothy Bennett, director, *What A Way To Go: Life at the End of Empire* (VisionQuest Pictures, 2007), DVD.

For those living at the end of empire nowadays, actual petrification shadows this feeling of being petrified, bringing the torment of existential fear into equanimity with its realisation.

Call a spade a rose or a rose a spade until the proverbial cow jumps over the moon: a rupture of life on earth is a rupture of life on earth. How do we place this one, then, in the context of all the others? Where, in fact, do we find evidence of all the others? The path leads behind, beneath, beyond, and above. Recall the secondary-school mnemonic: *Cows Often Sit Down Carefully. Perhaps Their Joints Creak?* Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian, Triassic, Jurassic, Cretaceous?

The question mark follows the Cretaceous because this is the era that met with Chicxulub's impact, ushering in the Cenozoic's New New Animals, including . . . the cow. Slated to become the proxy land dinosaur of New New Animals, wherein the domestic cow "may well" become "the largest mammal on Earth in a few hundred years"²⁷⁷ with the margin of error from forecasting near-future extinction of dwindling terrestrial megafauna. An extinction trend that has a long tail extending back into the past, as Alfred Russel Wallace presciently observed in 1876: "we live in a zoologically impoverished world, from which all the hugest, and fiercest, and strangest forms have recently disappeared."²⁷⁸

But why the mnemonic in the first place? The cow's creaking joints list the 10 geological eras since multicellular life first evolved 570 million years ago, in the Cambrian explosion. Between each era, a rupture of sorts. Between five of these eras that rupture constituted a Mass Extinction Event, and now at the tail end of the cow the sixth such event unfolds.

To see how the consequences of this event extend from human-to-human to human-to-all-other-life, giving weight to a near-future empire of domestic cows, consider the current relative weights of all terrestrial vertebrate animals. Animals enslaved into providing flesh, skin, milk and so on for *homo sapiens* comprise 67% of the total weight. *Homo sapiens* itself comprises another 30%. Leaving a grand total of 3% that comprises all that remains – "wild animals, covering everything from elephants, camels and polar bears to rabbits, kangaroos and wolves."²⁷⁹

²⁷⁷ Felisa Smith et al., "Body Size Downgrading of Mammals over the Late Quaternary," *Science* 360, no. 6386 (2018): 310–313.

²⁷⁸ Alfred Russel Wallace, *The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas as Elucidating Past Changes of the Earth's Surface* (New York: Harper, 1876), 150.

²⁷⁹ Vaclav Smil, "Harvesting the Biosphere: The Human Impact," *Population and Development Review* 37, no. 4 (2011): 613–636.

These vertebrate animal proportions speak loudly as to how a human monoculture and its attendant enslavement of non-human lifeforms have induced the Sixth Extinction Event. Call the first grouping of species domesticated, but those at the pyramid base, such as cows, chickens, sheep and so on, are born only into servitude, as are all their descendants. No nursery rhymes can render this atrocity as anodyne. A rose is not a spade. A cow does not jump over the moon. Instead, it will soon jump to take the title of largest mammal on earth.

Nor are the remaining 3% of “wild animals” living independently of human influence. The wild has been pushed into the margins set aside by society: national parks, wildlife reserves, and animal prisons made palatable by the sheltered nomenclature of the ‘zoo.’ Much of the remaining ‘wildlife’ is now restricted to this global network of animal prisons. If the monoculture of a single species dominating earth in *Blade Runner* sounds fantastical, picture a map of cities with zoos, where each member of each species is rendered as one colour, with *homo sapiens* designated as red.

Almost the entire map would be red, except for tiny slithers of multi-coloured dots where isolated individual wild animals are imprisoned. Having become recipients of the same biomedical engineering that has been unearthed to extend human life, the wild have become subjects of the court, like replicants in *Blade Runner*. Their kind is kept alive in zoos through games like moving individuals between prisons and using forms of induced breeding. The rebooted all-ages children’s classic takes on a title more ominous than the monsters of imagination: no longer *Where the Wild Things Are*,²⁸⁰ but *Where the Wild Things Were*.

Such a rupture is on the scale of a Mass Extinction Event. This act of clearing house ranges from turning furniture upside down, setting fire to the foundations, disintegrating the floor through magma seeping through the ground, or just whatever facet of earth’s behaviour manifests in the upheaval. A rupture is a cosmic joke: the dominion of many lifeforms is brought to an abrupt end, allowing new lifeforms to become dominant tenants in their new lease on life.

Picture the tree of life plotted as a painting, starting on extreme left with the first lifeforms 3.8 billion years ago, then progressively spanning right, branching chronologically for every species since. A Mass Extinction Event acts like a windscreen wiper: removing entire tree branches as it swipes right to left. Then, when the stage regains any semblance of stability, new branches emerge from the strands broken by the windscreen wiper. Chicxulub windscreen wipes dinosaurs into the dustbin, Rodentia then emerge from the broken strands to create entirely

280 Maurice Sendak, *Where the Wild Things Are* (San Francisco: Harper & Row, 1963).

new branches. Rinse and repeat. Such is life, varying in degrees of difference between microbe and megafauna, but united by the universal sighs of changeability, consequence, and comprehension of the same.

Comprehension, though, is a challenge, regardless of whether the brain is walnut- or rockmelon-sized. Deep time is a disorientating walnut cracker. Throw in the vicissitudes of cataclysms that rain down on and rise up from earth and the walnut [néé rockmelon] goes blank. There is no correlation between knowledge of such expanses of time – and evolution – and comprehension of same.

Meaning that there is no such thing as the end of the world. There is only ever the end of whatever-the-world-currently-is. If a new world can become, an old world must first give way. Had many a new world not come before, along with every innumerable incomprehensible fortuitous action and consequence that makes for the emergence of any species, its tenure, its expiration date, and then some, then *this* particular world would never have come to be. Even this ‘would’ must be abstracted here: the direction was aimless, the events random, the fortune subjective.

For this world to have been, many others were prevented from manifesting. As is the case for all that comes to be, at the expense of whatever else could have become. The end of *this* world is also the end of whatever worlds could have manifested when the next orbital perturbation deflected enough incoming solar radiation to tip the scale back into an ice age. Not ‘would’ have otherwise been: the accident was unintentional, the sheltered worldview deliberate, the idiocy absolute.

This time round, the rupture amounts to ruining, not pruning the tree of life. The wiper starts on the extreme right of the chronology, with a species that emerged only 200 millennia ago, having unintentionally forced the windscreen wiper into action. What then is the empire that life now lives at the end of? Could identifying it shed light on the disorientating walnut cracker, even if “the light [has] gone out for you? . . . Because . . . it is the twenty-first century.”

A Pox on Both your Epochs

If the question of how to depict the Earth’s strange new convolution of multiplicity and unity is a tricky one, perhaps even more so is the challenge of representing a humanity that is deeply divided both by sociopolitical and physical differentials – and yet at risk of being thrown together by the very event of its extinction. Unsurprisingly, the iconography of the Anthropocene is beset by paradox: thresholds whose precise co-ordinates will only be identified by their catastrophic violation, a human geologic stratum for which there will be no

human witnesses, a posthuman planet gradually effacing the traces of the very being that is beginning to imagine this destiny.

– Nigel Clark, *Anthropocene Incitements:*

Toward a Politics and Ethics of Ex-orbitant Planetarity (2016)²⁸¹

The Anthropocene (‘The Age of Humans’) is the technical term Paul Crutzen coined to describe the new human-induced geological epoch, having changed the Earth System so profoundly as to shift earth out of the Holocene. In a blog on *Living in the Anthropocene: Toward a New Global Ethos*, Crutzen and Christian Schwägerl detail just why the human-induced geological epoch is not a *continuation* of prior ecological destruction, but rather a *rupture*:

Albeit clumsily, we are taking control of Nature’s realm, from climate to DNA. We humans are becoming the dominant force for change on Earth. A long-held religious and philosophical idea – humans as the masters of planet Earth – has turned into a stark reality. What we do now already affects the planet of the year 3,000 or even 50,000. Changing the climate for millennia to come is just one aspect. By cutting down rainforests, moving mountains to access coal deposits and acidifying coral reefs, we fundamentally change the biology and the geology of the planet. While driving uncountable numbers of species to extinction, we create new life forms through gene technology, and, soon, through synthetic biology.²⁸²

Rupture is used here for this collective biotic and abiotic state of affairs, because intramural debates and warped non-scientific misreadings have confounded any fidelity to what the Anthropocene actually means. In *Defiant Earth: The Fate of Humans in the Anthropocene*, Clive Hamilton intones against wilful miscomprehension by non-scientists, arguing that “the Anthropocene’ has quickly become so encrusted with misreadings, misconceptions, and ideological co-optations that most who come to it for the first time are liable to be seriously misled.”²⁸³ Given its actual meaning, these encrustings perpetuate worldviews devoid of fidelity to the present tense. Against such wilful ignorance and/or woeful incomprehension, Hamilton declares:

It is of the utmost importance to understand that the ‘Anthropocene’ is not a term coined to describe the continued spread of human impacts on the landscape or further modification to ecosystems; it is instead a term describing a rupture in the functioning of the Earth System as a whole, so much so that the Earth has now entered a new geological epoch.²⁸⁴

²⁸¹ Nigel Clark, “Anthropocene Incitements: Toward a Politics and Ethics of Ex-orbitant Planetarity,” in *The Politics of Globality Since 1945: Assembling the Planet*, eds. Rens van Munster and Casper Sylvest (London: Routledge, 2016), 142.

²⁸² Paul Crutzen and Christian Schwägerl, “Living in the Anthropocene: Toward a New Global Ethos,” *Yale E360*, 24 January 2011, accessed 17 February 2021, https://e360.yale.edu/features/living_in_the_anthropocene_toward_a_new_global_ethos.

²⁸³ Hamilton, *Defiant Earth*, 18.

²⁸⁴ Hamilton, *Defiant Earth*, 19.

A pox on both your epochs! The humanities and social sciences play name and blame games with the functioning of human societies, then apply the results to how the abiotic world works – and even to how biophysical life works. To say this lacks fidelity is an understatement: it is like applying the mechanics of a needle and thread to a lace-weaving loom, or viewing the formation of a galaxy via the rules of snooker. Their failure is regrettable, because fidelity is needed to both the biophysical and social dimensions of the rupture, after all: “if the Anthropocene is a rupture in the history of the Earth as a whole, then it is also a rupture in the history of humans as a whole.”²⁸⁵

Conversely, scientific dimensions could well do with insight from the humanities and social sciences, given the Anthropocene thesis is “part geological hypothesis, part planetary alarm.”²⁸⁶ The confluence between becoming petrified and being petrified marks the meeting point between an exterior objective biophysical reality and an interior subjective emotional state.

When Chakrabarty attempts to reckon with this confluence between “species history and geological times into our very own lifetimes” that “now stares us in the face,” he likens the affect to falling. Though not like our ancestor Lucy out of her tree and into the earth to become petrified skeleton, nor the mental ‘falling’ of my childhood encounter with her skeleton and its uncanny reminder of the ghosts lurking in our shells. This is the fall “into . . . deep, geological time” which has thrown up a “shock of recognition . . . of the otherness of the planet and its very large-scale spatial and temporal processes of which we have, unintentionally, become a part.”²⁸⁷ Once again, the difference between intention and its absence has been nullified as a semantic sleight of hand, as per the difference between manslaughter and murder:

Humans are biological agents, both collectively and as individuals. They have always been so. There was no point in human history when humans were not biological agents. But we can become geological agents only historically and collectively, that is, when we have reached numbers and invented technologies that are on a scale large enough to have an impact on the planet itself. To call ourselves geological agents is to attribute to us a force on the same scale as that released at other times when there has been a mass extinction of species. We seem to be currently going through that kind of a period.²⁸⁸

²⁸⁵ Hamilton, *Defiant Earth*, 33.

²⁸⁶ Nigel Clark, “Anthropocene Bodies, Geological Time and the Crisis of Natality,” *Body & Society* 23 no. 3 (2017): 164.

²⁸⁷ Chakrabarty, “The Human Condition in the Anthropocene,” 180–181.

²⁸⁸ Dipesh Chakrabarty, “The Climate of History: Four Theses,” *Critical Inquiry* 35, no. 2 (2009): 206–207.

This fall reveals the human origin of this particular rupture, and then places that rupture in the context of a deep time filled with ruptures. If our agency in creating this rupture fed our dire, human-scaled anthropocentrism and narcissism (not only did we break it ourselves, but we are, in the managerial mindset of a Fuller aboard *Spaceship Earth*, also going to fix it), then the Dour quickly puts us back in our place, sending us back down the endless rabbit hole where we are but one rupture amongst many.

The “force” and “scale” of the human agency that Chakrabarty refers to is on par with the prior five Mass Extinction Events. James Hansen develops this comparison further, likening the unfolding rupture to “a giant asteroid on a direct collision course with Earth,”²⁸⁹ recalling the first part of Stegosaurus’ universal sigh about Chicxulub. Elizabeth Kolbert also declares “we are the asteroid now” in her book *The Sixth Extinction: An Unnatural History*,²⁹⁰ with the caveat that “the asteroid also had a lot of different effects,” including the fact that it “ended okay for our relative . . . [the] little shrew-like creature who crawled through the end of the Cretaceous.” Kolbert is however blunt about what life at the end of empire amounts to: “What is going to crawl through this moment? That’s the big question.”²⁹¹

Hansen’s comparison harks right back to Cold War existential anxieties, as he calculated that “Earth’s energy imbalance and implications” is equivalent to accumulating four Hiroshima bombs worth of heat per second in the atmosphere. The fairly unambiguous website www.4hiroshimas.info includes a widget to embed a real time Hiroshima-bomb-counter on digital devices. The baseline is any year from 1970 onwards, due to 1971 being when the energy balance shifted to net positive. My widget reads “Our climate has accumulated 4,901,982,836 Hiroshima atomic bombs of heat since 1970” as of 11:08:59am 21 February 2021.²⁹² Hiroshima-bombs-per-second has since become the standard for measuring planetary energy imbalance.

Yet the unfolding rupture has no proximal signal, like Chicxulub, or even a distal signal, like the day earth moved into net positive energy balance. We are waging a Warm War, as both aggressive belligerent and victim, with diffuse

289 Hansen, “Why I Must Speak out About Climate Change.”

290 Elizabeth Kolbert, *The Sixth Extinction: An Unnatural History* (New York: Henry Holt and Company, 2014), 41.

291 Elizabeth Kolbert, quoted in Robert Kunzig, “The Sixth Extinction: A Conversation With Elizabeth Kolbert,” *National Geographic News*, 19 February 2014, accessed 17 February 2021, <https://www.nationalgeographic.com/news/2014/2/140218-kolbert-book-extinction-climate-science-amazon-rain-for-est-wilderness>.

292 *Skeptical Science*, “Our Climate has Accumulated 4,901,982,836 Hiroshima Atomic Bombs of Heat Since 1970 as of 11:08:59 am, 21 February 2021,” accessed 21 February 2021, <http://skepticalscience.net/widgets>.

consequences that are orders of magnitude more complex than the neat binaries of enemy and ally, aggressor and defender, culprit and victim, to bomb or not to bomb. Because the Anthropocene boundary layer is not akin to proxies like concrete megalopolises, technofossils of industrial civilisation, radionuclides from the first atom bomb, factory farmed chicken bones, yada yada. Rather, the boundary layer marks a rupture in Earth System functioning, extending across the planet into geological time.

Yet the human scale of the dire mindset still conflates the Anthropocene with millennia- or century-old human impacts on ecosystems or landscapes. How should we define the rupture from the impact, and how should we understand the relationship of these impacts upon the planet to the rupture unfolding now? In a way, the starting point *is* what it *is not*: accumulated human impacts unleashing the rupture like a pile of blocks stacked too high until they finally come tumbling down. But this fails to convey the complete difference in scale between the impacts that opened up the way for the rupture and the rupture itself.

Water boils at 100°. The relationship of water to anything put in it changes drastically with the gradual increase in temperature up to 99° – a teaspoon of sugar melts, a grain of rice begins to swell, and a fish would die and cook well before the water actually boils. But only when it boils does water itself begin to change state, evaporating into steam. So too with the difference between biological and geological agency: the one causes damage that can be quantified, the latter sets in motions processes that change the game and its scale entirely. Like manageable, containable, measurable water turning into ungraspable steam. Like the first engines that combusted coal to boil water into steam, ushering in the game change unfolding for life on earth.

Social limits and scales also affect this history and the way the Anthropocene gets misappropriated. Picture Mount Rushmore in terms of what it symbolises, versus what it amounts to. The human faces carved onto the surface of the earth amount to a human-scaled impact that barely scratches the surface of the planet. In the symbolic realm, the construction is deeply socially and culturally affective, symbolising as it does both the public racism of its creator and the flagrant misappropriation of indigenous lands by the white colonialists. But they do not mark Chakrabarty's qualifier for distinguishing biological from geological agency, the latter of which can only be "on a scale large enough to have an impact on the planet itself."²⁹³

Nevertheless, Mount Rushmore makes for an apt illustration of how social thought can interrogate "the iconography of the Anthropocene." Namely, it speaks

293 Chakrabarty, "The Climate of History," 207.

to the social and political structures, motivations, and conflicts through which our species acquired the geological agency necessary to unleash a rupture of life on earth. A species does not obtain the Bomb without first forming nation states, taxation systems and xenophobia. The social limits to life shape the formation of such weapons of mass destruction, all the more so when tyrants who thrive on such societal structures are inscribed into the papyrus, or the mountainside.

These inscriptions are a symbol of proximal biological agency, but they cannot demarcate the rupture between one geological epoch and another, which are driven by both proximal and distal cataclysms and inscribed deep below the surface, beyond human sight. If Mount Rushmore is the shallow scratch of human impact, then ruptures are inscribed into strata, in the form of significantly different vertical layering, like the slender boundary between Cretaceous and Paleogene clay at Geulhemmergroeve in the Netherlands that attests to the Cretaceous–Paleogene extinction event.²⁹⁴ Lodged above the boundary layer are the fragments that remain of the Age of Dinosaurs, and beneath, those from the Age of Mammals. With this thin (less than one centimetre in most places) boundary being all that remains of Chicxulub, at least in terms of the geological traces of the rupture. Because the remains of Chicxulub also live on in all those whose speciation benefitted from the rupture, from ape to zebra.

If a civilisation only proves capable of destroying itself, as so many have done throughout history, then it is subsumed back into earth as no more than Percy Shelley's "colossal wreck" of "two vast and trunkless legs of stone," around which "boundless and bare/The lone and level sands stretch far away."²⁹⁵ Ashes to ashes. Dust to water. A desert tortoise may wander those sands, undisturbed by any civilization determined to flip it over onto its back. It may still die of thirst, but that would be a death faithful to the vicissitudes of the cosmos. But what happens when a civilisation amasses the force and scale sufficient to unleash a Mass Extinction Event? When not only the civilisation disappears from the desert, but the desert tortoise, and the desert to boot? Only when a civilisation acquires geological agency on this scale does its Self Assured Destruction become the Mutually Assured Destruction of bringing down the entire biosphere with it.

In a nutshell: the uniqueness of the unfolding rupture is more than just earth, or life-at-large, having no analogous precedent. It is a rupture first and foremost of biophysical life, made possible by systemic inequalities of race, class, and gender in social and political life, particularly in the half millennium since

²⁹⁴ Geology Page, "K-Pg Boundary Cretaceous–Paleogene Boundary," *Geology Page*, 30 March 2019, accessed 17 February 2021, <http://www.geologypage.com/2019/03/k-pg-boundary-cretaceous-paleogene-boundary.html>.

²⁹⁵ Shelley, "Ozymandias."

Queen Mary and the twenty-first-and-last century. Though to comprehend the *scale* of the rupture and its context, social and political thought needs to drag itself from the surface scratchings of Mount Rushmore's portraits and all the human failings they represent, down into the deep time underground of the earth's strata, where we find the record of this planet building, breaking, and renewing life for several billion years.

This might prove an empty gesture too, given the nearness and totality of the rupture, but if social and political thought need to travel down into geological time to gain some semblance of fidelity to the physical workings of this world, then bio-physical thought need heed the fact that the question of "what is life?" in the present tense is overwhelmingly determined by empire. Calling the Anthropocene 'The Age of Humans' just adds insult to injury for that vast majority who contributed next to nothing to flipping the turtle. Yet Clark's challenge "of representing a humanity that is deeply divided both by socio-political and physical differentials" cannot remain rhetorical, given it is "at risk of being thrown together by the very event of its extinction." To unearth these divisions we need dig into "the iconography of the Anthropocene" in terms of how it "is beset by paradox." Beginning with this word 'we', that can also be rendered, in the name of fairness, as WE*: White Europeans, with * as addendum for the politico-economic hegemony descended from them and globally imposed through colonialism, capitalism & co.

Dial Idioteque for Idiolect

Let me hear both sides (let me hear both sides)
 Ice age coming (ice age coming)
 Throw it in the fire (throw it in the fire).
 – Radiohead, “Idioteque” (2000)

It seems possible that man will be able efficaciously to regulate the future climate of the Earth and consequently prevent the arrival of a new Ice Age . . . It is too early to judge of how far men might be capable of thus regulating the future climate. But already the view of such a possibility seems to me so grand that I cannot help thinking that it will afford to Mankind hitherto unforeseen means of evolution.

– Nils Ekholm, “On the Variations of the Climate of the Geological and Historical Past and Their Causes” (1901)²⁹⁶

Nils Ekholm’s desire to acquire geological agency in order to “efficaciously . . . regulate the future climate of the Earth” did not fall on deaf ears. A half century after his 1901 article in the *Quarterly Journal of the Royal Meteorological Society*, this hubris had become concrete proposals to “prevent the arrival of a new Ice Age.” In *The Challenge of Man’s Future* nuclear chemist and geoscientist Harrison Brown argued that carbon dioxide generators should be built to increase plant growth and thus food production. Published in 1954, the book did not mention the greenhouse effect, or any deleterious biophysical effects of carbon dioxide.²⁹⁷ No lesser figure than Albert Einstein endorsed Brown’s book, with his praise prominently displayed on the rear cover. Four years later Frank Capra brought mainstream recognition to human-caused climate change in his 1958 *Meteora* television documentary, although the science vastly predates Brown’s 1954 publication.

Another half century later, climatologist David Archer laid out the temporal reach of human-caused climate change in *The Long Thaw: How Humans Are Changing the Next 100,000 Years of Earth’s Climate*.²⁹⁸ Archer detailed how Ekholm’s 1901 desire to “afford . . . hitherto unforeseen means of evolution” has been fulfilled: existing greenhouse gas emissions have already delayed the next ice age onset by at least 50,000 years. Whatever new worlds would have otherwise been formed by that ice age have been foreclosed, yielding not “unforeseen means of evolution,” but rather foreseeable means of Mass Extinction.

²⁹⁶ Nils Ekholm, “On the Variations of the Climate of the Geological and Historical Past and Their Causes,” *Quarterly Journal of the Royal Meteorological Society* 27 (1901): 1–61.

²⁹⁷ Harrison Brown, *The Challenge of Man’s Future: An Inquiry Concerning the Condition of Man During the Years That Lie Ahead* (New York: Viking Press, 1954).

²⁹⁸ David Archer, *The Long Thaw: How Humans Are Changing the Next 100,000 Years of Earth’s Climate* (Princeton: Princeton University Press, 2016).

The first edition cover of *The Long Thaw* illustrates how “the iconography of the Anthropocene is beset by paradox”: an iceberg floating in the ocean, viewed in profile to accentuate the vast majority lying below the surface. The metaphor encapsulates a thesis core to Earth System Science: social thought about changeability and its consequences rarely penetrate beyond the iceberg’s tip to encompass the broader gamut of cosmic vicissitudes, represented here by the bulk of the iceberg hidden from view below the water line.

Conversely, climatological scholarship such as *The Long Thaw* is versed in the gamut of biophysical changeability, but rarely folds the human into this menagerie with commensurate fidelity to the role of societal power and inequality in terms of how WE* became the we that has now acquired geological agency. The cover does not show an iceberg photograph, but rather an iceberg line drawing made using a thumbprint, to symbolise human imprints across every sphere: biosphere, cryosphere, lithosphere, and hydrosphere. The thumbprint however lies mostly below the sea’s surface – bringing together the revelations of human geological agency with how ecological thought fails to consider the out of sight or out of mind, such as the fact that whatever happens next, WE* have already changed the next 100,000 years of climate.

In a nutshell: worldviews of *The Long Thaw* ilk tend toward ‘humans caused climate change’, seldom even acknowledging how only a small portion of humanity is responsible for the greater bulk of the ecological crisis, and how this is differentiated by race, class, and gender. The general critique of the social sciences is that they are versed in the gamut of the social limits to life, but erroneously map this worldview onto the ecological crisis, because they have next-to-no fidelity to the science.

How (on earth) can the human be folded into this quagmire on Earth, sensitive to both the profound inequalities behind acquiring geological agency, and the utter indifference to consequences from who caused what, when, or how . . . ? The twain shall not meet so long as science tomes continue talk only of consequences, whereas social sciences speak only to causation. The two can only really meet if *The Long Thaw* cover is wilfully misread, with the thumbprint as acknowledging ‘we’ as WE*. The title now reads: *How WE* Changed the Next 100,000 Years of Earth’s Climate*.

The WE* that catalysed the cataclysm is the minuscule iceberg portion lying above the surface. Below, a telling reminder that the vast masses of humanity represented by the submerged portion of the iceberg thumbprint have been dragged down by WE*. Regarding humanity as the collective anthropos in Anthropocene may, therefore, be necessary to reveal the tyranny of melting icebergs for the next hundred millennia, but this regard conceals that fact that the great majority of humankind actually contributed next to nothing to this dangerous acquisition of geological agency.

The misread cover really only amounts to an empty gesture in terms of justice or accountability. It is important for our clarity, but the consequences,

beyond an enlightening capacity to alter our own demeanour, are few. WE* already has been rendered into past tense. Now it is the sheer weight of this exponentially increasing anthropos which crowds out the dwindling more-than-human world. While WE* caused the initial turtle flip, present sense contributions and causation have become a collective: “the ‘Anthropocene’ was a Eurocentric idea when it was coined, it is now Sino-Americo-Eurocentric, and in a decade or two it will be Indo-Sino-Americo-Eurocentric.”²⁹⁹ The title now reads: *How WE* Initially Changed the Next 100,000 Years of Earth’s Climate, and How WE* Became We . . .*

All the World’s a Sinking Stage

All the world’s a stage,
 And all the men and women merely players;
 They have their exits and their entrances,
 . . . Last scene of all, that ends this strange eventful history,
 Is second childishness and mere oblivion,
 Sans teeth, sans taste, sans eyes, sans everything.
 – William Shakespeare, *As You Like It* (1623)³⁰⁰

What then, of sensitivity from the social sciences to the science itself? Given that much of the social sciences limits itself to portioning responsibility for producing *The Long Thaw* thumbprint, to what end does this endeavour reveal “the iconography of the Anthropocene”? WE* did the catalysing, but we are now all well and truly aboard the lifeboat, and this ‘we’ includes the entire living world save for microbial or chemosynthetic life. What ethics *on Earth* can be sensitive to a situation that makes mockery of justice, just as it does accountability? Without fidelity to biophysical limits, ethics is also rendered irrelevant.

The lifeboat metaphor makes an apt raft for navigating the melting icebergs of *The Long Thaw*. In *Living on a Lifeboat*, Garrett Hardin explored the relationship between biophysical limits and socio-economic inequality. He likened wealthy nations to lifeboats filled with comparatively rich people, whereas:

the poor of the world are in other, much more crowded, lifeboats. Continuously, so to speak, the poor fall out of their lifeboats and swim for a while in the water outside, hoping to be admitted to a rich lifeboat, or in some other way to benefit from the ‘goodies’ on board. What should the passengers on a rich lifeboat do? This is the central problem of the ethics of a lifeboat.³⁰¹

²⁹⁹ Hamilton, *Defiant Earth*, 31.

³⁰⁰ William Shakespeare, *As You Like It* (Oxford: Oxford University Press, 2008 [1623]), Act II Scene VII.

³⁰¹ Garrett Hardin, “Living on a Lifeboat,” *BioScience* 24, no. 10 (1974): 563.

So far this raises questions of principle, but when a dilemma goes from abstract to concrete, the ethical problem becomes “the same for all”³⁰² as principles are pushed into practice:

Here we sit, say 50 people in a lifeboat. To be generous, let us assume our boat has a capacity of 10 more, making 60 . . . The 50 of us in the lifeboat see a 100 others swimming in the water outside, asking for admission to the boat, or for handouts. How shall we respond to their calls?³⁰³

Hardin’s analogy is only existential for the swimmers. Rich lifeboats can ignore those swimming, notwithstanding their guilty conscience at having chosen to let the poor drown.

In 1974, when this paper was published, there were outs for refugees to gain access to a rich lifeboat. Rich boats still had some carrying capacity, meaning they could assist those in need, by sharing more “goodies” and helping more selflessly. The outs were grossly inadequate and insufficient to the endemic inequality, as Hardin’s rich lifeboat can only accommodate 10 of the “100 others swimming in the water outside,” but they did exist.

In *Living Within Limits: Ecology, Economics, and Population Taboos* Hardin expanded his critique of economic theories proposing more equitable resource distribution, arguing that they had no fidelity to intrinsic biophysical limits: if rich lifeboats attempt to remedy inequality by admitting too many of the poor swimmers as possible, then they will also sink.³⁰⁴

As abhorrent as Hardin’s argument may seem, the situation has since moved on to far more serious consequences. Once Lifeboat Ethics goes from abstract to the concrete in the present tense, the entire premise sinks. Today, irrespective of how many swimmers are accepted onto rich lifeboats, the question remains as to where any lifeboat can make landfall and its inhabitants begin anew?

Fuller’s *Spaceship Earth*, for all its limitations in terms of our relationship with earth, is apt here. Aboard a planet cast adrift in the cosmos, having lost its moorings: there is no ‘Planet Ho!’ for a scout to sight from the deck, onto which the ruinous spaceship lands and its crew and passengers may start to rebuild their lives. The Dire is not about safe passage through an isolated instance of emergency – it is a protracted crisis with no end in sight, like a heatwave that becomes a heatflood that does not subside.

302 Hardin, “Living on a Lifeboat,” 564.

303 Hardin, “Living on a Lifeboat,” 564.

304 Garrett Hardin, *Living Within Limits: Ecology, Economics, and Population Taboos* (Oxford: Oxford University Press, 1993).

Hardin's lifeboats do not factor in storms or icebergs: like most metaphors, they reduce the world to a stage, with "all the men and women merely players." But in the present tense Hardin's Lifeboat Ethics become Sinking Lifeboat Ethics. The existential predicament encompasses rich and poor, despite the former's much over-estimated buffer of relative insulation. All the world's a sinking stage, and all but a few disproportionately powerful men and women are merely players. The Tyrells, Queen Maries, and Dr. Strangeloves are the ones reconfiguring how much of the world's stage will sink. Or, conversely and perversely, how much of the world will rise.

For Chakrabarty, this situation brings social science in line with biophysical limits:

Unlike in the crises of capitalism, there are no lifeboats here for the rich and the privileged . . . The anxiety global warming gives rise to is reminiscent of the days when many feared a global nuclear war. But there is a very important difference. A nuclear war would have been a conscious decision on the part of the powers that be. Climate change is an unintended consequence of human actions and shows, only through scientific analysis, the effects of our actions as a species. Species may indeed be the name of a placeholder for an emergent, new universal history of humans that flashes up in the moment of the danger that is climate change.³⁰⁵

The semantic journey has gone from the all-encompassing 'humans' that dominated in writing from Ekholm to Archer, through the gradations of 'we' to WE*, only to fall back into a singular category of Chakrabarty's "species" all aboard a sinking lifeboat. Distinctions collapse in the present tense because, even "if not every human is responsible for bringing on the Anthropocene, every human is destined to live in it."³⁰⁶ So argues Clive Hamilton, in his impassioned *Defiant Earth: The Fate of Humans in the Anthropocene*.

Hamilton is scathing about the failure of academic philosophy to grapple with the distinction between Lifeboat Ethics and Sinking Lifeboat Ethics. In an article whose title gives the game away, "The Banality of Ethics in the Anthropocene," he finds no landfall for the sinking lifeboat:

What does all this mean for justice and ethics? I would like to suggest that, without relieving individuals of culpability, when we step back and survey these Earth-shattering events our established ethical categories and legal principles appear banal and feeble. If the human impact has been so powerful that it has deflected the Earth from its natural geological path, describing the state of affairs as 'unethical' or 'unlawful' seems to be some kind of category error.³⁰⁷

305 Chakrabarty, "The Climate of History," 221.

306 Hamilton, *Defiant Earth*, 61.

307 Clive Hamilton, "The Banality of Ethics in the Anthropocene," *The Conversation*, 13 July 2015, accessed 18 February 2021, <https://theconversation.com/the-banality-of-ethics-in-the-anthropocene-part-1-44568>.

Hamilton then attempts to develop a sensibility commensurate with present tense biophysical limits. Though, as per Jasper's attempt to inculcate "epochal consciousness" in relation to the atom bomb, Hamilton first eviscerates the wilful ignorance that dominates Anthropocene discourse. The evisceration is well-deserved, but it means that, again like Jasper, the endeavour amounts to a litany against every folly, making precious little ground for any commensurate ethics of epochal consciousness.

For instance, Hamilton brings down the whole notion of virtue ethics, without claim for what, if anything, could or should follow in its wake:

Are we not in this predicament because hubris has defeated humility, because self-interest has trumped concern for others? Perhaps, but the virtues that guide us in daily life tell us nothing about the place of humans on the planet, and that is now what is at stake. The attempt to frame a transformed climate by mere ethics risks normalising an event without parallel, of rendering prosaic a transition that is in fact Earth-shattering.³⁰⁸

He thus concludes his book with a confession by a Professor of Public Ethics: "we have to confront the most difficult truth – in the Anthropocene we have no ethical resources to draw on. The cupboard is bare."³⁰⁹ Neath the house containing the cupboard lies the earth. There may be nothing to "draw on" from the domesticated dreams of the house, but outside the house there is a planet to dwell on. And there a different realm of ethics may lie, one unfamiliar but inalienable to conventional kinds of ethics. For if there were truly no ethics outside of the house, then to what purpose do we even engage in the empty gesture of examining our demeanour, here, at the end of our empire?

This is the difficult task that Nigel Clark offers as a last remaining wellspring for human ethics: go beneath the stage to ground surface affairs in all the subterranean contraptions and mechanisms which make play on earth's surface possible. Because the idea that all the world is a stage, sinking or not, limits the scope to the liquid and crustal surface, where the biosphere mingles with the tops of the lithosphere and cryosphere, and the bottom of the atmosphere. In place of a two-dimensional caricature of earth-as-stage, he suggests

The Earth itself must be understood as much more than a mere surface or stage on which political contests take place: it must acquire a volumetric or vertical dimension . . . But this requires . . . us to bring politics into an intensive engagement with the planet's own dynamics: its processes of sedimentation and mobilization, its layering and folding, its periodicities and singularities. This means that the crucial borders or thresholds on the political agenda

308 Hamilton, *Defiant Earth*, 11.

309 Hamilton, *Defiant Earth*, 11.

are not only those which divide nations or other socially inscribed territorial divisions of the Earth's surface, but also the spatio-temporal junctures at which one state or regime of an Earth system passes into another.³¹⁰

To bring the politics of the Dire (in all its anthropocentric glory) into engagement with the currently rupturing state of “the planet's own dynamics’ is to subsume politics into “the spatio-temporal junctures” of a particularly dynamic passage between two “state[s] or regime[s] of an Earth system.” It is to subsume the surface of the stage into the menagerie of contraptions unpinning it, making the stage expand to encompass the entire planet.

In this way, the politics that always imagined itself as sitting atop the earth will discover that not only is it currently entirely at the behest of the “volumetric or vertical dimension” of the earth, but that it always was, and hence lose its human-scaled dire demeanour in favour of some humility. To let go of the Dire is to let go of human scale, after all, along with ideas of human salvation.

This makes for no stable ground on which to build an ethics, but it shows that “the cupboard” is not entirely bare. It is just that we have to go beyond the apparently empty cupboard, using it instead as a portal into a worldview commensurate with the world itself. To dwell on such an earth is to abandon Hardin's (Sinking) Lifeboat Ethics, disembark from Fuller's conceited *Spaceship Earth*, and settle with open-eyed abandon into Bataille's dour demeanour.

Here we understand that the boiling of the water, or the straw that breaks the camel's back, is already coming from upstream, as it always has, compounding intractable challenges for keeping any lifeboat from tipping over at any time. Recall Fichte remarking that “we build our houses on the earth,” and still do, when that earth rests on a restless World Turtle, whose volatility we have managed to provoke with all the effectiveness of a Chicxulub. Or Tennessee Williams, who reminds us that “we all live in a house on fire, no fire department to call; no way out, just the upstairs window to look out of while the fire burns the house down with us trapped, locked in it.”³¹¹

The morale of the sinking lifeboat story thus seems to be that taking the moral high ground (when the high ground has gone under the rising seas) is utopian – it literally has no place. Though none of these abhorrent options have yet to touch on what to make of life (at the end of empire)? The Court Jester bows, acknowledging the digression with nothing more than a wry smile and a teary rejoinder. All aboard, all abhorred, all the same, none more, no less . . .

³¹⁰ Clark, “Geo-politics and the Disaster of the Anthropocene,” 31.

³¹¹ Tennessee Williams, *The Milk Train Doesn't Stop Here Anymore* (New York: Dramatists Play Service, Incorporated, 1998 [1963]), 245.

A Rose is a Rose is the Last Rose of (Endless) Summer

We find ourselves, all of us together, poised trembling on the edge of a change so massive that we have no way of gauging it. None of us knows where to look, but all of us know not to look down . . . Our question is: what would happen if we looked down? Would it be as bad as we imagine? What might we see? Could it even be good for us? We believe it is time to look down.

– Paul Kingsnorth and Dougald Hine, *Uncivilisation: The Dark Mountain Manifesto* (2009)³¹²

As my world comes crashing down

I'm dancing

Freaking out, deaf, dumb, and blind.

– Radiohead, “Present Tense” (2016)³¹³

In 2008, US singer-songwriter Zach Condon was touring with his band *Beirut* in Brazil. During an ocean swim after a concert, Condon nearly drowned. He explained that

A rip tide took me out pretty far – I was struggling to get back in. And as I came back in, a wave crushed me and actually punctured a hole in my eardrum. It just got me thinking: these last five years of my life, me and everyone I'm close to have all been taken by this bigger force that's mostly out of our control.³¹⁴

The experience formed the catalyst for his song *The Rip Tide*,³¹⁵ which meditates on a state similar to being petrified in a world that has become a sinking stage. Being dragged out to sea in a rip tide forces us to acknowledge the “bigger force that's mostly out of our control.”

The music video features a lone empty sailboat travelling across the open ocean. The viewer is invited to follow the boat on its funeral march journey into the abyss of a transformative storm that completely reconfigures the sky, from typical light sky blue to a special-effects kaleidoscope of colours, textures, patterns, and forms.

It appears as if Condon's near-drowning in the ocean is manifested by the sailboat in a world-changing storm. Once outside of the lifeboat, socio-political differences between individuals disappear, especially when any and all lifeboats

312 Kingsnorth and Hine, *Uncivilisation*, 9.

313 Radiohead, “Present Tense,” track 9 on *A Moon Shaped Pool* (XL, 2016), LP.

314 Zach Condon, quoted in Kristianna Smith, “Beirut: A Jet-Setter Settles Down,” *NPR.org*, 10 September 2011, accessed 7 December 2015, <http://www.npr.org/2011/09/10/140318038/beirut-a-jet-setter-settles-down>.

315 Zach Condon, “The Rip Tide,” track 6 on *The Rip Tide* (Pompeii Records, 2011), LP.

in the vicinity are sinking too. The present tense long ceased to be about the plight of an individual or an individual species. It is about a *New World Coming* on a planetary scale, as dramatic as the wild and complete atmospheric transformation featured in *The Ripe Tide*. Ashes to ashes, dust to water.

We can relate the sky's technicolour transformation in the music video to the "volumetric or vertical dimension . . . of the planet's own dynamics" that Clark refers to, since the highly volatile and changeable colours resemble optical side effects from volcanic eruptions. The video offers a rendering of the rupture, as if our sinking lifeboat were caught at the behest of a storm born of a volcano eruption. Sensibility toward such untoward torment runs rife in the arts. For instance, the 1883 Krakatoa eruption "would have turned the deep blue skies of rural areas into a Parisian-style white haze – but also have made dramatic fiery sunsets like the Krakatoa-induced one painted by Eduard Munch in *The Scream* entirely routine."³¹⁶

Munch, petrified by sky colours like those in *The Ripe Tide*, recalls how he transferred his experience into the painting:

I was walking along the road with two friends – the sun was setting – suddenly the sky turned blood red – I paused, feeling exhausted, and leaned on the fence – there was blood and tongues of fire above the blue-black fjord and the city – my friends walked on, and I stood there trembling with anxiety – and I sensed an infinite scream passing through nature.³¹⁷

Munch sensed in the uncanny sky a *New World Coming* – one without parallel or even the slightest reference within his life experience or normative notions of the world. Simone's apocalyptic premonitions in her *New World Coming* also share a heartfelt sense of being petrified at the passage from the known present to unknown futures, as does Condon's transferral of his near-death experience into a rumination on the profundity of volatility and vulnerability that is both personal and planetary.

In Munch's time the connections between the effect of an Indonesian volcano to phenomena in the Norwegian skies were largely unknown, meaning no one had a reference for the strange things going on above their heads. Nowadays that same infinite scream has taken on a bitter human twist. The mystery of planetary atmospheric transformation has been solved, but the problem of its human-causation proves insoluble. The ship is still headed for the rocky bar, but now we understand that bar promises not only shipwreck for the Old World Going, but also passage into a *New World Coming* unrecognisable to its predecessor. And there is no human pas-

³¹⁶ Bronislaw Szerszynski, "Colouring Climates: Imagining a Geoengineered World," in *Routledge Handbook of the Environmental Humanities*, eds. Ursula Heise et al. (London: Routledge, 2017), 85.

³¹⁷ Edvard Munch, "Nice 22 January 1892," diary entry.

sage aboard, safe or otherwise. *The Rip Tide* punctures an eardrum and gives out a song of being at home in a world ungrounded and turned upside down.

Bruno Latour offers an all-too-relatable explanation for why he is barely able to acknowledge this elephant in the room, let alone speak to it:

One of the reasons why we feel so powerless when asked to be concerned by ecological crisis, the reason why I, to begin with, feel so powerless, is because of the total disconnect between the range, nature, and scale of the phenomena and the set of emotions, habits of thoughts, and feelings that would be necessary to handle those crises not even to act in response to them, but simply to give them more than a passing ear.³¹⁸

In contrast to “a passing ear,” those working on the front lines need a song like *The Rip Tide*, that actually punctures the eardrum.

Science communicator Joe Duggan sought to capture such dire emotional responses in his 2014 project *Is This How You Feel?* He invited Australian climate scientists to compose handwritten letters describing their unsheltered worldview, to be photographed and displayed on his eponymous website. One of the scientists, Sarah Perkins, writes to “My Dear Friend”:

For some time now I've been terribly worried. I wish I didn't have to acknowledge it, but everything I have feared is happening. I used to think I was paranoid, but it's true . . . Certain behaviours that were only rare occurrences are starting to occur more often, and with heightened anger . . . How can anyone not feel an overwhelming sense of care and responsibility when those so dear to us are so desperately ill? How can you push all this to the back of your mind? This is something I will never understand.³¹⁹

Whereas for another, Steve Sherwood, the way forward implies the subject is both at the forefront, but one that we need to “get over” at the same time:

The main things I feel about this are deep disappointment and anger, though I should probably try not to. People have always faced challenges and adversity. When these are accepted and faced together, it can bring out our best . . . The opposite is happening with this issue . . . Global warming doesn't bother me as much as what it is revealing about humans. Maybe I need to just grow up and get over it!³²⁰

318 Bruno Latour, “Waiting for Gaia: Composing the Common World through Arts and Politics,” transcript of speech delivered at the French Institute, London, 2 November 2011, accessed 6 May 2019, http://www.bruno-latour.fr/sites/default/files/124-gaia-london-speap_0.pdf.

319 Sarah Perkins, quoted in Joe Duggan, *Is This How You Feel?*, accessed 14 February 2015, <https://www.isthishowyoufeel.com/this-is-how-scientists-feel.html#sarah>.

320 Steve Sherwood, quoted in Joe Duggan, *Is This How You Feel?*, accessed 14 February 2015, <https://www.isthishowyoufeel.com/this-is-how-scientists-feel.html>.

Condon, Munch, Latour, Perkins, Sherwood: a musician, painter, sociologist, climatologist, and atmospheric physicist respectively, all allude to solastalgia, a term coined by philosopher Glenn Albrecht to describe “the homesickness you have when you are still at home.”³²¹ Except that Albrecht refers to the present tense, where home is earth and the sickness is “solace” and “nostalgia,” making up his portmanteau ‘solastalgia.’

The growing unease of those intellectually and emotionally present to the ending of the world-as-it-currently-is and new world-that-is-coming-into-being lies behind *Dark Mountain*, a UK collective of ecological writers, artists, and activists. Two miles south of the pyre where the three bishops were burned alive by Queen Mary Tudor, and half a millennium later, *Dark Mountain* co-founders Paul Kingsnorth and Dougald Hine launched their *Uncivilisation: The Dark Mountain Manifesto*. Under the first heading, *Walking On Lava* they proclaim that “human civilisation is an intensely fragile construction. It is built on little more than belief: belief in the rightness of its values; belief in the strength of its system of law and order; belief in its currency; above all, perhaps, belief in its future.”³²²

Here again Clark’s “volumetric or vertical dimension” of “the planet’s own dynamics” are brought to the stage’s surface, through lava well-springing beneath our feet. Their manifesto appeals for a solastalgic home by uncivilising civilisation so-called:

This is a moment to ask deep questions and to ask them urgently. All around us, shifts are under way which suggest that our whole way of living is already passing into history. It is time to look for new paths and new stories, ones that can lead us through the end of the world as we know it and out the other side. We suspect that by questioning the foundations of civilisation, the myth of human centrality, our imagined isolation, we may find the beginning of such paths.³²³

Therein, acquiescing to the full and unsheltered history behind the nursery rhyme, following twisted tales, breadcrumb trails, and severed tails into the reality behind *Three Blind Mice*. No longer bracing for impact, but rather embracing for impact. Ready to lose eardrums rather than straining not to hear. Ready to recognise the something untoward going on in the strange skies of increasingly unseasonal seasons and catastrophically frequent transformative storms. Ready to make a home amidst the rupture, even if it has the solastalgic feel of a sinking boat heading at full speed for a rocky bar in the midst of a rolling thunderstorm.

³²¹ Glenn Albrecht, *Earth Emotions: New Words for a New World* (Cornell: Cornell University Press, 2019), 3.

³²² Kingsnorth and Hine, *Uncivilisation*, 2.

³²³ Kingsnorth and Hine, *Uncivilisation*, 17.

Ready to look beyond *Life at the End of Empire*, to what life there could be for the more-than-human world, when “the myth of human centrality” finally comes tumbling down.

Subterranean.Homesick.Blues.

The Anthropocene incitement to think with and through the ‘geologic’ implies more than just imagining that inorganic matter or minerality may be more life-like than we assumed. It is about confronting the possibility – signalled by Anthropocene geoscience’s concern with the trace our species will leave behind in the geological record – of our own extinction, fossilisation, or becoming mineral.

– Nigel Clark, “Anthropocene Bodies, Geological Time and the Crisis of Natalivity” (2017)³²⁴

Given that answering the perennial question of what is life changes according to the season, the present tense begs inquiry into what is life *at its limits*? These limits are thresholds, fitness curves within which an individual can survive. They are the critical minimum and maximum climatological bandwidth that an individual can tolerate. Thresholds are time sensitive: at best, species are attuned to local here and now conditions as they morph from month to month, year to year, decade to decade. Over time, the limits or thresholds of those species will change as (and if) their organisms adapt.

Limits are intrinsic to all life forms, and when these limits are breached *en masse* they lead down one of two principal pathways. If a species can change its tolerance thresholds, via genotypic and/or phenotypic plasticity, then it lives on. This is the nuts-and-bolts mechanics of evolution. The other pathway is more obvious: if a species cannot adapt to change its limits, it goes extinct. Shape up. Or ship out. Step up. Or step off. If evolution is indeed a comedy, it has a limited character range.

Changing climate regimes mean lifeforms generally strive to find new ground. What is too cold now for a species may become tolerable for the descendants of that species, but only where there is sufficient time to adapt. Drop an elephant overnight in the Siberian traps and it will freeze to death within a day. Slowly nudge them northwards from India over 200 millennia and they will survive, but will arrive as a woolly mammoth. Whether staying put or moving with the flow, the continual process of re-attuning to changing localities may mean descendants evolve into a new species altogether, like brown bears speciating into

324 Clark, “Anthropocene Bodies, Geological Time and the Crisis of Natalivity,” 160.

polar bears as they migrated into the Arctic. Home is not only where the heart is, but where the heart travelled from before it got here.

At present species the world over are on the move *en masse*, or are dying trying to do so. Rates of biophysical change both exceed existing tolerance thresholds and the adaptive capacity for thresholds to accommodate continuous redefinitions of the new normal. On the latitudinal plane the move is away from the equator, in search of cooler climates. On the elevation plane the move is away from sea level, upwards into the lithosphere for terrestrial species, or downwards into the hydrosphere for marine species. The search is on for refugia: somewhere to take shelter from the no-longer-so-proverbial storm brewing. Sooner or later each lifeform reaches the physical ends of the earth: the top of a mountain, the bottom of the ocean, the extremity of a landmass. If a species can survive in a refugia until a time of turbulence runs its course, then it may thrive in the more palatable conditions following. If a species cannot, then it goes extinct.

What then, is the answer to what is life (at the end of empire)? When “where do we go from here?” has been downgraded to ‘do we go from here?’, and those asking are the same perpetrators of this violence, who have been caught in their own feedback loop of Self-Assured Destruction. In riposte to Cormac McCarthy’s rhetorical question as to the “the whole thing now is, what do you do?”, and in dour appraisal of Yellowstone erupting “on Thursday” or “another three to four thousand years from now,” we can instead ask the question differently: where does life go from here? This brings into play a different order of questions, rich with answers, none of which our species will survive to see. Come what may (all other things being equal).

For *homo sapiens*, the Dire terminates in an ill-fated underground refugia manufactured to preserve not only the species, but the WE* that catalysed the rupture in the first place. If we are playing blame games, Kolbert’s claim that “we are the asteroid” is indeed justified, but it is perhaps more fitting to let the *Dr. Strangelove* character Major Kong take the fall: a white racist American soldier who shrieks with glee as he rides the atom bomb out of the plane, falling to collide with earth and set off the Doomsday Device.

In response to Major Kong’s catastrophically destructive antics, the eponymous scientist proposes to the War Room that the military-industrial establishment take refuge from impending nuclear holocaust by retreating into repurposed mine shafts. He pitches his idea to the US President thusly:

It would not be difficult *mein Fuhrer!* Nuclear reactors could, heh . . . I’m sorry Mr. President. Nuclear reactors could provide power almost indefinitely. Greenhouses could maintain plant life. Animals could be bred and slaughtered. A quick survey would have to be made of all the available mine sites in the country. But I would guess . . . that ah, dwelling space for several hundred thousands of our people could easily be provided.

Protected inside from the nuclear radiation and collapse of the biosphere, the humans would repopulate and emerge from their refuge when the radioactive dust settled, ready to make America great (again).

Dr. Strangelove depicts a bottleneck for *homo sapiens*. Only a minuscule proportion of a species make safe passage through a maelstrom. However, this is not Black Flag Day at Teahupo'o, where the fittest make it through the massive tunnel of a wave to find safety on the other side. Here we observe the evolutionary function of refugia, except that the ones permitted refuge and therefore a chance of survival are the self-selected creators of the bottleneck itself. Life at the end of empire is at the behest of a military-industrial complex that willingly co-opts ecological disaster for genocide and entrenchment of their authority, even though the *New World Coming* will be a veritable wasteland with neither military or industry, like the world depicted in *The Road*.

Life at the end of empire is the human-thumbprint-iceberg on the cover of *The Long Thaw* rendered into reality. The relatively powerless majority of the species, who are not responsible for the War Room men, nor the ideology under which they hold the world hostage with the Doomsday Device, drown beneath the waterline. Appeals to ethics are empty gestures enacted between the traded ivory towers of academia or the soapbox sermons of social justice warriors. And to add insult to injury, any concrete ability to leverage the Dire resides within windowless War Rooms. Global warmongers and industry heads have made and still make decisions on behalf of our species in any event, with vastly differentiated effectiveness observable between tyrants who wield power and their subjects. Yet away from intraspecies and anthropocentric concerns, planetary scale and deep time consequences play out regardless, as per the *The Long Thaw's* subtitle: *How Humans Are Changing the Next 100,000 Years of Earth's Climate*.

Dr. Strangelove's schema is also in keeping with the biophysical limits posed by Latimer's terrarium and Fuller's *Dome over Manhattan*. Mine sites would be manufactured into Closed Ecological Systems, protected from nuclear fallout like Manhattan under Fuller's *Dome*, and sealed like Latimer's terrarium, the sun simulated by nuclear reactors, powering greenhouses to grow plants, which provide the oxygen to sustain the WE*.

In keeping with truth being no stranger to fiction, the *Dr. Strangelove* finale parodied actual US plans to use mine shafts and subway stations for this purpose. The real-world plans sought to mimic refugia, except that like all attempts to outwit the World Turtle, applying teleology to evolution is at odds with the aimless, designer-less, purposeless, and directionless nature of life itself.

Whether real world plan never enacted, or fictional comedy never more real, the schema encapsulates life at the end of empire. Of all human-made transformations, the most substantial lie in subterranean realms. Resource extraction has

exhumed hundreds of millions of years of accumulated chemical energy, dispersing it into the bio-, litho-, hydro- and atmos-spheres in a couple of centuries. Surface transformations such as deforestation and pollution are so highly visible that they tend to distract from his simple fact, but in reality they pale in comparison with the consequences of un_earth_ing.

Waiting out the apocalypse in caverns hollowed of their fossil fuels is the terminus for being caught between a rock (a mine shaft) and a hard place (an extinguished biosphere). Fossil fuels represent a deeply ironic cycle of life, being played out all over the world: fossils of ancient life forms, having been resurrected through combustion, cause the biosphere to become petrified through a Mass Extinction Event, as members of the species that caused the cataclysm retreat into holes the fossil fuels were extracted from. Unlike the petrified human remains at Pompeii, huddling anywhere that provided an illusion of shelter when Mount Vesuvius buried the city in pyroclastic flows, petrified human remains of those huddled in old mine sites will be our endlings, when the earth once again will have no humans alive on it. As the refugees hide in subterranean strata, the confluence between being petrified and becoming petrified finds its fullest expression.

Such is life (at the end of empire).



Fig. 13: Sinkhole, Guatemala city, Guatemala, 1 June 2010. Photograph by Paulo Raquec, Guatamalan government.



ACT III: **THE DICE**

VII

It's All Fun and Games Until Someone Loses an Island

“... You're not helping. Why is that?”

In a nutshell:

Modern Convenience v Modern Conservation >

Biogenesis v Abiogenesis >

Do v Die >

Swim v Sink >

Now v Never >

Sinking the Stage v Raising the Stage

Three Blind Mice/Three Crooked Dice

A bit of wisdom is indeed possible; but I found this blessed certainty in all things: that on the feet of accident they would rather – dance. Oh sky above me, you pure, you exalted one! This your purity is to me now, that there is no eternal spider and spider web of reason: – that you are my dance floor for divine accident, that you are my gods' table for divine dice throws and dice players.

– Friedrich Nietzsche, *Thus Spoke Zarathustra* (2006 [1884])³²⁵



Fig. 14: “Mertle,” green turtle (*Chelonia mydas*), Raine Island Recovery Project, Raine Island, Australia, 24 December 2016.

Mertle, Tokolou, and Turturi are three female green sea turtles of the species *Chelonia mydas*. So named in 2016, following their capture by park rangers and conservation biologists, who glue satellite tags to their shell tops, and spray-paint

³²⁵ Friedrich Nietzsche, *Thus Spoke Zarathustra*, ed. Robert Pippin (Cambridge: Cambridge University Press, 2006 [1884]), 178.

large 'X's across their shell centres. Satellites then monitor their behaviour for the next 12-odd months, until shell growth dispels the tag, causing it to fall to the sea floor. Now anonymised, once more. But this is not their first capture, track, and tag: more detailed data shows that for Mertle this goes back to 1992, for Tokolou, 2006, and for Turturi, 1984.³²⁶

In the more recent taggings and trackings, however, the gameplay and its stakes are altogether different. These turtles three are the only ones named in a publicity campaign for an experimental conservation project in 2016. The relevance of the traditional, familiar forms of conservation – 'yesteryear' conservation – is disappearing at an exponential rate. Conservation ideas and concepts, say of 2006, 1992, or 1984, are rendered completely nonsensical, because for these turtles, as well as life-at-large, the world a few decades ago may as well be another geological and climatological epoch. There is no way to compare conservation from the halcyon yesteryears of the twentieth century with the experimental approaches coming to the fore today, let alone with ever more interventionist proposals for the future.

These turtles three have borne, and still bear witness to this transition from recent conservation ideas to current conservation ideas. The former refers to those mainstays of post-World War Two environmentalism: David Attenborough docudramas, Greenpeace, proximal campaigns for singular bioregions and/or singular species. Save the Whale. Save the Panda. Save the Bee. The latter is really just a shorthand for ModCon – Modern Conveniences, or rather, Modern Conservation – because such emerging approaches pivot on technofixes that share their lineage with anthropocentric conveniences that manipulate the environment, such as air conditioning. If your house is uninhabitable at its ambient temperature, can the ModCon of air con instead control your domestic microclimate?

Applied to the plight of the more-than-human world, such Modern Conservation takes Frankensteinian forms of intervention that appear more like science fiction than environmentalism: intervention ecology, assisted evolution, synthetic biology, climate engineering and the like.³²⁷ Despite seismic differences in scale, method, and medium, all seek a timely answer to the burning question: if the base causes of climate change (capitalism, consumerism, human exceptionalism and individualism,

³²⁶ Andrew Dunstan and Katharine Robertson, *Raine Island Recovery Project: 2016–17 Season Technical Report to the Raine Island Scientific Advisory Committee and Raine Island Reference Group* (Brisbane: Department of National Parks, Sport and Racing, Queensland Government, 2017), 13.

³²⁷ Oliver Morton, *The Planet Remade: How Geoengineering Could Change the World* (Princeton: Princeton University Press, 2017).

not to mention utter political and social inertia) cannot be curtailed, can ModCon instead ameliorate some of the consequences?³²⁸

The answer to the former is self-evident: domestic climates can be controlled in the short term here-and-now with air con. But so doing collectively induces long-term chaos in the planetary climate there-and-then, which will then encompass all here-and-nows too. Shut off the air con of equatorial cities, as well as cities that have been transformed into urban heat islands, and they become instantly uninhabitable. Keep them habitable in the here-and-now through air con, but when exacerbated climate change consequences – partly exacerbated by air conditioning itself – arrive on our doorsteps, all homes will be uninhabitable, air con or no air con.³²⁹ All technofixes actually do is disguise the true cost of ModCon, which is the undermining of the future for the same civilisation it now comforts and upholds. More sinister, technofixes fundamentally undermine the biosphere to which this so-called civilisation is hitched.

The answer to the latter is the subject of Act III, because this seemingly innocuous proposition in fact encapsulates the most pernicious game of dice ever played. The outstanding question is whether desperate Modern Conservation measures will not only fail, but exacerbate planetary biophysical chaos through thwarted casts of the die. After all, these conservational dice are thrown in a way that reverses the logic of the universal sigh, tasking our comprehension of the world with fulfilment of a desire to intentionally influence the planet's changeability, and control the consequences of experiments undertaken with that intention.

Recognising the abject failure of the Dire to placate the demon with soothing nursery rhymes of sheltered worldviews and human-scaled ideas of rupture and refuge, the Dice sings instead of outright biophysical manipulation to coax it back into its bottle of containment. For even though a dire demeanour is premised on comprehension of cosmic changeability and its consequences, only a dice demeanour seeks to wager with this premise, assuming one can “become smart enough to control”³³⁰ the demons. A feat that depends on the kind of macro-comprehension that we think we have, even as Stegosaurus stands before us and laments how “we all have a brain about the size of a [rockmelon née] walnut.”

As if the prospects were not already dire enough, in a universe that was not already dour enough, the walnutshell-sized comprehension now seeks to control

328 Holly Jean Buck, *After Geoengineering: Climate Tragedy, Repair, and Restoration* (London: Verso, 2019).

329 David Wallace-Wells, *The Uninhabitable Earth: Life after Warming* (New York: Tim Duggan Books, 2019).

330 Berry, *Standing by Words*, 65.

the demons by wager at “gods’ table for divine dice throws and dice players,” who, as Nietzsche reminds us, “on the feet of accident they would rather – dance.”³³¹ This is where Nigel Clark’s earlier ideas about “my gamble, with the usual provisos about decision-making under conditions of unknowability”³³² comes into play. This is a gamble on increasingly radical proposals for conservation (so-called, for it is a tautology to propose to conserve an organism by manipulating biophysical environments ranging all the way from cell to sky), and the idea that they can remain in step with massive and brutal biophysical changes already occurring across every sphere of the planet.

Against always out-of-reach “conditions of unknowability,” we now want to stake it all on a wager at the “table of the Gods.” But this is no game of chess, immortal or otherwise: this will manifest chaos not just in the order of ecosystems, but in evolution. Not just in a species here, a genus there, a family or two. At the table of the Gods, we play for impact at the level of order, class, and phylum, from here into the inconceivably distant future.

If ModCon are desperate measures for desperate times, they face down prospects rendered deceptively simple by the sheer enormity, speed, and scale of the rupture as it now unfolds around us: as simple as the old adages of Do-or-Die, Swim-or-Sink, Now-or-Never . . . It would appear to be a no brainer that we should *do* and *swim* right *now* to the absolute limit of our capacity, given the alternative is to *die* and *sink* into the *never* of mass extinction. Like Frankenstein, the loss involved in doing nothing is so great that those pursuant to the Dice will hedge no bets in this gamble, meaning the only end results can be victory, or forfeited hands and defeat.

If all spoils go to the victor, then what would such spoilage entail? In such a desperate pursuit, *doing* and *swimming* right *now* does not allow for the luxury for Bataille’s humility toward cosmic vicissitudes, because steering clear of *dying* and *sinking* (or indeed, capturing *now* before it disappears into *never*) requires the hubris of Fuller’s *Spaceship Earth*, the end game envisioned as a managed Noah’s Ark of as much of the more-than-human world as is necessary to ensure human survival. The original *Blade Runner* film took place in a 2019 devoid of non-human life, while its sequel is set in 2049, following full scale ecological collapse in the 2020s.³³³ As it turns out, both films may only have been off by a year or so.

Part of learning to sing a new song is learning new words, especially as so many words inherited from old worlds, like ‘conservation’, no longer apply for

331 Nietzsche, *Thus Spoke Zarathustra*, 178.

332 Clark, “Volatile Worlds, Vulnerable Bodies,” 33.

333 Denis Villeneuve, director, *Blade Runner 2049* (Warner Bros. Pictures, 2017), 35 mm.

what now lies on the table. In 2002, Tim Low sang the emerging lyrics for ModCon in his book *The New Nature*:

That's what conservation management will be like in the future – laced with irony. Old mines will be saved for bats, and pine plantations kept for endangered cockatoos. Experts will argue about the ecological value of weeds. There will be less clarity of purpose (do we recreate the past, preserve the present, or usher in the future?) and more potential for misguided actions. Intervention, after all, is more difficult than a hands-off approach . . . Conservation is intervention, and intervention isn't easy.³³⁴

The term Intervention Ecology has since become the accepted surrogate for dead-in-the-rising-seawater 'conservation.' Plant biologist Richard Hobbs, from the Ecosystem Restoration and Intervention Ecology Research Group at the University of Western Australia, confesses how difficult it is to sing this new song:

The term intervention is itself loaded and has militaristic overtones as a result of recent popular usage. It is certainly not the nurturing term that restoration is, and it is hardly likely to engage communities in ecosystem management in the way restoration does. It seems unlikely that a community group would label a site being manipulated with 'Intervention in Progress' (although this would transmit a more realistic message).³³⁵

As technoscientific intervention, ModCons bypass the impasse of societally-structured causes of climate change. Technofixes do not fix societal causes, nor do they seek to. They are what remain on the table when what should have been done – a dramatic and sustained decrease in greenhouse gas emissions, alongside all other human-induced biophysical change – faces the stark reality of what was done – a dramatic increase in all forms of human-induced biophysical change. They are what remain when the table at the United Nations General Assembly in Manhattan is going underwater. Its banner that should have hung behind Margaret Thatcher's address in 1989, now hangs in tatters, still surmising that *It's All Fun and Games Until Someone Loses an Island*. Nowadays, any such address from the twentieth-and-second-to-last century merely denotes what was needed way back when, before the two-degree guardrail became a game of two-too-little, two-too-late.

Nowadays, what could or should be done bears little relationship to what could have been done, should it have been done when there was still time. Add to this the temporal gap that is rapidly closing between what could be done – in the form of radical ModCon – and what should be done if seeking to thwart extinction by throwing the biosphere a lifeline through technoscience. Given the manifest

³³⁴ Tim Low, *The New Nature* (Sydney: Penguin, 2002), 301.

³³⁵ Richard Hobbs et al., "Intervention Ecology: Applying Ecological Science in the Twenty-first Century," *BioScience* 61 (2011): 447–448.

failure of policy instruments to curb any such social excesses, biophysical interventions are proffered as workarounds.

Now our Desert Tortoise dilemma, having already opened up a portal to the World Turtle, comes crashing back to earth, through the turtles three. Mertle, Tokolou, and Turturi are not conscripted into ModCon due to the existential plight of their sole species, or even existential plight at the scale of Tu'i Malila and her *Geochelone radiata* species, let alone that of Lonesome George, as the ending of the *Chelonoidis abingdonii* species. Rather, what is at stake is the fate of their entire superfamily *Cheloniodea*, encompassing all of these turtles and our problematic desert tortoise as well. As a team of conservation biologists remarked in their 2018 article “Where Have All the Turtles Gone, and Why Does It Matter?”:

The fate of turtles is especially tragic in light of their distinction as paragons of evolutionary success. They survived everything nature could throw at them from both earth and outer space (for example, the asteroid that wiped out the dinosaurs), but will they survive modern humans?³³⁶

Looking at the present tense through a deep-time lens, these turtles three are synecdoche for the plight of life-at-large. Their “fate” entwines their superfamily’s 120-million-year record of enduring not only the two Mass Extinction events prior to this one, but also all the many varied unnamed ruptures that are part and parcel of long-term survival. Here again, an echo of the universal sigh: turtles lived through Chicxulub, as well all the other “whenever[s],” only for the ‘whenever’ unfolding now to render them highly precarious and endangered. To opt to roll the dice against such prospects is not in keeping with fidelity to cosmic vicissitudes, but rather to claim fidelity toward the guilt of causing the rupture, or the ethics of triaging lifeforms that it imperils.

The turtles’ “fate” also raises the ominous question of whether the rupture unfolding will be their final undoing. With 120 million years of continuous existence, now is not the first time *Chelonia mydas* have found themselves caught on the chessboard between the Court Jester and the Red Queen. But it is the first time they have shared that chessboard with modern human society.

This society currently proposes various Modern Conservation efforts directed at the superfamily *Cheloniodea*, and these ModCon proposals for turtles are a microcosm of attempts to respond to the rupture. In this way, the microcosm also provides a portal into the biophysical limits to life. Part VII explores dice thrown at the

³³⁶ Jeffrey Lovich et al., “Where Have All the Turtles Gone, and Why Does It Matter?” *BioScience* 68, no. 10 (2018): 772.

scale of one island and one superfamily of species, with the relative scale of knock-on effects to interconnected species and ecosystems. Part VIII explores dice thrown at the level of an entire class of species, distributed all around the planet along the tropics, with correspondingly greatly increased stakes for many more species and ecosystems. Finally, Part IX explores dice thrown at planetary scale inhuman forces, in a one-shot operation to cool the climate. Those stakes could not be higher, as that cast of the die will foreshadow what comes between earth and the sun, and thus all life which depends directly or indirectly on photosynthesis.

Together, the three crooked throws of the dice run the gamut of what *on earth* Modern Conservation means at all scales, from atom to atmosphere, and cell to sky, and raise global dilemmas over what conservation could, or should, become. Running counter to the throw of the dice is the cold comfort of the perennial universal sigh, and the Dour's acquiescence to how, even if desperate times call for desperate measures, the response can only be measured against its one true correlate – the cosmos. And beside the cosmos, the dice and the rupture they attempt to ameliorate are drops in a temporal and spatial ocean. In response to the “future likelihood of crossing climate thresholds”³³⁷ the Dice offers a reflexive response to Detective Holden's vexing question: “*You're not helping. Why is that?*”, while the Dour maintains that any available help amounts to nothing more than an empty gesture.

The reflexive human response to the plight of Mertle, Tokolou, and Turturi sought to understand the question of “Where Have All the Turtles Gone, and Why Does It Matter?” by tracking where turtles are going at present. Peering down on them from satellites over 2016 to 2017 confirmed some staggering feats of green sea turtle migration, including that they swim up to 2,500 kilometres to reach their nesting site, from as far as Vanuatu, Indonesia, and Papua New Guinea. Each nesting migration is an unvaried return to the exact beach of birth, navigating via earth's magnetic field. A field which has aperiodically flipped polarity many a time, at random intervals without rhyme or rhythm, while their homing beacon fixates on points in space and time as fluid as the rise and fall of entire continents, when one's habitation extends over 120 million years.

For these turtles three, their sole destination is a drop in the ocean: Raine Island.

337 Clark, “Volatile Worlds, Vulnerable Bodies,” 33.

Game On

I'll stand on the ocean until I start sinkin'
 But I'll know my song well before I start singin'
 And it's a hard, it's a hard, it's a hard, it's a hard
 It's a hard rain's a-gonna fall.
 – Bob Dylan, “A Hard Rain’s a-Gonna Fall” (1963)³³⁸

Raine is a microcosm for how life did not happen on, but rather to, earth. After all, the island is biogenic. Like all coral cays, its origins lie not only in a lifeform (coral), but also in the death of this same lifeform, composed, as it were, of skeletal coral remains. In the beginning there was a disruption to ocean currents, as living coral entangled passing waters through their reef structures simmering just beneath the sea surface. By slowing down water directly above the reef, sediment carried by currents became deposited on top.

Meanwhile, petrified dead coral became broken into smaller and smaller pieces by the grinding and reductive vicissitudes of oceanic motion. Those pieces also get entangled in the slowed ocean currents, creating further deposits atop the reef. Add skeletal remains from other animals and plants as well as abiotic sediment and the makings of a new landmass are born.

Bit by bit, year by year, century by century, coagulating sediment forms proto-sand that becomes a lagoon, then a beach, and finally an island. From little things, big things grow. From little things, big things grow! Recall the World Turtle: while turtles do not make the world the way coral makes islands, an earth built on infinite layers of petrified organisms is not mere metaphor. In the case of Raine, sediment started congregating immediately downwind of sea surface coral around five millennia ago. Over the following millennium or two an island formed out of the open ocean.

The biogenic formation and ongoing reformation of Raine Island itself demonstrate the dour forces at play when a species whose tenure on earth extends a mere 200 millennia threatens a species whose tenure extends 120,000 millennia, on a planet that has flipped of its own accord many-times-more than one would dare imagine. While current game play is about human attempts to configure a *New World Coming* for Raine, the biogenesis of this island’s microcosm reveals how this is neither the first or last time a world has come into, or out of, being. Via biogenesis, life itself has been part and parcel of configuring many-a-world many-a-time before.

³³⁸ Bob Dylan, “A Hard Rain’s a-Gonna Fall,” track 6 on *The Freewheelin’ Bob Dylan* (Columbia, 1963), LP.

For this microcosm, life had thus far happened from the bottom-up: built upon ocean, sediment, and coral corpses. Once Raine became an established land mass not only year-round, but year-in-year-out, life then happened to this earth on a whole other level. For coral is not the only way life (or at least life's excrement) is literally woven into the island's fabric itself. Next came an earth suffused with life from the top-down: shit happens. And it happens from the sky.

Biogenic contributions to creating Raine came from guano, when dried birdshit accumulates on a semi-solid foundation, say rocks or sand above sea level. Guano reacts with existing sand, sediment, and water to make top-down bedrock, a mirror process to how coral aggregate sediment to make bottom-up bedrock. The guano bedrock then lays the foundation for soil and grass to form, which add to existing attractions for birds to nest. This creates more guano, which amplifies the cycle of shit-fuelled land ho!

To the naked eye it appears obvious how coral change cay geomorphology: no coral = no island. But the way guano can change cay geomorphology is hidden from plain sight. Chemical reactions started by the birdshit catalyse "a unique form of reef island in which a phosphatic cap formed from the downward leaching of guano plays an important part."³³⁹ While this process is endemic to all phosphatic cap islands, "unique" refers only to Raine, for reasons borne out by this island's creation and features, which make for a microcosm of earth.

The sentence comes from *Raine Island: Its Past and Present Status and Future Implications of Climate Change*, a 2008 report by geomorphologist David Hopley. The sentence's abrupt ending begs a cascading series of questions: "an important part" in what? Important in catalysing Raine? Important for Raine's resistance to oceanic erosion? Important for marine and terrestrial life which depend on Raine for breeding and nesting?

The possible answer – a definitive answer is absent from the 101 pages of the report – encapsulates how the Dour, Dire, and Dice trio are interwoven within this microcosm. Because what the report does state is that the guano-phosphate cap has life and death consequences for turtle nesting. Given turtles' drive to nest only where they are born, nesting sites are the existential thread connecting successive generations. And given Raine is the largest remaining *Chelonia mydas* nesting site in the world, and thus the most important green sea turtle rookery, the stage makes for a telling tale of the Dour, Dire, and Dice trio.

³³⁹ David Hopley, *Raine Island: Its Past and Present Status and Future Implications of Climate Change: Project Report* (Townsville: School of Earth and Environmental Sciences, James Cook University, 2008), 1.

Since geographically distinct populations of *Chelonia mydas* do not interbreed, each is effectively contained to its respective nesting site. The only other population in Australia, some 2,000 kilometres south in the Southern Great Barrier Reef, makes Raine the primary preserve of the entire Northern Great Barrier Reef population. In addition, Raine's rookery has the longest known use in the world, having nurtured turtles for at least the last millennium.

Thus the story of Raine Island takes us from Mertle, Tokolou, and Turturi to *Chelonia mydas*, then to turtles-at-large, and beyond to life-at-large, because turtles are but one of many lifeforms dependent on this drop in the ocean. 130 years of European observations have identified 84 bird species nesting on Raine, making it "one of, if not the most important tropical seabird nesting site on the Great Barrier Reef."³⁴⁰

And, like green sea turtles' mammoth migrations, the birds connect Raine to distant corners of the globe. This island, a mere three-square kilometres, 100 kilometres off the mainland, is globally interconnected to distant corners of the planet by the migratory feats of those nesting there. If Raine is a drop in the ocean, it shows how all drops are connected far and wide.

Mertle, Tokolou, and Turturi were born before 1981, when the global importance of the refugia was first recognised by establishing the Raine Island Corporation. These turtles three herald from the last generation before the geomorphology of the phosphatic cap began to play "an important part" in the survival of their species. By the time Hopley published his 2008 report, the stakes around the refugia's protective status had been raised, and the island's management had been transferred from the Corporation to the Queensland state government just one year prior. The stakes were raised again when it was subsequently reclassified as a "Nature Refuge" and then as a "National Park (Scientific)." The latter holds the most stringent status and highest level of protection in Australian law, including limiting all access to "scientific research and essential management only."³⁴¹

Talk, though, is cheap. While it is already dubious whether such strictures hold up at the scale of Raine, at a planetary scale all legal protections are revealed to be null and void for the present tense. Arbitrary boundaries that demarcate a "Nature Refuge" are empty gestures against underwater heatwaves-cum-heatfloods, when warming waters never subside and rising waters never recede. The same goes for arbitrary boundaries that demarcate a *Spaceship Earth*, which sails at the behest of

³⁴⁰ Hopley, *Raine Island*, 13.

³⁴¹ Peter Beattie and Lindy Nelson-Carr, "World's largest green turtle rookery given highest protection status," ministerial statement, Record of Proceedings, First Session of the Fifty-Second Parliament of Queensland, 22 August 2007, 2727.

forces that will never respect its boundaries. The stakes extrapolated from this microcosm of earthly biogenesis and now subjected to human geological agency are neither a superfamily of reptiles or a seemingly isolated drop in the ocean. At stake is whether “a hard rain’s a-gonna fall,” drowning Raine, its turtles, the World Turtle with it, and with that, the world.

Ramping Up

One of the most profound (if initially counter-intuitive) effects of Anthropocene discourse is to disclose the radical asymmetry of human and non-human forces . . . It prompts us to consider the extent to which all human life remains utterly dependent on geologic and biological conditions bequeathed to us by Earth and cosmic systems. And reminds us that our existence is reliant on certain states or regimes of Earth systems that in many cases represent only a narrow range of their potential operating spaces.

– Nigel Clark, “Geo-politics and the Disaster of the Anthropocene” (2014)³⁴²

Life happening *to* earth has vastly different repercussions for those who *act upon*, rather than *intervene with*, the earth. Raine’s biogenesis, through coral catalysing bottom-up deadrock and guano catalysing top-down shitrock, is without intention or design. Yet bottom-up/top-down biogenesis was only the beginning of life happening to this microcosmic earth. While Raine is composed of coral and birdshit that randomly happen *to* the island, it is continually recomposed laterally by turtles, whose intervention is intentional.

For a turtle, intervening with an environment is far more likely to yield negative consequences for the actant than for the environment, even when directed at immediate ends. Coral-caused island bottoms or birdshit-caused island tops are incidental for the ongoing life of coral and bird respectively. Both are largely after the fact creations, where ‘the fact’ equals deposited exoskeleton and tissue upon coral death, and deposited excrement upon migratory bird passage. The turtle’s contribution, however, happens during the fact, bringing adult and hatchling alike into chance-based games of life and death.

Just as “we build our houses on the earth,” turtles too build their houses, or nesting burrows, on the World Turtle. Wherein, their existence becomes entangled with earthly vicissitudes. For fledgling turtles, earth is incubator and protector. Burrows keep eggs warm enough, cool enough, and dry enough, and hold them deep enough and long enough to hatch without respectively being cooked, drowned, eaten, or prematurely unearthed. Each existential challenge is just a

342 Clark, “Geo-politics and the Disaster of the Anthropocene,” 27.

smattering from biophysical limits to life. Too hot = die inside the egg. Too cold = insufficient growth inside the egg. Too much water = drown inside the egg. Too little water = dehydrate inside the egg. Yet the turtles' unwavering instinct to only burrow into the soft sand of their birth beach brings their plight into infinitely regressing layers of chance, layers resting on layers resting on layers, until it is turtles, born and unborn, all the way down . . .

Such is life (and death) for green sea turtles. But on Raine the "unique form" of solid phosphatic rock poses distinct existential challenges. During nesting season upwards of 20,000 individuals may burrow at the same time, redistributing so much sand over the island that they unintentionally construct ramps from the beach to the raised phosphate centre. In search of better sand for burrowing, or due to overcrowding of other turtles on the beach, some climb these ramps to nest on the raised central platform.

These ramps are the only means up or down, because the edge of the phosphate platform has eroded, creating a cliff with a metre or so drop to the beach below. Platform hatchlings then need the accidental ramps created by adults to still be there so they can get down onto the beach and into the sea. The first existential challenge for those platform birthing or hatching is to be able to ramp down, with all the entailed vicissitudes. Because a ramp constructed today is as ephemeral as tomorrow, given the winds, hurricanes, surf swell, or burrowing by subsequent turtles over the 60 days of incubation.

For adults though there is an additional predicament, both cognitive and proprioceptive. *Chelonia mydas* live their whole lives in water, other than when on Raine. Being on land is the exception to their rule: following birth, the first 40 years are spent at sea. Having reached maturity, the females then return to the beach of their own birth once every two to four years for a nesting season, nesting four to six times per season. Having swum up to 2,500 kilometres to return to Raine, they haul a 130-kilogramme torso across tropical sands in 35 to 40°C heat, negotiate their way through the thousands of their kind doing likewise, locate a site, then burrow for hours on end to create a nest. By the time they finish laying their eggs their energy levels have plummeted, making for a dehydrated and delirious return to sea.

With energy repositories barely sufficient to provide motion toward the sea, the wherewithal to search for a ramp is wanting. Unable to negotiate the cliff edge, many exhausted turtles fall over, landing on their back on the hot beach sand. Enter a human, confronted with a turtle: "*The tortoise lays on its back, its belly baking in the hot sun, beating its legs trying to turn itself over, but it can't . . .*" intones Detective Holden.

Back-to-front turtle flipping has subsequently become an endeavour whenever scientists and park rangers visit Raine during nesting season. They walk the

cliff base perimeter, stepping around those nesting on the beach, to manually flip hundreds of turtles back onto their front. At first, staff drag them on surfboard like platforms across the beach to get them back in the sea. As demand increases, they introduce little diesel-powered tractors to wheel them back into the sea. So far one would be hard pressed not to follow suit: why *on earth* would one not flip a turtle onto its front? But then how *on Earth* can this microcosm be scaled up to the incomprehensively larger and more complex macrocosm of earth?

Manual turtle flipping is a reactive intervention, meaning the reaction follows after an event has occurred. Reactive interventions suffer from bleedingly oblivious intrinsic limits, especially when applied to human-caused environmental damage. First we create catastrophes, and then reactively attempt clean-ups that are often completely insufficient and haphazard. A reactive mentality is already problematic for discrete incidents with proximal cause-and-effect chains, such as oil spills. But it is absolutely delusional when confronted with distal non-linear phenomena that are discrete in neither space nor time, such as climate change. Coaxing oil demons back into barrels is self-evidently hazardous. Coaxing greenhouse gas demons back into the magic lantern of earthly sequestration is self-evidently preposterous.

The logical alternative to reactive interventions is also fairly self-evident. Proactive interventions attempt to anticipate, rather than react. First: extrapolate from the present to an anticipated future consequence of present phenomena. Then: intervene to thwart the undesirable future from eventuating. Or so the logic goes, where the proof in the pudding is that the originally anticipated future does not eventuate. The premise is that pre-intervention is better than cure. On Raine, the first such proactive intervention can be seen in the low fences constructed around the cliff edge to stop turtles going over. Now a turtle is prevented from flipping onto its back, provided the fence exerts sufficient resistance.

So far the factors, predicaments, and interventions are the most visible and self-evident cause-and-effect chains. A turtle has a significant chance of flipping as it falls from the cliff, unless a human intervenes and builds a fence strong enough to prevent the fall. A flipped turtle only gets back on its feet if a human manually exerts sufficient force to turn it over. For each individual it is Do-or-Die, determined solely by the amount of time that passes before human aid arrives or hydration limits are breached.

The most visual, obvious, and isolated incidents are easiest to rectify, say by flipping turtles one by one. Consequently, they are the least consequential. The most intractable, invisible, and omnipresent phenomena are the most consequential, say by dissipating earth's energy imbalance due to existing greenhouse gas concentrations. Air that Tu'i Malila breathed shortly before her 1966 death had 40% more carbon dioxide than that breathed in her 1677 youth. And yet, she, like most lifeforms,

would find the difference imperceptible. Up to a point, oxygen-breathing life is less immediately sensitive to such changes in atmospheric chemistry. But the same life-forms have no such shelter from the climatic changes induced by such changes in atmospheric chemistry.

Say one chooses to not flip upturned turtles, or to not stop them flipping in the first place. This does not represent a higher level of existential threat *per se* to the species. They would still successfully return to their sole refuge and nest *en masse*, though some would then die on the attempted return to the sea. From an evolutionary standpoint, these are ordinary vicissitudes. Especially since death occurs after conditions have been met for the next generation to hatch. Let us then object to intervening by flipping fallen turtles back onto their fronts on the basis that it is only a Do-or-Die predicament for each individual turtle. We object not because of indifference to their suffering, fully aware that “*you’re not helping. Why is that?*”

We look at the fact that a certain number of turtles never make it back to sea after nesting and declare this to be natural selection, a realm of suffering that resides on the yonder side of the fence, within nature as distinct from humanity. This distinction is however problematic. It means that no level of existential threat to the more-than-human-world is actually a human concern, whether a threat made against an individual lifeform (like Raine Island’s overturned turtles), a species (like Raine Island’s turtles *en masse*), a family, superfamily, or indeed an entire regional or planetary ecosystem.

The distinction, and the objections to intervening that arise from it, rest on two premises. Firstly, that there exists a natural order of things (whether inclusive or exclusive of humanity). Secondly, that to speak of upturned turtles as insufferable injustice is to conflate the world’s biophysical workings with a misconstrued worldview of the world itself. Recall the long arc of justice wherein Chicxulub set upon its trajectory of extinguishing The Age of Dinosaurs, right at the advent of the dinosaurs’ ascendancy. Turtles have died upturned since time immemorial, just as all lifeforms eventually do, whether peacefully or violently. Of all species that ever lived on this planet, 99.9% have already gone extinct. One should let sleeping dogs lie, as well as upturned turtles, so to speak. Shift happens, so to speak.

But what happens to these premises when breadcrumb trails lead from upturned turtles back to interventions by WE* ancestors? Now the upturned turtle bears a distinctly human twist, even if the flipping was done indirectly by those who came long before. The turtle no longer appears to be on the yonder side of nature, but has now been ensnared on the human side, at least as far as culpability goes. How then can one still maintain this objection to intervening in its

plight? An objection that rests on absolving humankind from more-than-human worldly affairs.

However, tracing these breadcrumb trails does not dissolve any arbitrary distinctions between humans and nature. At the very least, the trails show how the more-than-human world's current plight bears thumbprints, however faint, of WE* ancestors. And what we encounter beyond simple flipping of turtles sets us on a journey into Modern Conservation.

With Raine as earthly microcosm and flesh-and-blood individual turtles as synecdoche for the World Turtle, this dilemma can be extrapolated to all uses of ModCon to intervene in ecosystems and evolution. Recall the image of an infinite progression of turtles underpinning the earth. No matter how many successive turtle layers are upturned in the search for incontrovertible anthropogenic signals, we are, as always, working from the remaining fragments. The details have been lost to time.

The fragments, however coarse, still paint a picture connecting the present flipped turtle to past WE* interventions. The island's microcosmic rupture now reveals both biogenic origins – coral and birdshit – and anthropogenic origins, mingled through and through with myriad abiotic forces of cosmic progeny. Raine going under the rising seas now stands for Hamilton's emerging "joint human-Earth story":

Beyond its scientific importance, the appearance of this new object, the Earth System, has ontological meaning. It invites us to think about the Earth in a new way, an Earth in which it is possible for humankind to participate directly in its evolution by influencing the constantly changing processes that constitute it. It therefore brings out the conception of a joint human–Earth story.³⁴³

While thinking about the earth in such a "new way" does not scale up from an individual mind to the entirety of the planet's past, rupturing present, and inconceivable futures, Raine-as-microcosm is a proxy vision. A species-level humanity folded into the ethics of intervening *on Earth*. This is where earth's biogenesis becomes the product not just of intentional intervention, but of rolling the dice of Modern Conservation to boot.

343 Hamilton, *Defiant Earth*, 25.

Staging an Intervention

The Miller and his merry olde Wife,
 She scrapte her tripe licke thou the knife.
 – Thomas Ravenscroft, *Three Blind Mice* (1609)

The breadcrumb trail starts in 1842, the year the sheltered version of *Three Blind Mice* was published in the *Nursery Rhymes of England*. In that same year a barque, also hailing from England, was wrecked on a reef 40 kilometres from Raine.³⁴⁴ Many such ships ran aground on the Great Barrier Reef, which led the British colonial authorities to build a beacon on Raine, in the form of a non-light-emitting lighthouse. The island was selected not so much for its position, but rather for its phosphate cap, which guaranteed its relative year-to-year landmass stability and also provided on-site building resources. In 1844, an expedition began building the beacon with rocks mined from the phosphate cap and timber salvaged from the 1842 wreck.

So followed a settlement of convicts consigned to build the beacon, and their captors, who enforced their labour. The island peak was now the tower, neighboured by an inverse indention from the quarried central phosphate platform. In effect, Raine-as-microcosm experienced a biological intake akin to when the Isthmus of Panama first connected North and South America. Goats and vegetable gardens visited upon existing plants, replacing native species with lifeforms from the far reaches of the world. Following the coral and birdshit biogenesis, Raine's first non-indigenous incursion constituted a distinctly modern form of anthro-genesis.

The legacy of this anthro-genesis ran amok for the following few decades, once the beacon was built and Raine was once again uninhabited and unvisited. When intensive guano mining began in 1890, Raine experienced an export equivalent to the first land exchange between North and South America. Tens of thousands of tonnes of guano were mined from the island's central platform, used to manufacture phosphorous that was shipped all around the globe. Raine's shit-catalysed topography was distributed onto farming fields far and wide, as phosphorous was foundational to developing industrial agriculture. Unlike the explicitly coerced beacon builders, coercion now was implicit between Chinese labourers and their European overlords. The breadcrumb trail reveals how innumerable tales of vastly differentiated agency, will, and responsibility entwine with the question of how the anthropos acquired the Anthropocene's geological agency.

³⁴⁴ Hopley, *Raine Island*, 68.

The legacy of this second stage of anthro-genesis on Raine ran amok for the following few decades, as Raine became uninhabited once more, after all mining had been exhausted. In combination, both stages of anthro-genesis constituted a biogeochemical upheaval of Raine. With the upper guano removed, rainwater could now penetrate the raised central platform substrate. Chemically reacting with the phosphate, seeping rainwater then eroded the substrate away, in turn eroding the cliff edges of the central platform. Picture a limestone cave – the principle is the same, except the erosion manifested over decades rather than over millions of years. Picture the Isthmus of Panama closing over decades rather than millions of years – the skewed temporal ratios are alike.

However, the anthro-genesis does not paint a neat breadcrumb trail from nineteenth-century phosphate mining to flipped turtles today. Any such trail depends on whether Raine's nesting topography is considered human-induced, or within 'natural' vicissitudes intrinsic to earth (based on a worldview where humans sit outside of 'nature'). To compound an already heady confusion, the opposing worldview situates humans as always already part-and-parcel of nature. Wherein, human-induced phenomena can only ever lie within the natural order of things.

This worldview lies at the heart of a dour demeanour, as it places humanity within rather than without the natural order of things. Given our shared progeny with all other earthly lifeforms, how could our labour, including its disastrous fruits, be anything but natural? The Dour decries how we are but the latest rupture in a long line of ruptures, and consoles us that while we may be the most destructive experiment of this planet's evolutionary chaos, its experiment we most certainly are.

Hence it is a sleight of hand and a betrayal of our aquatic origins to set humanity outside of 'nature', where nature refers to life-at-large on earth. Following the breadcrumb trail from this line of thinking to its watery grave, why should the plight of an upturned turtle concern us, whether WE* flipped it, we flipped it, or it was flipped by forces not of our making or influence?

But the breadcrumb trail remains opaque against such searches for certainty by either opposing worldview, because WE* intervention into Raine's substrate is still only a drop in the ocean relative to the extant history of coral-birdshit-water-sand interminglings which have produced and reproduced the island since its conception. Steadfast sediment such as rock can provide reliable portals for winding back the clock over millions-cum-billions of years, with high fidelity to what happened when, and how. But, with coral cays being too volatile to yield such precise insights, Raine presents an enigma for dissolving, or absolving, human concern for the more-than-human world.

To convert the confusion into a full-blown contusion, Raine is unique and therefore does not have a host of comparable islands for cross-referencing. Current cliff erosion could have an intrinsically nonhuman origin that predates nineteenth-century mining, although the incontrovertible fact that this mining caused significant geomorphological changes does argue strongly for a human hand amongst the breadcrumb trail to the current plight of cliff-flipped turtles. And, given Raine is “probably the most studied turtle nesting site in the world with more than 130 years of observations,”³⁴⁵ hypotheses about precipitating the phosphate cap erosion are not without some solid ground.

With Raine as earthly-microcosm, this minutia becomes a synecdoche for modelling cause-and-effect on earth-at-large. Namely, given the distinction between humans and nature is mere delusion, are we morally obliged to reactively or proactively intervene in turtle flipping? The distinction is academic – in the worst sense of the term – unless one argues against intervening on the rationale that responsibility to the more-than-human world is restricted to when WE* or we caused a flip.

And the distinction remains academic, because the opaque breadcrumb trail of human interventions on Raine have become peripheral to what is actually at stake. *Chelonia mydas* now face an existential predicament that is orders of magnitude more acute than the Do-or-Die predicament of the individual fallen turtles on Raine Island’s nesting site. When turtles “build [their] houses on the earth,” they do so at the behest of not just their metre-deep burrows, but the successive layers upon which sand rest, going down to “an elephant, the elephant on a tortoise, the tortoise again . . . and so on *ad infinitum*.”

Intramural debates about human culpability and responsibility are finally laid to rest in the brine bedrock that lies directly under the beach sands where turtles nest. The bedrock has progressively shifted under their burrowing area, by way of phosphate transported by water that has leached through the eroded cap, making, in effect, a solid platform under the beach sands. That shift may or may not have been catalysed when seeping rainwater first began modifying the stratal chemistry and eroding the phosphate rock. Meaning guano mining may have catalysed the shifting bedrock by exposing the phosphate rock, or maybe, in Clark’s sense, Raine’s cataclysm lies further ‘upstream’, before any humans came on the scene. At this late hour of the nightmare, it seems sensible to ask *why on earth* does it matter? When an existential predicament escalates from threatening individuals to an entire species, does the gravity not supersede any debates about culpability, as well as any hesitation about whether or not to intervene?

345 Hopley, *Raine Island*, 10.

The shifting bedrock appears to be the terminus for David Hopley's 2008 statement that "the downward leaching of guano plays an important part."³⁴⁶ Conservation biologists were initially baffled as to plummeting hatchling numbers, hence Hopley's ambiguity about what on earth was the "important part." Subsequent research revealed that since the bedrock is not porous, the water table is increasingly rising up the beach area, where turtles build their nests. The bedrock thus retains falling rain under the beach and exacerbates sea water rising through the beach sand. Thus, from coral-birdshit-water-sand-human-industrial intermingling, a rising sea water level was drowning the vast majority of incubating eggs. The Do-or-Die of individual fallen turtles had graduated to become a Sink-or-Swim predicament for the species as a whole.

By 2014, the sink:swim ratio had become critical. Whereas 370,000 hatchlings represented an average nesting season, all other things being equal, conservation biologists estimated 2,500 hatchlings that season.³⁴⁷ Government agencies reactively intervened by experimentally increasing egg distance from the water table. Transporting massive engineering vehicles onto Raine, they raised a 100 x 100 metre beach section one metre, redistributing the equivalent of six Olympic swimming pools of sand from the front beach area to the rear. With the experiment indicating a less dire sink:swim ratio, the state government proposed a larger scale beach re-profiling.

But, instead of fronting up the eight million Australian dollars required to do so, the government advertised for private sponsorship. As per the technofix ethos of ModCons, so with their societal ethos. David Attenborough lent his voice to their fundraising video, inviting the viewer to "be part of the largest green turtle recovery project in history."³⁴⁸ Attenborough has a long association with Raine – having first filmed there in 1957, back when it was still possible to claim innocence about flipping the world by flipping turtles. Like all innocence though, it was born of ignorance and died in disgrace – three months after the BBC broadcast his Raine episode, in November 1957,³⁴⁹ US television broadcast Capra's *Meteora* episode.

³⁴⁶ Hopley, *Raine Island*, 1.

³⁴⁷ Andrew Dunstan, quoted in Neil Mattocks, "Natural History and Research and Management of Raine Island's Green Turtle Rookery," *eAtlas*, 12 August 2014, accessed 6 May 2019, <https://eatlas.org.au/ts/raine-turtles>.

³⁴⁸ David Attenborough, quoted in *Be Part of the Largest Green Turtle Recovery Project in History* poster (Department of Environment and Heritage Workshops, Queensland Government, 2016).

³⁴⁹ David Attenborough, director, *Zoo Quest*, episode 2, "Zoo Quest for the Paradise Birds," aired British Broadcasting Corporation, 17 November 1957.

Like a turtle returning to its birth site for its first nesting season, Attenborough returned to Raine a half century later, filming the 2014 fence building and beach raising interventions. Featuring the experiments in his major three-part BBC series *Great Barrier Reef*, the projects suddenly received international attention. A consortium of companies, NGOs, state agencies, universities, and Traditional Owners responded to the call for desperate measures, and with funds secured, the Raine Island Recovery Project launched in 2016.

The title is unwittingly ironic: recovering Raine by literally re-covering the beach in its own sand. A larger re-covering intervention in 2017 bore a title befitting the neoliberal conservation: “Operation Sand Dune.”³⁵⁰ After all, ModCon is *Nature Inc: Environmental Conservation in the Neoliberal Age*, as the authors Bram Büscher, Wolfram Dressler, and Robert Fletcher lament.³⁵¹

Mertle, Turturi, and Tokolou were tagged and tracked as part of analysing the comings and goings of adult turtles during the Raine Island Recovery Project. Indigenous schoolchildren named Mertle and Tokolou, from their respective local indigenous languages. But it was multinational fossil fuel company BHP that named Turturi, a fringe privilege gained from their principal funding of the whole five-year project. Conservation through ecosystem engineering, outsourced by a state government, funded by a fossil fuel company. The more-than-human world now beholden to the tyranny of the court. A price put on everything under the sun, while those burning it to the ground fund empty gestures toward conserving what remains. A deal with the devil it may be, but conservationists who have wagered this game for decades are putting all options on the table, because the floor is already soaked through with the rising seas.

One could take the moral high ground and protest the bitter irony of the funding source. But the moral high ground is not as obvious as refusing to stand on the re-profiled beach area. Without that sponsorship, the second beach level raising and ancillary experiment support would not have occurred in time. When populations plummet, so does the luxury of time in which to respond: “*The tortoise lays on its back, its belly baking in the hot sun, beating its legs trying to turn itself over, but it can’t . . .*”

Raising the beach, combined with fences to prevent turtles falling onto their backs, combats the existential threat on both the individual and species levels. It is the *do* in Do-or-Die for individual turtles, and the *swim* in Sink-or-Swim for the

350 Great Barrier Reef Foundation, “Mission Accomplished to Re-Shape Raine Island,” media release, 19 September 2017, accessed 30 July 2024, <https://www.barrierreef.org/news/media-release/mission-accomplished-to-re-shape-raine-island>.

351 Bram Büscher, Wolfram Dressler, and Robert Fletcher, eds., *Nature Inc.: Environmental Conservation in the Neoliberal Age* (Tucson: University of Arizona Press, 2014).

species: raising the height of the beaches stops the eggs from drowning, meaning a certain number of hatchlings will at least attempt the journey from nest to sea. Technically, any material intervention into an ecosystem will indirectly influence evolution. Flipping a turtle – Do-or-Die – is an obvious intervention. Raising the beach sand height – Swim-or-Sink – is another obvious intervention.

As such interventions change sea turtle populations, they influence all species in their food web, alongside a host of ancillary influences up and down the infinite regression of World Turtles. In this vein, Clark remarks, that

All interventions in Earth systems are matters of trial and error. At whatever scale they are attempted, experiments with flows of matter and energy have a fair chance of failing, falling short, or having unintended consequences. Efforts to deflect or modulate disaster, in this sense, can be expected to precipitate new disasters.³⁵²

At the scale of the Raine Island turtles, the evolutionary repercussions of such “interventions in Earth systems” are largely restricted to populations of affected species, such as more seagrass being around if there are less sea turtles to eat it. Only over evolutionary time scales will turtle or sea grass generations manifest any phenotypic or genotypic modification.

Such is the relatively limited remit of individual Do-or-Die or species Swim-or-Sink predicaments. While the latter affects far greater proportions of a species than the former, both are limited in their repercussions. Neither can be included in the acutest level of existential threat, perhaps best understood as Now-or-Never. Thus far this is not a Now-or-Never predicament, because the unreconstructed beach was still (barely) above water levels for hatchling rates to precipitously dwindle. 2,500 hatchlings out of an expected average of 370,000 is precipitous if restricting the view to this individual sample, but it is not yet an existential threat so acute that any means whatsoever can be justified in combatting it. Recent nesting years fared better in relative terms, producing increased numbers of hatchlings that are nonetheless still precarious in absolute terms. Yet the substantial effects on hatchling rates in unconstructed beach areas were still insufficient to constitute a Now-or-Never dilemma.

The point being that these levels of existential predicaments negate each other as the threat levels scale up: just as slower-moving insidious threats at the level of Swim-or-Sink make individual Do-or-Die threats pale into insignificance, so do more acute Now-or-Never threats make any threat restricted to a single species or happening along an extended time-frame pale into oblivion.

352 Clark, “Geo-politics and the Disaster of the Anthropocene,” 34.

What then, when the gap between now and never is simply the distance between us and the powerful entity we run from, having enraged it? And how should we even judge that gap, given the entity may or may not have already blinded us to our comeuppance? This distance is an interval that pushes irresistibly at the limits to both social and biophysical life, holding now, but never forever.

Did you ever see such a sight in your life/As three blind mice?

Exclamation.Point.Extreme.

It's funny how people, just won't

Accept change

As if nature itself – they'd prefer

Re-arranged.

– George Harrison, "The Light That Has Lighted The World" (1973)³⁵³

While the biophysical limits of ModCon are decidedly mechanical and technical, they are presaged first and foremost by social limits. Nowhere is this more the case than when facing down acute existential predicaments: the kind of predicaments that present Now-or-Never dilemmas, where *now* is the last chance for a last-ditch attempt to avert extinction, and once the window of *now* closes, there will *never* be another chance. This level of existential threat can apply to a species, or to an entire ecosystem, or, indeed to life-at-large, but the Now-or-Never mindset is heavily flavoured by social and cultural domains.

When Attenborough returned to Raine in 2014, he drew a perplexing and distinctly socio-cultural line in the sand, whose demarcation made a mockery of any protests against intervention, while also revealing that any such interventions can only ever be empty gestures when viewed on any meaningful scale.

In his 2014 documentary, Attenborough unintentionally shows up human hubris as a hollow conceit when profiling the work of conservation biologists who count hatchlings from the re-profiled beach area that they have steered into a shallow trench. The team from the Great Barrier Reef Marine Park Authority lift each hatchling from the trench, putting them onto the beach to continue their shell to sea journey. Attenborough concludes the segment about Raine by interviewing the project leader, Andrew Dunstan, on the beach raising experiment:

It's confirmation that Andy [Andrew] and his team have found the right way to restore this vital breeding area. But for the young hatchlings, the trials of life have only just begun. Each

³⁵³ George Harrison, "The Light That Has Lighted The World," track 3 on *Living in the Material World* (Apple, 1973), LP.

new arrival will have to make a perilous dash to reach the ocean. Now they're on their own. Andy and his team must not interfere at this stage. Inevitably, the tiny, defenceless hatchlings attract scores of predators.³⁵⁴

This statement draws a line in the sand, by separating humans from nature. Once the hatchlings leave the trench, "Andy and his team must not interfere" any further in the turtles' journey to the ocean. It appears as if the tiny hatchlings have crossed some invisible line, leaving the protection of human hands. Human hands that have raised their nesting beach so that they did not drown as eggs, flipped their parents onto their backs so that they did not die of dehydration, built fences and even trenches to aid adults and hatchlings respectively. But now the hatchlings return back to the yonder side of nature, the one that is "red in tooth and claw,"³⁵⁵ with all human aid withdrawn.

For every 1,000 hatchlings, only 70 make it to the sea. On the journey from shell to sea crabs or birds eat those whose "trials of life" end after they "have only just begun." For every 1,000 that make it to the sea, only one makes it to adulthood. On the journey into the sea, tiger sharks wait so close to the shoreline that their entire backs are exposed above water. Granting safe passage from shell to sea would thus go a long way to greater numbers reaching adulthood. If aiming to help plummeting populations, why go only so far as flipping individuals back onto their front and propping up portions of their nesting area over the rising seas? Socially okay to capture, tag, and track. To manually flip. To transport on tractors. To install cliff-top barriers. To raise the beach height. But, having partially restored shelter to their refugia through all this intervention "now they're on their own. Andy and his team must not interfere at this stage." Why *on earth* is everything so far considered acceptable, but sheltering hatchlings from predators on their shell to sea journey is not?

Worse still – why tell ourselves we made right when so much more remains to even remotely get things back up the right way round? Manually flipping turtles and beach sand raising may appear to make good on Do-or-Die and Swim-or-Sink predicaments, but they are by no means "confirmation that Andy and his team have found the right way to restore this vital breeding area." At best they offer ephemeral and inadequate band-aid solutions to a wound that will only continue to fester. This "right way" begets a game of cat-and-mouse, between a fossil-fuelled civilisation that causes the seas to rise, while fossil fuel companies fund the raising and re-levelling of beaches so that not quite all the world will be a sinking stage.

354 David Attenborough, quoted in Michael Davis and Anne Sommerfield, directors, *Great Barrier Reef*, episode 3, aired British Broadcasting Corporation, 13 January 2016.

355 Tennyson, *In Memoriam A. H. H.*, Canto LVI, line 15.

The Dour lurks in these depths as well, though its comfort is, as ever, absolutely cold. A dour demeanour might counter Attenborough's claim that this is "the right way to restore this vital breeding area" with Richard Dawkin's dour appraisal, that "a time of plenty . . . will automatically lead to an increase in population until the natural state of starvation and misery is restored."³⁵⁶ But even disregarding the cold comfort of such dour pronouncements, this story is still plagued by contradictions as to what *on earth* prompted Attenborough to set the limit to intervening here? It is not as if the Raine Island Recovery Project has any means to redress the myriad existential challenges facing coral beneath the island, turtles within the island, and seabirds atop the island. To boot, the acuteness of the situation is well-illustrated by the fact that the Modern Conservation mentality driving the project shows the same insatiable urge to cannibalise earth as the industrial capitalism (here in the form of a fossil-fuel company) that it depends upon for its primary funding. Hopley demonstrates this in his report's sobering rationale for Raine's *Present Status and Future Implications of Climate Change*:

Nearby cays . . . before they disappear their value may be in providing the sand for any replenishment on Raine Island. This will be a no loss position, as within a few years as sea level rises, these cays will disappear completely and their sand resource lost forever.³⁵⁷

Thus far the universities and companies who paid to attach their names to the ModCon have celebrated success so-called in their marketing and public relations. Yet the fact that the neighbouring cays are disappearing under the water remains set aside. And even worse, they remain entirely mute on the acute existential threat that was subsequently unearthed when the project was only halfway through its tenure, a threat sufficiently acute to beget a genuine Now-or-Never dilemma.

Like reptiles in general, turtle sex is determined by egg incubation temperature. Below a certain sand temperature threshold, turtles are born male. Above, a female. As adults, Mertle, Tokolou, and Turturi herald from the 1970s and 1980s, when one male *Chelonia mydas* was born for every 6.6 females. By the time the beaches were being raised, this had changed to one male for every 116 females. In response to these findings from her research, turtle scientist Camryn Allen declared in 2018 that "this is extreme – like capital letters extreme, exclamation point extreme . . . we're talking a handful of males to hundreds and hundreds of

³⁵⁶ Dawkins, *River Out of Eden*, 154.

³⁵⁷ Hopley, *Raine Island*, 48.

females. We were shocked.”³⁵⁸ From this point on all talk, though still cheap, should be in capital letters all the same. Being petrified and becoming petrified are neither hyperbole nor metaphor respectively. EXCLAMATION.POINT.EXTREME.

When Attenborough crouched over hatchlings born in the re-covered heightened sands, he declared that “for the young hatchlings, the trials of life have only just begun.” Beyond the usual proximal predators, their trials of life are actually at the behest of the distal suspect that is murder most foul: anthropogenic climate change. Behind the far more pernicious threat to the turtles’ ongoing existence lies the same non-linear causation that is raising the water table up the beach. From climate change: too wet, they drown. From climate change: too hot, they cook. The breadcrumb trail has terminated, leaving incontrovertible evidence for human culpability, as well as woefully insufficient evidence for human ability to make good the flipped turtle.

Having drawn a line in the sand about not interfering in hatchlings’ shell to sea passage, how *on Earth* would the social limits to life prefigure any intervention that could flip their male to female sex ratio back towards 1:100, let alone 1:50 or 1:10? Now-or-Never predicaments arising from acute existential threats are premised on accepting a situation has become so dire that the only potential means available to stave off human-caused extinction is to throw the dice and gamble on truly radical ModCon.

Through which things get really risky, complex, and uncertain: intervening directly into evolution itself to forestall extinction. Now-or-Never interventions into evolution are as acute as the Now-or-Never predicaments from which they arise. Such interventions are about catalysing effectively instantaneous phenotypic and/or genotypic modification for future descendants to inherit the modified traits. Say a discernible phenotypic or genotypic trait takes ten millennia to appear across a species, and scientists induce a discernible inherited trait in ten years in a population of the species. From an evolutionary time perspective that is effectively instantaneous.

Therein, redressing the sex ratio would necessitate radical interventions into both ecosystems and evolution. The risks, complexity, and uncertainty in this Now-or-Never predicament are palpable. The timeframe to act is now. Or never. The consequences quite literally determine the procreative viability of sea turtles,

³⁵⁸ Camryn Allen, quoted in Craig Welch, “99% of Australian Green Sea Turtles Studied Turning Female From Climate Change,” *National Geographic*, 8 January 2018, accessed 6 May 2019, <https://www.nationalgeographic.com/science/article/australia-green-sea-turtles-turning-female-climate-change-raine-island-sex-temperature>; Michael Jensen et al., “Environmental Warming and Feminization of One of the Largest Sea Turtle Populations in the World,” *Current Biology* 28, no. 1 (2018): 154–159.

due to the extinction prospects arising from one male for every ten females, or one for every 100, or one for every 1,000 . . . Against the rapidly diminishing time-frame for any efficacious intervention, what would such a flipping entail? More to the point, assuming any such means, vexing questions arise as to whether we could or should, in further contradiction to the already heady non-sense arising from whether humans are separated, effectively dissolved and thus absolved, from nature.

When the stakes are Now-or-Never, rolling the dice becomes a risk that is above and beyond that of rolling them against less acute and less wide-ranging Do-or-Die or Swim-or-Sink predicaments. The higher the stakes, the more bewildering the cause-and-effect chains that make up Clark's "geo-political or cosmopolitical challenge of the Anthropocene." This challenge, he argues,

May be as much about how we choose to engage with others whose experiments have fallen short or been overwhelmed, as it is about how we make decisions about our own strategic interventions. And ethical relating too, as the most searching theorists of the disaster have long observed, is a matter of risky experimentation and urgent improvisation.³⁵⁹

In other words, urgency and non-delimitable risk configure the play of interventions for something that has become "extreme – like capital letters extreme, exclamation point extreme." The burning question thus becomes: what would such "risky experimental and urgent improvisation" look like for Raine's turtles?

End Game

Had I right, for my own benefit, to inflict this curse upon everlasting generations? . . . I shuddered to think that future ages might curse me as their pest, whose selfishness had not hesitated to buy its own peace at the price, perhaps, of the existence of the whole human race.
– Mary Shelley, *Frankenstein* (1818)³⁶⁰

It is self-evident that localised, proximal interventions – fence building, individual turtle rescue, and sand raising – amount to woefully inadequate responses to the rupture. These are limited to proximal Do-or-Die and Sink-or-Swim predicaments. So *how on earth* should we respond to acute distal Now-or-Never predicaments that demand we choose between *now* or *never* right now? Is this, in fact, a choice at all? Because not only must the *now* happen now, but the means to make it possible are yet to exist, and, even if the die could be cast while *now* still exists, any

359 Clark, "Geo-politics and the Disaster of the Anthropocene," 34.

360 Shelley, *Frankenstein*, 299.

throw is cast by a hand that may or may not have already been blinded by the entity it enraged, and now seeks to placate by a last-ditch bet on the dice falling in its favour. What then, should ModCon entail if it is to be anything other than an empty gesture or cosmic joke?

There is a punchline to this joke though, though it can only be reached via an eccentric-orbit way of landing. Comedy = tragedy + time where time = zero. Because the climate system has roughly a five-decade lag between emissions and their consequences manifesting, the change in the Raine Island turtles' sex ratio from 1:6.6 to 1:116 in 2018 was due to emissions made around the time Attenborough first visited Raine in 1957. So *now* is already entirely too late.

This means that to be anything other than an empty gesture, only a seismic (and successful) intervention in the *Chelonia mydas* genotype could stop the sex ratio from going from its current 1:116 to 1:1160, all other things being equal. Let alone bring it back from 1:116 to 1:6.6. Will Attenborough lend his voice to campaigns to sculpt the *Chelonia mydas* genotype via millions of dollars of corporate donations? Will there be public outcry or even public debate about such proposals? Will there even be towns in which to assemble a Town Hall meeting so the assembled can collectively inhale and exhale the universal sigh when faced with these choices?

Instead, our *now* is stuck in the meantime of ad hoc reactive interventions. One being to relocate eggs to cooler sands, including on neighbouring islands. Another being to lower sand temperature by modifying the albedo ratio, say by adding light coloured sand to nest tops. Sand which could not stay on top for long, given the how much sand the burrowing turtles redistribute. Uncertainty also abounds as to whether imported sand would bring fresh existential challenges to incubation mortality at the microbial scale, from microorganisms that inhabit coral cay sand.

To circumvent these ground-level problems, another proposal simply moves higher up, suggesting shade cloths be used to modify the albedo ratio, suspended above the vicissitudes of sand morphology and terrestrial microbes. Such experiments have already taken place in a handful of key rookeries across the globe, including over the Mon Repos rookery in the southern Great Barrier Reef, in an initiative by the Queensland Department of Environment.

While shade clothes demonstrably result in proportionally more males being born, Raine's logistics are unwieldy. Consider 20,000 turtles arriving and departing all hours of the day, weeks on end over nesting season, which is also hurricane season. Having the right nest in the right area at the right time becomes a game of cat and mouse – unless human intervention extends to completely covering these so-called natural environments in shade cloth tents. While this is under consideration for Raine, due to the remote location and unwieldy topography,

such structures would turn it into a triage centre, requiring round-the-clock vigilance on par with a hospital emergency ward.

To circumvent these immediately-above-ground-level problems, some suggest going further upwards, above the vicissitudes of shade cloths and endemic hurricanes. Precipitating artificial rain by cloud seeding is nothing new under the sun, though it prefigures planetary scale proposals to engineer the climate, to avert runaway climate change. Will BHP or another fossil fuel company sponsor such intervention? Does this not show up the ludicrous mindset of funding technofixes via the same tyranny that catalysed the rupture to begin with?

In any event, both shade cloths or artificial rain are still only ephemeral interventions. While they are at the forefront of existing Modern Conservation experiments, they do not remotely amount to the seismic *now* that can avert the impending *never*. As regards this most vital rookery-turned-triaged-emergency-ward, ephemeral interventions are band-aids to the insoluble condition known as evolution. Given how precipitous the sex ratio already is, further proposals to systematically redress this sex ratio are far more insidious.

To have any chance of averting the *never* facing down turtles, other conservation experiments propose to intervene not in ecosystems but in evolution itself, by means of assisted evolution and synthetic biology.³⁶¹ Both of these nascent and promissory scientific fields sound like they took a page out of Shelley's *Frankenstein*, celebrating all the main character's hubris and arrogance but failing somehow to read the book to the end to discover what tragedies befall those who play games with the limits of life and death. At least for those who do not first ask "had I right, for my own benefit, to inflict this curse upon everlasting generations?"

Assisted evolution is the field of breeding organisms in a laboratory to develop strains that have increased tolerance to accelerating rates of biophysical change. Synthetic biology is the field of designing entire organisms, or components of organisms, to engineer their genotype. It is currently limited to microbial life, though commercial, industrial, and fundamental scientific research are increasing dramatically.³⁶² As neither field has yet been formally proposed for any reptiles, Part VIII will leave the turtles on the beaches of Raine Island to go down into the foundations of the cay itself, since a primary objective of both assisted evolution and synthetic biology is to intervene with another precipitously endangered lifeform fundamental not only to Raine, but to unimaginable swathes of marine life: coral.

³⁶¹ Kent Redford and William Adams, *Strange Natures Conservation in the Era of Synthetic Biology* (Yale: Yale University Press, 2021).

³⁶² Jane Calvert, "Synthetic Biology: Constructing Nature?" *Sociological Review* 58, no. 1 (2010): 95–112.

In relation to turtle conservation, synthetic biology would entail discovering the genes that assign sex according to temperature, modifying them, then using gene drives to get the modification inherited across generations. For example, sand that is 29°C produces more females than males. At 33°C, all hatchlings are female. At 23°C, all hatchlings are male. Synthetic biology would modify the genome so that the eggs of future descendants would become male at a higher temperature, say 31°C.

To date, no such research has been publicly proposed. Even Tyrell found his technoscientific prowess ran up against biophysical limits to life. Recall Attenborough drawing a line in the sand about stopping the birds and crabs from eating hatchlings on their journey from shell to sea. How would he, or younger generations of conservationists or environmentalists, draw a line in the sand about such Modern Conservation? Existing ModCon can only act on proximal effects, whether a flipped turtle or two hundred, whereas what is required is an efficacious ModCon for the distal scale of the actual existential challenges.

Such is the measure by which ModCon comes to terms with the potential efficacy it could offer the more-than-human world, as it faces down the rupture unfolding now. And in so doing, ModCon must also decide whether it has in fact now been reduced to a fantasy for modifying biophysical limits to life to better withstand the unfolding rupture, given that the *now* is right now, and these are sciences that are at best nascent, and at worst, still non-existent. Bert the Turtle in *Duck and Cover* may survive an explosion of dynamite right next to his shell, though the cartoon is presented as a child-like whimsical fantasy, with Bert beaming a wide smile after emerging from his shell once the explosion has ceased. In the propaganda film the fantasy continues, suggesting that humans could survive nuclear explosions by merely ducking and covering under a desk.

In the rupture currently unfolding, ModCon can neither be reduced to a mere fantasy, nor can its prospects for yielding anything efficacious be considered even remotely real, nor commensurate with the timeframes available. So much for throwing the Dice with still woefully ignorant human hands, petrified by the direness of the predicament and, lost in that dire demeanour, unable to see past our guilt and also our skewed self-conception as saviours of the more-than-human-world, distinct from nature and its immutable laws.

What, then, is left to consider? In the midst of such seemingly certain peril, it is the Dour that reminds us of the true cosmic measure of the desperation surrounding Raine's turtles. Throughout their existence, turtles have accommodated the comings and goings of things essential to their livelihood, such as nesting sites, the seagrass species they eat, currents, and ocean temperatures. Their adaptive capacity to avoid maximum sand temperatures includes nesting at cooler times of the year and changing to beaches with a lower solar albedo. The same

being that is so insistent on returning to nest at its birthing beach, even when it proves perilous, is also able to collectively revise that instinct and switch to new times of the year and new locations, when the timeframe is sufficient to accommodate the gradual pace of such evolutionary change.

Ironically, the turtles' instinct to return to their exact birth place makes them less able to accommodate durational change, such as the comings and goings of entire rookeries. The antiquity of their tenure on earth self-evidently attests to their ability to shift *en masse* to different islands, though their instinctive return to birth sites also attests to their propensity to nest in sites that have since become perilous. A rookery that disappears within a century may not provide enough time for turtles to shift *en masse* to a new breeding ground. But disappearance over a millennium may suffice. As always, adaptation is a matter of time. The same algebra of comedy = tragedy + time can be applied: evolution = adaptation + time.

Same for a food source disappearing, or ocean temperature substantially changing. Yet seismic and catastrophic change of the stochastic and non-linear variety is nothing but normal. A 2018 hurricane eviscerated an entire Hawaiian island that was a sea turtle refugia – even if we set aside the inarguably just, but at this point ineffective game of poring through fragments to determine the extent of human-induced amplification of that hurricane, shift happens just as shit happens.

And yet the timeframe for playing Now-or-Never dice games bears next to no relation to either saltation moments of evolutionary exuberance – such as when turtles adapted to prior rapid biophysical change – or atmospheric turbulence which could eviscerate Raine in a single hurricane season. The game can in fact be squarely placed in the timeframe between the rise of nineteenth century colonial and industrial activity and today. The seismic local impacts of the 1842 beacon construction and 1890s mining took 120 years to ensue. They offer scaled down proxies for the cataclysmic planetary impacts stemming from the 1970 to 1971 catalyst for a *New World Coming*, extrapolated an equivalent distance in the future, say 2090, 120 years after 1970.

While those details are lost to a future of ever greater fragmentation, the song foretells only greater planetary volatility and bodily vulnerability for respective abiotic and biotic bodies in the maelstrom. Any doubt about the human role inherited from the nineteenth century legacy was shredded decades ago, and now there is no doubt about the anthropogenic legacy that foreshadows the future. The mystery was solved, the murderers cannot be absolved. It was all fun and games until some lost an island.

For Raine, the fun and games will come home to roost much later than any of its neighbours. Once climate change drowns all the surrounding islands, Hopley predicts that “Raine Island is likely to be the last cay to disappear in the northern

Great Barrier Reef.”³⁶³ This depends upon the unique phosphate cap continuing to provide a bulwark against erosive ocean currents, and coral continuing to replenish aggregating sediment. Which in turn means that Raine is ultimately dependent on the ongoing living and dying of coral.

An end to living coral means an end to replenishing the dead coral which provide aggregating sediment piled into the raised area that makes Raine's sea-shore. Which in turn means that Raine's story begins and ends with a rock, albeit a living rock of abiotic progeny: coral corpses. Which in turns means that the next dice roll turns to coral, journeying into the earth as a kind of living rock itself.

But Raine's other story – the human one – begins and ends with another, different kind of rock: the beacon. That piled high aggregate of mined phosphate cap now stands at a maximum seven metres above sea level. One day, when the rest of Raine has gone under, a beacon poking up out of a flooded sea is all that will be exposed, its sociopathic means of creation thus obscured, and so of the myths by which the civilisation of its day lived and died.

363 Hopley, *Raine Island*, 48.



Fig. 15: Green turtle (*Chelonia mydas*), Raine Island, Australia, 12 August 2014. Photograph by Neil Mattocks.

VIII

Laughing All the Way to the Cryobank

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

In a nutshell:

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 nutshell, 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 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 sunscreen 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-smearing 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 deplures. 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 UNFCCC 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 Bio-rock? 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 Mod-Con 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’ sunscreen. 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 unobtrusive 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/_oldgcr/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 nutshell: 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.

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 planci*, 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.

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 evolvment 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).

IX

How to Fall in Lava with Volcanoes

"I'll laugh until my head comes off."

In a nutshell:

Thinking Like a Mountain v Thinking Like a Volcano >

Acting Like a Volcano v Doing Like a Volcano >

The Synthetic Age v The Age of Loneliness >

The Subterranean Sigh >

The Return of Frankenstein's Monster >

Why Did the Chicken Cross the Road?

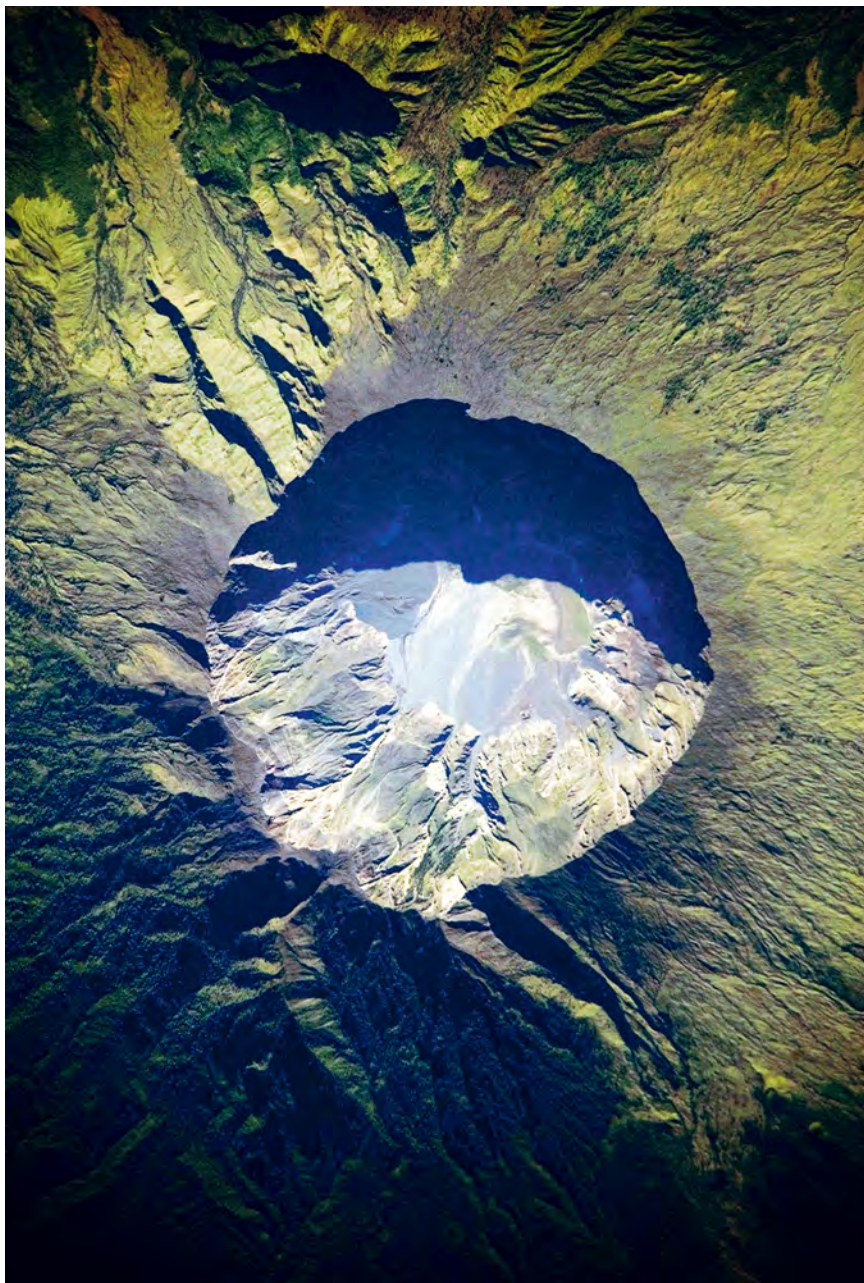


Fig. 18: Mount Tambora Volcano, Sumbawa Island, Indonesia, from the International Space Station, 350 kilometres above Earth, 3 June 2009.

Thinking like a Volcano

A deep chesty bawl echoes from rimrock to rimrock, rolls down the mountain, and fades into the far blackness of the night. It is an outburst of wild defiant sorrow, and of contempt for all the adversities of the world. Every living thing (and perhaps many a dead one as well) pays heed to that call. To the deer it is a reminder of the way of all flesh, to the pine a forecast of midnight scuffles and of blood upon the snow, to the coyote a promise of gleanings to come, to the cowman a threat of red ink at the bank, to the hunter a challenge of fang against bullet. Yet behind these obvious and immediate hopes and fears there lies a deeper meaning, known only to the mountain itself.

– Aldo Leopold, “Thinking Like a Mountain” (1949)⁴⁰³

Epochal consciousness is not a position to which everybody naturally gravitates; one occupies it by following a certain path of thinking.

– Dipesh Chakrabarty, “The Human Condition in the Anthropocene” (2015)⁴⁰⁴

Death makes for a mean leap into a zoocentric deep time worldview. For Aldo Leopold the leap came about by “thinking like a mountain.” Rather than making the leap by watching an upturned turtle’s eyes, Leopold reflected upon the “fierce green fire dying” in the eyes of a wolf he had mortally wounded. Through his act of murder, and reflection upon the act, Leopold fell into the “outburst of wild defiant sorrow,”⁴⁰⁵ an outburst synonymous with the dour demeanour’s heartfelt riposte to the demeanour of those who throw the dice.

The falling is one of freefall down into a portal to another temporal dimension – one known perhaps, in some way, by wolves, through their influence over the ages on the geomorphology of their mountain abodes. Leopold’s epiphany was to peer down into the future, seeing that culled wolves means booming deer populations, which erode mountain vegetation, leading to denuded shrubs and trees, through to mountain topsoil dispersed into the winds. In a nutshell: “only the mountain has lived long enough to listen objectively to the howl of a wolf.”⁴⁰⁶

Picture the life cycle of entire mountain chains that have appeared, right through to their disappearance; from every accumulating grain, their sedimentation into rock, compiled upon rock-cum-rockface; their uplift through the endless cycling of plate tectonics, their metamorphosis from abiotic and biotic forces becoming conjoined: from glaciers carving a mountain in two, to ice cracking a rock

403 Aldo Leopold, “Thinking Like a Mountain,” in *A Sand County Almanac and Sketches Here and There* (Oxford: Oxford University Press, 1949), 130.

404 Chakrabarty, “The Human Condition in the Anthropocene,” 143.

405 Leopold, “Thinking Like a Mountain,” 136.

406 Leopold, “Thinking Like a Mountain,” 132.

into two, to microbial life living in soil, through to plant roots holding rocks together that would otherwise fall off the face of a mountain side.

Instead, the price of not learning to “think like a mountain” is that “we have dustbowls, and rivers washing the future into the sea.”⁴⁰⁷ Thus the intentional culling of wolves, or our unintentional flipping of the turtle, cry out for fidelity to life’s inextricable entanglements with realms of space and time that far precede everything currently living, and far exceed its death. Leopold’s epiphany heeds the call of Chakrabarty’s “epochal consciousness” and its explosion of the spatial and temporal dimensions that our act of turtle flipping has opened up. And closed down.

To abide by that newfound fidelity is to hum along to the universal sigh, admitting changeability, consequences, and the comprehension of same, into the kernel of the walnutshell. It is to get reacquainted with the ghosts in one’s shell, falling out of a tree with Lucy, or watching the Panama Isthmus slowly close and Raine Island slowly rise out of the ocean through the eyes of thousands of generations of mammals with whom we ultimately share a common ancestor. It is to stare into the eyes of the dying wolf, see there the genesis and erosion of mountains, and finally acquiesce entirely to the vicissitudes of the cosmos.

Once upon a time, which lasts the entire history of earth up until this particular rupture was unleashed, epochal consciousness could bask, awestruck, in the sheer majesty of Darwin’s “endless forms most beautiful”⁴⁰⁸ that is life. Nowadays, all such portals are fractured by the abhorrent shock of the human violence that first enacted this epiphany, then fell at the feet of the infinite regression of consequences revealed as the threads unravelled. In a walnutshell: epochal consciousness folds the “fierce urgency of now”⁴⁰⁹ into deep time, enclosing the generations of human who had no knowledge of what they were doing with those who knew full well what they were doing, down to those who now understand we could not comprehend the full scale of the consequences of our actions even if we had all the time in the world. Those alive today have collectively acquired geological agency through the slow violence enacted by colonialism and capitalism on the poor and the biosphere alike. Social and biophysical limits to life come head to head, tail to tail.

Such is life, when one happens to be living during a rupture of life on earth. When epochal consciousness no longer cuts the mustard gas. When it is no longer enough to “think like a mountain.” When one is “currently going through that

407 Leopold, “Thinking Like a Mountain,” 135.

408 Darwin, *On the Origin of Species*, 459.

409 King, “I Have a Dream.”

kind of a period”⁴¹⁰ where the period referred to is the Sixth Mass Extinction Event on earth. A psyche attuned to imperceptible deep time unfurling, like the time taken to forge, transform, sculpt, and eventually erode a mountain, is a psyche ill-tuned to the present tense.

Writing a half century after Leopold, Chakrabarty’s leap into a zoecentric deep time worldview came from folding social limits into biophysical limits to life. Namely, Leopold’s 1949 wolf murder expresses what Chakrabarty means when he says “humans are biological agents, both collectively and as individuals. They have always been so.” This is the once upon a time . . . up until the Anthropocene. By the time these words had been penned in 2009, we had ceased being mere biological agents, and had instead “become geological agents,” having “reached numbers and invented technologies that are on a scale large enough to have an impact on the planet itself.”⁴¹¹

Leopold’s “thinking like a mountain” is ill-tuned to this event, wherein our species went from being biological agents to geological agents within the space of a human lifetime. This transition from one form of agency to the other does not so much stretch the comprehension limits of the [rockmelon – née walnut – sized] brain, as demand a complete renewal of perspective. It throws our experience of the present tense into perspective, where the length of a day or the intrinsic volatility of earth and life itself become measured at the scale of the cosmos, and not at the scale of the being sizing up its measurement of all things great and small. But if desperate times do call for desperate measures, then measured against its only true correlate – the cosmos – a mountain does not make for a portal into either the desperation of the times, or the desperation of current proposals to counteract them.

Given the gravitas of the particular period we are now going through, thinking like a mountain appears too gradual, too gentle, and too soothing a solace of cosmic nihilism. Living, as it were, during a rupture of life on earth, sings out instead for a worldview commensurate with the ‘period.’ This does not mean a worldview premised on the tangible geological agency now being wantonly banded about the planet. True, we are no longer in the business of marvelling at the unspeakable grandeur and cosmic verisimilitude of beholding a mountain. Nowadays we are in the business of blowing their tops off, to suck out the marrow of minerals and fossil fuels that compose a mountain interior. But this does not mean we can update Leopold’s adage to our period by renaming it ‘thinking like a mountain top removal.’

410 Chakrabarty, “The Climate of History,” 207.

411 Chakrabarty, “The Climate of History,” 207.

A worldview commensurate with living *during* a rupture of life on earth might, however, be achieved by thinking like a very specific form of mountain, one which passes from appearance to disappearance not with a “whimper, but with a bang.”⁴¹² By thinking, in short, like a volcano:

This is a planet on which a shell of solidified rock – a slender firewall – is all that separates us and fellow creatures from a world of unbearable heat, pressure and motion. At the same time, our existence and the continuity of this crustal dwelling place is utterly dependent on its periodic puncturing, its replenishing by the matter-energy beneath. To even begin to comprehend this relationship, we must huddle around the hot spots, the fracture zones, the fiery portals between surface and underworld. Small wonder then that volcanology . . . is one of the deadliest fields of intellectual inquiry: a subdiscipline premised on stealing up on life-extinguishing forces.⁴¹³

To gain a faithful view of our world is to huddle over “the fiery portals,” with their ever-imminent latent cataclysms, in full awareness of our own fragility. Learning to think like a volcano is learning to embrace, rather than brace, for impact. Because, for all their cataclysmic consequences, Clark reminds us that volcanoes’ puncturing of earth also replenishes “our existence.” This ‘our’ is not anthropocentric because the hour at hand is not anthropocentric. This rupture, and indeed ruptures in general, are not about replenishing the existence of a single species. As The Flaming Lips sing it: “We’re not going to make it/You and I were never meant to be part of the future . . .”⁴¹⁴

Neither is the ‘our’ biocentric. Chicxulub has been unfairly judged within the moral arc of the universe, bending, as it does, neither to justice, nor to rhyme, nor to reason. Recently it has been revealed that the asteroid was probably not the single fell swoop from the heavens that it was always thought to be. Rather, it was the straw that broke the camel’s back, the “cataclysm upstream” which cleared the planet for mammalian ascent, progressively speciating the order of mammals (from which: camels).

This is however a straw at the scale of the universe: the bolide impact, in and of itself, constituted a planetary-scale rupture. Its shockwaves repeatedly encircled the earth as their force permeated through all oceans and all landmass. At the time of the collision a colossal hotspot lay precisely opposite, on earth’s yonder side, and the area that is now the Deccan Traps in India lay above this hotspot. One theory contends that, having travelled the planet’s circumference, all these shockwaves transferred the concentrated bulk of their force onto this

412 T.S. Eliot, *The Hollow Men* (London: Faber & Faber, 1925), 128.

413 Nigel Clark, “Bare Life on Molten Rock,” *SubStance* 47, no. 2 (2018): 14.

414 The Flaming Lips, “All We Have Is Now.”

region, rupturing the earth above the hotspot.⁴¹⁵ The massive and enduring volcanic eruptions this unleashed thus became the straw that catalysed one of the most intensive known periods of planetary-scale transformations of all earthly -spheres: atmosphere, lithosphere, and, consequently, biosphere.

What remains of those hundreds of millennia of eruptions is nowadays the Deccan Traps: solidified flood basalt two kilometres thick, stretched across half a million square kilometres. Through “its replenishing by the matter-energy beneath,” the hotspot under the traps may have elevated Chicxulub’s rupture into the end of The Age of Dinosaurs. The hotspot’s ability to be woken by intergalactic forces contains the overwhelming wellspring of one such period: a period that can be counted on “the same scale as that released at other times when there has been a mass extinction of species.” Such is the “period” we are “currently going through.”⁴¹⁶

By this time, it has become redundant to recall that the details have been lost to time. It is self-evident that only fragments remain. Though it is clear that Chicxulub was a case of the Court Jester going about his merry ways, rather the Red Queen, the jury is still out on just how much Chicxulub was in cahoots with the Deccan hotspot. Mark Richards, one of the leading proponents of the theory that the asteroid set off the volcanic eruptions, appeals to reason, rather than rhyme: “If you try to explain why the largest impact we know of in the last 100,000,000 years happened within 100,000 years of these massive lava flows at Deccan . . . the chances of that occurring at random are minuscule.”⁴¹⁷

Hence, volcanic “replenishing” of “our existence” is zoocentric, not biocentric. Where “life-extinguishing forces” also come to constitute life-creating forces. Which is why volcanoes make for the pre-eminent straw to break the back of the present tense. In “Volatile Worlds, Vulnerable Bodies: Confronting Abrupt Climate Change,” the same article that has provided the premise of this song, Nigel Clark considers who else, or rather what else, is casting dice at the table where we so recently took a seat:

A tiny nudge may be all it takes to unleash a set of cascading, self-reinforcing changes in the climate system. Conversely, a major impetus to change might lie dormant in the system for centuries or millennia before its impact is manifest . . . global climate might already be ‘naturally’ close to a tipping point, thus dramatically amplifying the significance of human

⁴¹⁵ Mark Richards et al., “Triggering of the largest Deccan Eruptions by the Chicxulub Impact,” *GSA Bulletin* 127, nos. 11-12 (2015): 1507–1520.

⁴¹⁶ Chakrabarty, “The Climate of History,” 207.

⁴¹⁷ Mark Richards, quoted in Robert Sanders, “Did Dinosaur-Killing Asteroid Trigger Largest Lava Flows on Earth?,” *Berkeley News*, 29 May 2015, accessed 8 January 2018, <https://news.berkeley.edu/2015/04/30/did-dinosaur-killing-asteroid-trigger-largest-lava-flows-on-earth/>.

forcing, while there is also the possibility that human impacts have taken climate systems closer to a threshold, for which the final push could turn out to be an unforeseeable non-human forcing – such as a large-scale volcanic eruption.⁴¹⁸

Clark's thinking like a volcano embraces the dour worldview that makes up the refrain of this song. It is incontrovertible that humanity is responsible for enraging the climate system, which looks set to “unleash a set of cascading, self-reinforcing changes.” But humans were able to do this precisely because the system was always already prone to fits of rage. The three blind mice enraged the farmer's wife because she was already of volatile temperament, just as the three bishops were able to elicit such violent comeuppance from Queen Mary, because she was already in the habit of violently suppressing competing claims to faith and authority.

So, “a large-scale volcanic eruption” may become the actual straw to break the camel's back. Or, historical industrial activity may have already sufficed to induce a new climate regime. Or, historical industrial activity may have catalysed a series of events linked by breadcrumb trails, showing how those who created the trail also created the conditions of their own extinction. Nineteenth-century Raine Island phosphate mining is to twenty-first-century turtles falling over the island's cliff edge as the melting icecaps are to the isostatic rebound of continental crust millennia upon millennia from now.

Beyond the more obvious effect of raising sea levels, melting icecaps also give renewed buoyancy to some continental plates. Beyond this less obvious effect of the isostatic rebound, melting icecaps make it easier for magma to rupture earth's surface.⁴¹⁹ In a nutshell, the proverbial “large-scale volcanic eruption” can be traced back to human forcing. Yet the details of those fragments will be lost to a time long succeeding our petrification. In the meantime, we are still blind to whether or not we have already been blinded. As we always were. As we could only ever have been.

In this Bataille-esque worldview, life is a phenomenon always at the behest of forces of radical asymmetry and radical contingency operating at the scale of the cosmos. And now, life is even more at the behest of these same forces, having been thrown into discombobulation by human-forcing that may (or may not) amount to the straw that broke the camel's back, or may (or may not) have

⁴¹⁸ Clark, “Volatile Worlds, Vulnerable Bodies,” 42.

⁴¹⁹ Summer Praetorius et al., “Interaction Between Climate, Volcanism, and Isostatic Rebound in Southeast Alaska During the Last Deglaciation,” *Earth and Planetary Science Letters* 452 (2016): 79–89.

already amounted to the final straw. To add contusion to the blunt force trauma: it turns out the camel's back was already broken, because it more or less exists in a permanent state of breaking.

In this perspective, it does not matter that we/WE* who did the flipping are but a tiny fraction of life-writ-large. Our culpability is certain, but irrelevant at this scale, especially since there is no possibility of atonement or repair. Thus, in the face of our empty gestures only humility remains, and with it, dour recognition of the incomparable pain and suffering the rupture will exponentially unleash not only in the coming decades, centuries, or millennia, but over unfathomable epochs to come.

In this vein, to think like a volcano is to embrace a zoocentric worldview. Hark the *New World Coming* with its New New Animals, which, on the balance of probabilities, will be dominated by forms of life that are utterly more tolerant to incomparably rapid biophysical change. Alas, that is not a new world conducive to the likes of animals or plants as they have lived thus far in their respective kingdoms. Which means the Stegosaurus does not lament that “the mammals are taking over.” Rather, our present tense lament is that ‘the microbes are taking over,’ once the lion's share of existing animals and plants have become petrified.

If this is the cause of our desperation, then we do not have to look far to find the measure of it. Timely and appropriate as it may be to *think* like a volcano in our present tense, our desperation can be measured by the fact that ModCon now wants to *act* like a volcano, without learning how to *think* like one first. This is a course of action that embraces a hubristic Fuller-esque worldview, of scaling *Dome over Manhattan* up to the entire planet via intervention in the form of climate engineering. In this measure of desperation, acting like a volcano refutes the zoocentric and the biocentric, convulsing instead with the self-importance of human exceptionalism, and its demonic progeny of an anthropocentric worldview.

Whereas the price of not having learned to “think like a mountain” was “dustbowls, and rivers washing the future into the sea,” the price of not learning to think like a volcano is a dustbowl earth, and the sea evaporating into outer space via runaway climate change. To forestall such eventualities, ModCon now proposes one-shot and mostly completely blind casts of the dice designed to forestall the rupture's “cascading, self-reinforcing changes in the climate system.”

Snorted Forth Fire-Streams

If ever a breath came to me of creative breath and of that heavenly necessity that forces even accidents to dance astral rounds . . . If ever I rolled dice with gods at the gods' table of the earth, so that the earth quaked and ruptured and snorted up rivers of fire – because the earth is a gods' table, and it trembles with creative new words and gods' throws.

– Friedrich Nietzsche, *Thus Spoke Zarathustra* (1884)⁴²⁰

Above all, to work with and through volcanism or other geologic process, we stress, is to engage with an excess of possibility. To think in terms of becoming with volcanic and magmatic processes is to recognize that 'we' and other organisms have actualized only a fraction of the potentiality that inheres in the geologic domain. Which is also to imagine that, however much damage our species has done to the Earth – or the Earth to us – there remain a great many biogeophysical avenues as yet unexplored or incompletely realized.

– Nigel Clark, Alexandra Gormally, and Hugh Tuffen, "Speculative Volcanology: Time, Becoming, and Violence in Encounters with Magma" (2018)⁴²¹

A year after *Dr. Strangelove* satirised a fictional US President presiding over the Cold War MAD mentality, the actual President, Lyndon Johnson, was presented with a scenario that revelled in the MAD absurdity of the real world. On 5 November 1965, the President's Science Advisory Committee (PSAC) presented their report on *Restoring the Quality of Our Environment*. Having been directed by Johnson to investigate human-induced global warming, they reported that

only about one two-thousandth of the atmosphere and one ten-thousandth of the ocean are carbon dioxide. Yet to living creatures, these small fractions are of vital importance . . . Within a few short centuries, we are returning to the air a significant part of the carbon that was slowly extracted by plants and buried in the sediments during half a billion years.⁴²²

Framing "worldwide industrial civilisation" as "unwittingly conducting a vast geophysical experiment," the report's authors calculated that the complete melting of the Antarctic ice cap by human-induced global warming would raise sea levels 130 metres.⁴²³ Stating the obvious, they restricted their frame to members of the same industrial civilisation that had catalysed the crisis to begin with: "the climatic changes that may be produced by the increased carbon dioxide content

⁴²⁰ Nietzsche, *Thus Spoke Zarathustra*, 185.

⁴²¹ Clark, Gormally, and Tuffen, "Speculative Volcanology," 289.

⁴²² Roger Revelle et al., *Restoring the Quality of Our Environment: Report* (Washington DC: The President's Science Advisory Committee: Environmental Pollution Panel, 1965), 112.

⁴²³ Revelle et al., *Restoring the Quality of Our Environment*, 123.

could be deleterious from the point of view of human beings.”⁴²⁴ Thus far unremittingly anthropocentric, echoing the public disclosure of same in the 1958 *Meteora* television documentary.

The PSAC report’s private persona and *Meteora*’s public persona also both echoed US attitudes toward responding to human-induced climate change. These are also unremittingly anthropocentric, and based on human agency and human hubris, rather than any kind of cessation of deleterious activities or humility to the forces at play. The report rhetorically asks whether “the possibilities of deliberately bringing about countervailing climatic changes therefore need to be thoroughly explored.”⁴²⁵ By “countervailing” they endorse a Fuller-esque ‘do to undo’ mentality: climate change should be actively tackled by asserting equal but opposite force, rather than reducing or minimising human forcing of “climatic changes.”⁴²⁶ Human interventions to ‘restore’ *our* existence and *our* environment stand in stark contrast to Clark’s vision of the biosphere replenishing itself through volcanic ruptures and eruptions.

Both the PSAC report and *Meteora* already demonstrated that “countervailing” dice was a long-enjoyed US mentality. In *Meteora*, Baxter boasts to Carlson that “the next few years will see more progress in weather control, weather prediction, and in the use of weather, than has been made since man first raised his eyes to the sky.” Such feats included “learn[ing] how to steer” hurricanes, through the use of “oil fires on the ocean, oil slicks, cloud seeding. The possibilities are endless . . .”⁴²⁷

From little things, big things grow. From little things, big things grow. From such proposals to control weather came forth planetary scale climatic interventions. Carlson boasts back: “And from these future weather wizards will come the answers to such questions as . . . what would happen if we could change the course of the gulf stream? Or the other great ocean currents. Or warm up Hudson Bay with atomic furnaces?”⁴²⁸

The “weather wizards” did not have to wait long to be anointed as the magicians behind the MAD myths that propel civilisation. By 1962 they had already conjured up “On the Possibilities of Climate Control” when Harry Wexler, Chief of the US Weather Bureau’s Scientific Services, put forth the first proposal that constitutes climate engineering.⁴²⁹ Although Wexler was building upon a much

424 Revelle et al., *Restoring the Quality of Our Environment*, 127.

425 Revelle et al., *Restoring the Quality of Our Environment*, 127.

426 Revelle et al., *Restoring the Quality of Our Environment*, 127.

427 Capra, *Meteora*.

428 Capra, *Meteora*.

429 Harry Wexler, “On the Possibilities of Climate Control,” in James Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010), 224.

longer US history of proposed weather control going back a century before *Meteora*, to 1841, when James Espy, the first US Government meteorologist, proposed a systematic network of fires to form ‘artificial volcanoes’ in his *The Philosophy of Storms*.

Yet Espy’s proposal did not quantitatively or qualitatively constitute climate engineering because it aimed to ephemerally control regional weather, through the network of “great fires”⁴³⁰ that would, in theory, catalyse rainfall. And the relatively regional and short duration of weather control interventions are chalk to the cheese of the planetary scale and deep time effects of climate engineering. Suffice to say that delusions of grandeur in *The Philosophy of Storms*, *Meteora*, *On the Possibilities of Climate Control*, or *Restoring the Quality of Our Environment* were largely just utopian in the 1950s and 1960s, like Fuller’s *Dome Over Manhattan*.

Over the 1970s and 1980s however, acting like a volcano became quantifiable and demonstrable, by satellite measurements of volcanic eruptions of sulphur dioxide, beginning with the 1982 El Chicho eruption. Ironically, the first modelling of cooling effects from an eruption was conducted aboard Nimbus 7, the satellite that first began to measure solar irradiance in 1978. The same device pinpointing the transition between earth’s net negative to net positive energy balance, and thus the transition between Cass’ and Simone’s *New World Coming*, also pinpointed the efficacy of mimicking volcanoes to stall that new world from appearing around the bend.

Later in the same year that El Chicho’s eruption provided the litmus test for mimicking volcanoes, Anglophone audiences discovered that their cultural imaginary was in fact shared by another booming industrial economy, via the Japanese cartoon *Astro Boy*. In *The Great Meltdown* episode, Astro Boy’s arch nemesis Atlas deliberately melts the Arctic ice cap, showing up the tenuous fragility of industrial civilisation:

Fortunately our city [Tokyo] has not yet been harmed by the rising waters but half of New York has been severely flooded. Almost all the icebergs of the North Pole, with the exception of the glaciers of Greenland, have melted completely. Tidal waves and extreme weather conditions are now pelting cities all over the globe and within days, much of the earth’s land may be underwater.⁴³¹

⁴³⁰ James Pollard Espy, *The Philosophy of Storms* (New York: C.C. Little and J. Brown, 1841), 496.

⁴³¹ Osamu Tezuka, director, *Astro Boy*, episode 29, “The Great Meltdown,” aired Nippon TV, 12 November 1982.

To remedy the rupture being unleashed, the Japanese government summons Astro Boy for a mission to refreeze the melted icecaps by delivering a “freezing proton bomb”⁴³² upon the Arctic. The bomb equates to the same “countervailing” forces advocated by *Restoring the Quality of Our Environment*: both born of an “epochal consciousness” that recognises industrial civilisation was already unleashing a *New World Coming*, but believing demons can be coaxed back into containment. Like his real-life US counterparts, the cartoon scientist Dr Elefun offers a rationale for such a weapon:

We’ve been working on it because air pollution has been gradually raising the temperature of the atmosphere. Eventually this would cause the polar ice caps to melt, just enough to cause disastrous flooding in both hemispheres.⁴³³

The Great Meltdown collapses a deep time scale, equivalent to the unfathomable millions of years taken to suture together the Isthmus of Panama, into the duration of a human life. This ‘eventually’ is like witnessing the isthmus close over a handful of decades. Similarly, the episode scales down the long emergency that is the twenty-first-and-last century into a cartoon plot convention. Dr Elefun cautions Astro Boy that

we hadn’t planned to use it [the freezing proton bomb] this soon but this is an emergency . . . we know its powerful but its only in the experimental stage. It may cause undesirable results. But we have to take a chance.⁴³⁴

Likewise, the Dice decries that “we have to take a chance” to slow the quickening global heating through climate engineering. In the cartoon version of *Astro Boy*, all hell breaks loose but all’s well that ends well. In the film version of *Dr. Strangelove*, all breaks loose but all’s well to end all. In the real-world version of the present tense, it remains to be seen which kind of all hell breaks loose in any eventuality.

In the decades following El Chico’s eruption and Astro Boy’s heroics, proposals for new forms of climate engineering have increasingly taken shape alongside the growing awareness that “worldwide industrial civilisation”⁴³⁵ amounts to Atlas melting the ice caps. In July 1988, while James Hansen was testifying to the US Congress about human-induced climate change already being in effect, oceanographer John Martin infamously proclaimed to the Woods Hole Oceanographic Institution: “give me a half tanker of iron, and I will give you an ice age.”

432 Tezuka, *Astro Boy*.

433 Tezuka, *Astro Boy*.

434 Tezuka, *Astro Boy*.

435 Revelle et al., *Restoring the Quality of Our Environment*, 123.

This was based on his modelling that “with 300,000 tons of iron, the Southern Ocean phytoplankton could bloom and remove two billion tons of carbon dioxide.”⁴³⁶ Martin recalls first ushering his proposal “more or less facetiously” by “putting on my best *Dr. Strangelove* accent.”⁴³⁷ The punchline of his joke remains to be seen.

The following year, US engineer James Early put forth the first off-world climate engineering proposal, to deflect incoming solar radiation from outer space. His “Space-based Solar Shield to Offset Greenhouse Effect,” published in the *Journal of the British Interplanetary Society*⁴³⁸ effectively scaled up Fuller’s *Dome Over Manhattan* to a 2,000-kilometre-wide glass shield stationed at Lagrange Point One. At this scale, the biosphere would not only be hitched to the vicissitudes of our local region of the solar system, as it always has been, but to human intention too. The same cosmic vicissitudes apply to covering Raine Island or coral reefs in shade cloth. The universe is here, there, and everywhere, connected across and between scales of inextricable entanglements.

Just as Hurricane Sandy would have obliterated Fuller’s *Dome*, J002E3 would have shattered this glass ceiling when it returned via this Lagrange Point in 2002, had the solar shield ever actually been built. And in the exceedingly unlikely event any such structure will ever be built, mounted, and parked there, it is already written into the stars that J002E3 will become gravitationally lured in toward it when it next passes this Lagrange Point in 2041.

The Endless Summer Without a Year

Anybody not wearing two million sunblock is gonna have a real bad day, get it?! You think you’re safe and alive? You’re already dead! Everybody! Him, you, you’re dead already! This whole place! Everything you see is gone! You’re the one living in a fucking dream!

– Sarah Connor in *Terminator 2: Judgement Day* (1991)⁴³⁹

Merrily merrily merrily merrily life is but a dream.

– Eliphalet Oram Lyte, “Row, Row, Row Your Boat” (1881)⁴⁴⁰

436 John Martin, “Woods Hole Oceanographic Institution Journal Club lecture,” transcript of speech delivered at Woods Hole Oceanographic Institution, Massachusetts, US, July 1988, accessed 18 February 2021, <https://earthobservatory.nasa.gov/features/Martin>.

437 Martin, “Woods Hole Oceanographic Institution Journal Club lecture.”

438 James Early, “Space-based Solar Shield to Offset Greenhouse Effect,” *Journal of the British Interplanetary Society* 42 (1989): 567–569.

439 James Cameron, director, *Terminator 2: Judgement Day* (TriStar Pictures, 1991), 35 mm.

440 Lyte, “Row, Row, Row Your Boat.”

While many climate engineering proposals are as fantastical as Early's space mirrors, and many others have already been deemed as ineffectual as Martin's oceanic iron filings, one proposal remains too down to earth to be discounted outright as either fantasy or delusion. Stratospheric Sulphur Particle Injection (SSPI) proposes to mediate in earth's energy imbalance by continuously injecting sulphur particles into the stratosphere. Like Espy's system of 'artificial volcanoes', this entails mimicking volcanoes, but here by reflecting incoming solar radiation back into outer space in order to slow global heating. It is otherwise incomparable to Espy's 'artificial volcanoes', whose effects would be relatively local and ephemeral, whereas SSPI would have a wholesale effect on the Earth System's biogeochemical functioning.

SSPI received an air of legitimacy when Paul Crutzen declared his provisional support for researching the efficacy of such an intervention in his 2006 article on "Albedo Enhancement by Stratospheric Sulphur Injections: A Contribution to Resolve a Policy Dilemma?"⁴⁴¹ Posed with the poignant use of a question mark to end the title, Crutzen's article has reverberated through the work of scientists, especially given his standing as a Nobel laureate for co-discovering the ozone hole, and as the first scientist to propose formally renaming the current epoch to the Anthropocene.

Crutzen's provisional support encapsulates how the feverous measure of desperation is begetting utterly desperate measures. Eli Kintisch explains the dilemma this creates with breathtaking bluntness in *Hack the Planet: Science's Best Hope or Worst Nightmare for Averting Climate Catastrophe*: "to cogently oppose geoengineering research . . . one has to accept one of two faulty propositions: either the problem is not that serious, or we're on our way to solving it. These days, one will be hard pressed to find many takers for either."⁴⁴² Confronted with the present Now-or-Never, or truly pressed between the rock we rolled and the hard place we built, the familiar ethics of conservation and intervention must either become unspeakably warped, or lose their relevance altogether.

The measure of desperation and the ethical impossibility of the present tense is succinctly expressed by environmental philosopher Christopher Preston, in his *Climate Justice and Geoengineering: Ethics and Policy in the Atmospheric Anthropocene*:

⁴⁴¹ Paul Crutzen, "Albedo Enhancement by Stratospheric Sulphur Injections: A Contribution to Resolve a Policy Dilemma?", *Climatic Change* 77 (2006): 211–220.

⁴⁴² Eli Kintisch, *Hack the Planet: Science's Best Hope or Worst Nightmare for Averting Climate Catastrophe* (Washington, D.C: Wiley, 2010), 16.

Many of the best options for dealing with the escalating climate problem are no longer on the table. The options that remain are increasingly far from ideal. What might have been a slow and orderly transition to a low-carbon economy will now have to be a rapid and lurching one. What might have been a timely and balanced research and development path away from fossil fuels and towards clean technologies will now have to be an almost impossibly quick one. Where climate engineering once looked outlandish or even repulsive, it is now becoming increasingly credible to growing numbers of observers.⁴⁴³

Having waited so long that “many of the best options” for dealing with the crisis are no longer “on the table,” the remaining choices are between multiple evils, both active and passive. That time has passed (into the past). That boat has sailed (into the storm). This bird has flown (into the jet propeller). SSPI is truly shoot first, ask questions later: this one-shot cast of the dice seeks to co-opt volcanic forces, now that no more appealing or ideal choices remain.

Of the “increasingly far from ideal” options that do remain, SSPI is also too down to earth because of how close to home it is. Namely, as inhuman geographer Kathryn Yusoff points out, the “logic” of a superficial similarity between unintentional anthropogenic climate change and intentional climate engineering is “used to defend geoengineering to its critics” on the basis that

there is little distinction between inadvertent geoengineering (anthropogenic climate change) and overt climate engineering, just one of intent . . . The shift is from the generation of predictive climate scenarios to predictive interventions in climate actualities.⁴⁴⁴

For instance, the dust jacket of legal theorist Jeremiah Purdy’s 2015 book on *After Nature: A Politics for the Anthropocene* states that “climate change is engineering without design.”⁴⁴⁵ Yet nowhere in the book does he mention climate engineering or even design, making such claims toward a politics for the Anthropocene null and void. Climate change can only be reduced to “engineering without design” if earth can be reduced to Fuller’s *Spaceship Earth* and his hubristic notion that it “must be comprehended and serviced in total.”⁴⁴⁶ In Purdy’s wilful misreading of climate science, exercising climate engineering agency is situated as a choice to

⁴⁴³ Christopher Preston, “Introduction: Climate Justice and Geoengineering,” in *Climate Justice and Geoengineering: Ethics and Policy in the Atmospheric Anthropocene*, ed. Christopher Preston (New York: Rowman & Littlefield International, 2016), xi.

⁴⁴⁴ Kathryn Yusoff, “The Geoenigne: Geoengineering and the Geopolitics of Planetary Modification,” *Environment and Planning A* 45, no. 12 (2013): 2801.

⁴⁴⁵ Jedediah Purdy, *After Nature: A Politics for the Anthropocene* (Cambridge, MA: Harvard University Press, 2015), dust jacket.

⁴⁴⁶ Fuller, *Operating Manual for Spaceship Earth*, 16.

be made in the future. Yet we have been “unwittingly conducting a vast geophysical experiment” since well before Johnson’s PSAC warned of such, back in 1965.

WE* are the ones who let the times for less desperate measures pass. The time when intervention could have amounted to merely ceasing to do bad deeds. And now amounts to doing new bad deeds: intentional geoengineering to counter the current “inadvertent geoengineering” that constitutes anthropogenic climate change. Meanwhile, instances abound that quantify the extent of our existing ‘inadvertent geoengineering’ in terms of both frequency and severity of detail. The show about nothing must go on: recall the 1°C increase in temperature over the continental US in the 48 hours after the 11 September 2001 attacks, because air traffic was grounded.

After all, modified commercial aeroplanes are one of the proposed means for placing the sulphur particles in the stratosphere. In this proposal, they are modified to leave behind sulphur trails, in addition to their existing contrails that also manifestly modify the current climate. For Yusoff, climate engineering is indefensible because it acts with this degree of intentionality. Similarly, sociologists Maialen Galarraga and Bronislaw Szerszynski inveigh against the defence that climate engineering merely represents the distinction between unintentional influence and intentional intervention:

The very definition of geoengineering means that it is intentional and planned; the full-scale implementation of Solar Radiation Management would thus result in a climate that was an artefact – a climate that has not just been disturbed by human intervention, but has been intentionally shaped by human intervention.⁴⁴⁷

Endorsements of such interventions in the social sciences go back as far back as a 1998 article published in the *Stanford Environmental Law Journal*, whose author, Jay Michaelson, proclaimed it to be “the first law review article advocating geoengineering as a climate change mitigation strategy.”⁴⁴⁸ Michaelson’s *Geoengineering: A Climate Change Manhattan Project* is indeed such an endorsement, though it never defines what it means by its titular conflation of climate engineering and the Manhattan Project. Nor does it mention the atom bomb, Hiroshima, Nagasaki, violence, war, or indeed what enemy is to be combatted via this herculean undertaking. Naturally, it also fails to point out that any such Manhattan

⁴⁴⁷ Maialen Galarraga and Bronislaw Szerszynski, “Making Climates: Solar Radiation Management and the Ethics of Fabrication,” in *Engineering the Climate: The Ethics of Solar Radiation Management*, ed. Christopher Preston (Lanham, MD: Lexington Books, 2012), 221.

⁴⁴⁸ Jay Michaelson, “Geoengineering and Climate Management: From Marginality to Inevitability,” *Tulsa Law Review* 14 (2010): 21.

Project is premised on a MAD mentality, thus enacting its Mutually Assured Destruction: so goes the biosphere, so goeth civilisation-so called.

Instead, Michaelson argues that “in the post-Kyoto world, we need more than promises of emissions cuts and tradable permits. We need a Climate Change Manhattan Project.”⁴⁴⁹ Avoiding mention of any historical or contemporary disasters posed by nuclear weapons, his proposal riffs on the “famous film subtitle” with the paraphrase that “it is time for environmentalists to learn to stop worrying and love the Big Fix.”⁴⁵⁰ In subsequent years Michaelson’s endorsement has not waned, wherein he concluded a 2010 article with the heading “How I Learned to Keep Worrying and Still Love Climate Management,” arguing that “if human management of the global climate scares us, good – it should scare us. But it should not scare us into jokes.”⁴⁵¹ That the butt of the joke is Mutually Assured Destruction is evidently no laughing matter.

With such a worldview gaining increasing currency with tyrants who wield world-changing power, namely, fossil fuel companies and their geopolitical omnipresence, climate engineering has come to be posited as manifest destiny for designing a way through the rupture. However, that portentous throw of the die differs greatly from all other ModCons, as many proponents are not motivated by any more-than-human concern, such as species extinction, but rather by pure self-interest in perpetuating the society and economies that put us into this parody of *Dr. Strangelove’s* parody in the first place.

Swirling in such self-edifying currency, “we are, it seems, gearing up to fight fire with fire” in this manifest destiny rationale, which for Clark

is hardly surprising that claims about humankind becoming a preeminent geomorphic force have been accompanied by proposals to convert our accidental impacts on earth systems into effects that are intentional and compensatory.⁴⁵²

All the more reason to collectively consider the childhood adage about how those who play with fire get burned. First, by accident. Now, with intention.

⁴⁴⁹ Jay Michaelson, “Geoengineering: A Climate Change Manhattan Project,” *Stanford Environmental Law Journal* 17, no. 73 (1998): 81.

⁴⁵⁰ Michaelson, “Geoengineering: A Climate Change Manhattan Project,” 131.

⁴⁵¹ Michaelson, “Geoengineering and Climate Management,” 27.

⁴⁵² Nigel Clark, “Rock, Life, Fire: Speculative Geophysics and the Anthropocene,” *Oxford Literary Review* 34, no. 2 (2012): 259.

The Year Without a Summer

There's a fatal subconscious attraction in resolving the problem of one's own death in the thought of the whole world blowing up together.

– Stanley Kubrick, on *Dr. Strangelove* (1964)⁴⁵³

I like juxtaposing all the silly details with the end of the world. When the Earth is ready to crumble between our fingers, whatever we do in the way of heroic conquests or petty family squabbles doesn't matter.

– Lars von Trier, on *Melancholia* (2011)⁴⁵⁴

Nearing the end of something is as good a time as any to return to the beginning. In this case, the cover song of this book: Mount Tambora, photographed from the International Space Station, 350 kilometres above earth, in 2009. The six-kilometre-wide and one-kilometre deep caldera shows the remains of the day in 1815 when this Indonesian volcano erupted, changing global climate so profoundly over the following years that 1816 was referred to in Europe as The Year Without a Summer.

Up to ten million deaths are attributed to the eruption's proximal and distal effects. This includes those killed instantly in the immediate vicinity, as well as those who died from starvation months later and tens of thousands of kilometres away, due to crops ruined by the abrupt climatic changes caused by the eruption. Those killed instantly may have become frozen in motion, caught at the confluence between being and becoming petrified, like the petrified remains of a village of 10,000 inhabitants on the flank of Mount Tambora. Entombed in their last moments, as were the inhabitants at Pompeii and Herculaneum.

Experiencing the aftereffects from Lord Byron's house on Lake Geneva, an 18-year-old Mary Wollstonecraft weathered The Year Without a Summer with an acute sensitivity to something untoward in the air. It was there and then that she conceived *Frankenstein; or, The Modern Prometheus*, inspired by the unnerving winter-during-summer, although nobody at that time knew that the cause lay in a volcanic eruption.

In her prescient insights into the relationship between social and biophysical limits to life lies the key for taking *Frankenstein* as a parable for contemporary proposals to harness volcanism to engineer climates. These proposals bear echoes of Dr Frankenstein's harnessing of mortality to design life. Like the tormented

⁴⁵³ Stanley Kubrick, *The Stanley Kubrick Archives*, 365.

⁴⁵⁴ Lars von Trier, interview with Juul Carlsen, "The Only Redeeming Factor is the World Ending," *Danish Film Institute*, 4 May 2011, accessed 18 February 2021, <http://www.dfi.dk/Service/English/News-and-publications/FILM-Magazine/Artikler-fra-tidsskriftet-FILM/72/The-Only-Redeeming-Factor-is-the-World-Ending.aspx>.

doctor, we are already confronted with the return of monsters set loose well before yesteryear: whether emissions from the 1960s or space-junk like J002E3.

These monsters were, unlike Frankenstein's creation, born of accident, ignorance and incompetence, rather than actual intention. But what happens when we do as Shelley's doctor did, and intentionally create monsters: new monsters, born of intention to ameliorate both themselves and the monsters of old. Monsters which, as the unfolding rupture teaches us, will inevitably return to haunt us.

The monsters confronting us today already take multiple forms, owing to the historical actions that fuelled contemporary civilisation. The foremost form confronting us is a contemporary manifestation of the character Burk Turgeson's all-options-are-on-the-table report, which he brandishes in the *Dr. Strangelove* War Room. The report, entitled in upper case as "WORLD TARGETS IN MEGADEATHS", lists projected figures for US first strike and counter-strike atomic warfare scenarios, drawn from the all-too-real contemporaneous MAD doctrine.

While Tambora, despite its cataclysmic portent, lies comfortably in the realm of cosmic vicissitudes and more-than-human agency, intentional climate engineering is a man-made monster that responds to the rupture with a MAD mentality. It asks in all earnestness which multitudes are most or more likely to perish from SSPI side effects, as if the probability of the once-and-once-only die roll can be foretold. The War Room report now reads WORLD SPECIES IN MEGADEATHS. This is where the "fatal subconscious attraction in resolving the problem of one's own death in the thought of the whole world blowing up together" emerges from screenplay into all-too-stark reality. Here, Kubrick is referring to the cold comfort he satirised in *Dr. Strangelove*, although, WORLD TARGETS cannot map onto the contemporary manifestation of WORLD SPECIES.

What thinking then, and thinking like what volcano, could offer a portent into the present tense? While Tambora has been passive since its last explosion in 1815, the westerly volcano that neighbours Agung and Batur is perpetually active. Kawa Ijen provides a telling stage for an alternate take on Lars von Trier's rationale for *Melancholia*, which he describes as "juxtaposing all the silly details" of individual human lives with the "end of the world."⁴⁵⁵

Ijen's details are by no means 'silly', though they are rendered so, as is all else, by the unfurling end of the world. The volcano is distinct for being an active sulphur mine, which provides the raw mineral that any prospective SSPI would require. Furthermore, Ijen is distinct because its sulphur is artisanally mined, meaning that only hand tools are used, without any mechanised equipment. 'Artisanal' often conjures up romantic images, but here this euphemism conceals

455 von Trier, "The Only Redeeming Factor is the World Ending."

the differentiated anthropos that begat the Anthropocene, whereby WE* became we, through the entrenched inequality and subjugation that fuelled the cataclysm.

Day in day out men trudge up to the summit of the 2,800-metre peak, then descend 300 metres into the caldera, via a narrow, unfenced path with cliff drops either side, to the acidic lake edge, where they prize off exposed sulphur chunks with a crowbar. Piling upwards of 60 kilogrammes in bamboo wicker baskets worn across the shoulders, they carry each load back up to the caldera summit, accumulating them into hand-pulled trollies that are then wheeled three kilometres down the volcano flank to a car park.

Massive plumes of toxic sulphur dioxide continuously funnel out of dozens of vents by the lake edge. Working without any mask, save for a scarf wrapped around the face, long-term health injuries ensue from osmotically breathing in the toxic fumes. Continuously changing wind directions also inundate workers in thick sulphurous vapour clouds, reducing visibility to less than being able to see one's hand in front of one's face. Including while descending and ascending the caldera, with thongs for footwear and no handrails to brace from falling into the precipice.

So goes the deeply divided anthropos folded into the imbroglio. Between those wielding geological agency by making War Room-style decisions to throw the dice in an attempt to lessen the numbers of WORLD SPECIES IN MEGADEATHS, and those who wield only biological, not geological, agency. Those who dictate and those who listen remain as different and chalk and cheese, and yet they are now forced to stand together under the Anthropocene's all-encompassing umbrella. The present tense and its rupture unfolding mean that these social limits to life placed on individuals and groups of individuals are bound up with the species' biophysical limits to life in ways that have never been more closely entwined.

In response, Chakrabarty argues for folding such deep time processes as volcanism into the social limits of life:

For humanists living in such times and contemplating the Anthropocene, questions about histories of volcanoes, mountains, oceans, and plate tectonics – the history of the planet, in short – have become as routine in the life of critical thought as questions about global capital and the necessary inequities of the world that it made.⁴⁵⁶

Yet, while the “questions” have become “routine in the life of critical thought,” this life of critical thought takes place far away from Ijen's crater, and worlds away from the men who work there. Removed from the privilege of space and time and leisure to pontificate, the absence of answers is anything but routine.

456 Chakrabarty, “Anthropocene Time,” 32.

What question does Ijen then pose, both by the “inequities of the world that it made” and the volcanism itself?

In search of a response to that question, I visited Ijen, following on from my journey to Agung, Batur, and Pemuteran, to get too close to home with climate engineering, sulphur mining, and volcanism itself. No reason or rhyme to be made, only that of following the workers down into the caldera to one of William Blake’s “dark satanic mills.”⁴⁵⁷ Only to surmise the sheer scale of activity, of human bodies dwarfed by the enormity of the caldera cathedral, ensnared in earthly volatility in order to fuel a human desire for unearthing that harks back to some of the earliest ghosts in our shells. The wind whips in all directions, sending the thick sulphur plumes morphing into everything from thin cyclone-like spiral shapes, to diffuse clouds that circle around the caldera.

Attempting to ascend back up the caldera face, I am forced to enter into the sheer volatility of the plume’s shapeshifting directions. The sulphur dioxide burning against my eyes and throat, cowering on my hands and knees, blinded and choking on the fumes, unable to move, frantically wondering whether to grope about blind on all fours to search for the plume’s edge, even while unable to see the path’s edge. Or, to lay in wait for the wind to change. I just keep cowering pressed against the cliff face, even though I cannot breathe, because to crawl around blind is to probe the fall a metre or so away from the cliff face path.

The response comes back in a walnutshell: no such fire can be wielded against the fire already lit by civilisation so-called. It is no coincidence that hell-fire and lightning were once thought to be composed of sulphur. Having opted to unearth the infernal material, we now seek to co-opt it to our ends. These ends have, up until now, generally precipitated disasters at the proximal level, from petroleum to gunpowder in the case of sulphur. Now we co-opt it to try and delay our own end. SSPI skirts disaster at a cosmic level, in the original meaning of disaster: fallen stars. Our end extends to our local star, whose solar radiance we seek to diminish. All aboard *Spaceship Earth* – destination: nowhere. In short: the response itself also amounts to an empty gesture.

In long form, so too do all climate engineering “details,” and, by extension, all ModCons. These are the “details” that become “silly” when juxtaposed “with the end of the world.” Their silliness arises not only from their inability to actually forestall the end of the world, but in the conceit they display, of humans attempting to redirect the Earth System trajectory. To play such a game is to play with the dice of N-LSD, blindfolded and dumbfounded at the table of the gods.

457 William Blake, “And Did Those Feet in Ancient Time,” in *Milton: A Poem in Two Books* (London, 1810).

As if the spurious claim that no other options remain is grounds to pursue the game. To fathom such non-sense means descending deeper into what acting like a volcano actually entails. Clark states that ModCon “can only ever be a negotiation between the forces that humans can conceivably impact upon and those that remain – provisionally or permanently – beyond their practical reach.”⁴⁵⁸ Namely, biophysical limits to life always already outmatch any metamorphosis within the social limits to life. He maintains that

even advocates of the most audacious proposals to intervene in the earth’s climate are aware that they are only ‘tweaking’ a vast, massively complex system. They know full well that any nudging of global climate into or away from a threshold is only possible because the alternative regime is one of the possible or virtual states that inhere in the extant earth system. In whatever form it might be imagined or applied, then, geoengineering is not a total remaking of the earth, not the final seal on the ‘end of nature.’⁴⁵⁹

Yet those hell bent on acting like a volcano do so by massively overstating human agency as if it were “a total remaking of the earth.” As if the dilemma about whether to flip the World Turtle back onto its front were in any way akin to flipping individual turtles on Raine Island.

Alongside concerns about nation state(s) unilaterally pursuing climate engineering, say, in desperation against the global lack of greenhouse gas mitigation, there are also legitimate concerns about rogue individuals acting outside of any global governance conventions. The most notorious experiment to date occurred in 2012, when the Oceaneos Marine Research Foundation illegally dumped 100 tons of iron sulphate into the coastal waters off British Columbia. The experiment aimed to sequester carbon dioxide by triggering an algae bloom, which would also boost salmon stocks for local fisheries.

Deemed to be in violation of UN prohibitions against geoengineering experiments, a global backlash ensued from marine and climate scientists as well as environmental governance bodies. Yet the dumped iron sulphate and the backlash both amounted to empty gestures, the former of human ability to coax the demon back into its bottle of containment, and the latter of human ability to placate it with soothing words.

Such meagre prospects for both acting and non-acting highlight how ill-suited notions of ethics are for responding to the rupture. Applying normative human ethics in the midst of a cataclysm recalls the absurdity of the scene preceding *Dr. Strangelove’s* climax, when Major Mandrake desperately attempts to telephone

⁴⁵⁸ Nigel Clark, “Geoengineering and Geologic Politics,” *Environment and Planning A: Economy and Space* 45, no. 12 (2013): 2831.

⁴⁵⁹ Clark, *Geoengineering and Geologic Politics*, 2831.

the US President to provide the code to withdraw the planes from their bombing mission. Colonel Guano thwarts Mandrake, as he suspects him of being an enemy soldier. Short of change to make the phone call, Mandrake begs Guano to shoot a Coca-Cola vending machine in order to get enough coins. In response to Guano's reluctance, Mandrake implores:

Can you possibly imagine what is going to happen to you, your frame, outlook, way of life and everything, when they learn that you have obstructed a telephone call to the President of the United States? Can you imagine? Shoot it off! Shoot! With the gun!

To which Guano finally agrees to shoot the vending machine, with the caveat that if Mandrake is unsuccessful, then “you're going to have to answer to the Coca-Cola Company.”⁴⁶⁰

As an analogy for the present tense, imagine the entire world has been overtaken by a madman who has exploited a MAD mentality to destroy the world. In this context, Guano still upholds normative ethics, claiming that a vending machine cannot be damaged in order to extract the money for the phone call, because “that's private property.”⁴⁶¹ When the entire world has been held hostage by a group of warmongering men, why is individual behaviour not a free-for-all, especially when it may be motivated by attempts to undermine the destruction of the world?

Such are the dilemmas posed between thinking like a volcano, versus acting like one. As with this song, haunted by Tambora by way of *Frankenstein*, volcanoes indeed make for a good cover story even when they appear peripheral to the subject of an inquiry. Beyond their shared subject matter, Nigel Clark's *Inhuman Nature: Social Life on a Dynamic Planet*, Michel Serres' *The Natural Contract*, and Bruno Latour's *An Inquiry into Modes of Existence*⁴⁶² each feature a volcano on their respective book covers. While volcanism is woven through Clark's book, Latour mentions volcanoes only once, whereas Serres does not even mention it explicitly or implicitly.

Only those who know that acting like a volcano is perilous can comprehend the folly of acting like one. Only those who are hell bent on acting like a volcano could choose to not give a damn or toss of the dice about what it means to attempt to think like one.

In the instance of the Oceaneos Marine Research Foundation's ocean iron fertilisation experiment, these dilemmas were expressed not only in the project's

⁴⁶⁰ Kubrick, *Dr. Strangelove*.

⁴⁶¹ Kubrick, *Dr. Strangelove*.

⁴⁶² Bruno Latour, *An Inquiry into Modes of Existence: An Anthropology of the Moderns*, translated by Catherine Porter (Cambridge, MA: Harvard University Press), 2018.

controversy, but so too in its efficacy. Even though the Canadian government effectively shut down its outcomes, and the 100 tons fell well short of the 300,000 that John Marin facetiously claimed “will give you an ice age,” the experiment opened the door for dice rolling as an individual intervention. A door all the more portentous, as Clark cautions, since “geoengineering promises the worst of all worlds.” Because it leaves unchecked the inequities behind Ijen sulphur mining, and by extension, all the root causes for the unfolding rupture. Clark explains why such intervention can only promise “the worst,” due to how

the authorisation of climate modification under the veil of emergency is likely to override democratic procedure and undermine the nascent architectures of collective environmental governance. And catastrophic global change will be visited upon us, regardless.⁴⁶³

For instance, say curtailing the rupture was limited to diffusing excess thermohaline energy. A Manhattan Project is undertaken, removing Panama’s mid-section to allow the Pacific and Atlantic oceans to once again become one. Yet the equivalent forcing wieldable through climate engineering amounts to prying open Panama with the Panama Canal. This is neither thinking like a mountain, nor thinking like a volcano, but rather thinking like ‘mountain top removal.’ Because a trickle does not become a torrent unless it has the means to do so. A torrent needs a lasting, unequivocal chasm. To do so then requires not only removing the landmass, but the means generating and re-generating the landmass itself. Which means putting a lid on the subterranean volcanoes that feed Panama. ENSO on ENSO forth *ad infinitum* . . .

463 Clark, *Geoengineering and Geologic Politics*, 2827.

Throw Down or Throw Up

Everybody knows the dice are loaded,
 Everybody knows that the good guys lost.
 – Leonard Cohen, “Everybody Knows” (1988)⁴⁶⁴

This civilisation is over and everyone knows it.
 – McKenzie Wark, “This Civilization Is Over. And Everybody Knows It” (2015)⁴⁶⁵

In the end, the game of dice appears to boil down to two principal options. To watch the desert tortoise die of dehydration, lying “on its back, its belly baking in the hot sun, beating its legs trying to turn itself over, but it can’t.” Or to attempt to flip it back onto its front. The latter employs a Fuller-esque hubris of increasingly experimental and risky ModCons deployed at a Manhattan Project scale.

The former remains resigned to a dour demeanour, accepting with Bataille-esque humility that anything and everything was always already too little too late. All rivers *eventually* empty into the sea, all species undergo petrification upon extinction, all interior heat of the earth is progressively being expelled into the cosmos by way of volcanic eruptions, through to the universe finalé by way of universal heat death. In this demeanour, there are always forces at work that episodically rupture life on earth, making any measures to counter this nothing more than empty gestures in a universe that gives and takes with wanton abandon.

Always behest to these same forces, the hubristic path also suffers from the inherent flaw, that dealing with the tail-end of changeability and its consequences is an act of chasing one’s tail. A never-ending pursuit that never gets anywhere, much like the Red Queen’s race, where all must run constantly just to stay in the same spot in *Through the Looking-Glass*, except that to stop running is not to come to a standstill. It is to die. Do not hold your breath for any such curbs. Do not hold your breath for ModCon to stem the unfolding Sixth Extinction Event. Were it to allow some species to remain on the playing field, embattled, they would still remain under the auspices of the Dour, which underpins everything.

Granted this game played at the table of the gods already has, and will increasingly have, consequences throughout the world-of-life. But the game was never going to be won. Because it is not a game that gets won. It cannot usurp the universal sigh, say by deflecting the asteroid or designing fitness curves for species’ safe passage through the unfolding rupture.

⁴⁶⁴ Leonard Cohen, “Everybody Knows,” track 3 on *I’m Your Man* (Columbia, 1988), LP.

⁴⁶⁵ McKenzie Wark, quoted in Rachel Rosenfelt, “This Civilization Is Over. And Everybody Knows It,” *Versobooks* blog post, 21 April 2015, accessed 18 February 2021, <https://www.versobooks.com/blogs/1950-this-civilization-is-over-and-everybody-knows-it>.

Why then intentionally intervene in ecosystems or evolution? Can the ends that these ModCons claim to serve ever justify the means? How so, when there is no end in sight for how intervention only begets more intervention in an endless spiral of dependency?

The simple answer to the question of why it is necessary to intervene rests on a simple premise of how acute the existential threat or predicament really is: Do-or-Die, Swim-or-Sink, Now-or-Never. The facts are not euphemistic or arguable. Much that presently lives has already become or is becoming consigned to extinction over the coming decades and ModCon is the only option left on the table, all the less interventionist options, including the *ceasing* of damaging action, having been manifestly ignored until they became too little, too late. When talking in desperate measures, though, where do we draw the line between human responsibility (or culpability) for trying to stem the extinction tide facing the more-than-human world? Do we, in fact, draw any lines? As Hamilton argues:

Humankind is now confronted with a momentous decision: to attempt to exert more control so as to subdue the Earth with greater technological power – the express purpose of some forms of geoengineering – or to draw back and practice meekness, with all of the social consequences that would follow.⁴⁶⁶

Except that “all of the social consequences” are the least of our concerns, when the subject at hand is bio-graphy: the biography of life-at-large. The life story of life is concerned with all biophysical consequences over the long-term future of earth. Which in the present tense manifests as a deep concern for how the next decade’s ModCon responses to the ecological crisis will disproportionately determine the long-term trajectory of life on earth. Therein, the decision to not attempt to flip the turtle onto its back is taken despite how much more-than-human life will perish as a result. This is to choose inaction, not as we have done before, in denial, but in the full knowledge of what we are doing.

Even if invoking a spectrum of possibilities, there is no middle ground between these two extremes. To throw down is to commit to rolling the dice. To throw up is to be repulsed at what happens if the dice are not cast. Do does not become reconciled with Die. Neither Swim with Sink, nor Now with Never. Nor do these dilemmas allow for a moral high ground, when the ground is so clearly going underwater, and drowning species in the act of rising up. Picture again a soap box sermon delivered by a puritan opposed to the disproportionately powerful and their

⁴⁶⁶ Hamilton, *Defiant Earth*, 17.

ModCons, standing on the non-profiled section of Raine, where tens of thousands of drowned turtle eggs lie underfoot.

To object to such hubristic intervention and attempted control requires an avowed willingness to accept a colossal loss of species alive today. That is not so much puritanical as tyrannical. Who is it that speaks for the more-than-human, saying ModCon should not be extended to their plight? That means the choice not to throw down carries the burden of knowing what the consequences entail for those multitudes of species dragged into our quagmire. Just as there is no bet hedging when playing at the table of the gods, ignorance was never bliss. It merely had the innocence of a nursery rhyme.

Evolutionary biologist Edward Wilson sums up this double-edged sword in the opening gambit to his book on *The Future of Life*. He declares that “the race is now on between the techno-scientific forces that are destroying the living environment and those that can be harnessed to save it.”⁴⁶⁷ Wilson does not describe what these other forces are, or how they can be harnessed. Simplistic framing like this has no bearing on the new rules of dice game we are playing, where life-at-large has been pushed to its limits by the same obliterating technoscience now proposed as its salvation.

Given attempts to ‘save nature’ require remaking it into something so unnatural that it becomes . . . un-nature, does not all of this just serve to call into being new tyrannies far more insidious than Tyrell and Queen Mary? In trying to save ourselves, we may well beckon a *Blade Runner* world made manifest on *Earth*. Or on what is left of earth. Well may we find ourselves pleading to leverage some of this new tyranny’s power to redefine social and biophysical limits to life. Not to extend our own lives, but rather to redirect some of their social and biophysical power toward the plight of species at imminent risk of extinction.

Indeed, Christopher Preston dubs ModCon as heralding *The Synthetic Age*. His 2018 book, subtitled *Outdesigning Evolution, Resurrecting Species, and Re-engineering Our World*, charts how:

The changes we are facing are much more significant than the familiar litany of human impacts such as climate change, species extinction, and toxic pollution. Earth is entering a period in which some of its most fundamental processes are being co-opted and redesigned by engineers. Synthetic biologists, climate engineers, and nanotechnologists are reaching deeply enough into the workings of nature to alter the very metabolism of the planet we inhabit. In so doing, they promise to create an entirely new, synthetic world.⁴⁶⁸

⁴⁶⁷ Edward Wilson, *The Future of Life* (New York: Vintage, 2003), xii.

⁴⁶⁸ Christopher Preston, *The Synthetic Age: Outdesigning Evolution, Resurrecting Species, and Re-engineering Our World* (Massachusetts: MIT Press, 2018), dusk jacket.

The operative word here is “promise.” Given that climate engineering, assisted evolution, and synthetic biology are not only promissory but also propositional, vexing debates rage as to whether they should be deployed, how, and by whom. After all, they entail reconfiguring life from cell to sky, and the earth from atom to atmosphere. And after all, they promise nothing less than the flipping of the turtle back onto its front by redesigning the turtle and its desert to fit the *New World Coming*.

Whether we withdraw into acquiescence or attempt to design novel and radical responses to the rupture, whatever world that results will be unrecognisable to the world-as-it-currently-is. If the radical proposals for *The Synthetic Age* are kept at bay, say due to moral outrage against enacting them, then the *New World Coming* will also be unrecognisable to the world-as-it-currently-is.

That age will also have a neologism to describe it: Edward Wilson tells us “we will then enter what poets and scientists alike may choose to call the Eremozoic Era – The Age of Loneliness.”⁴⁶⁹ The loneliness he speaks of would be between our species and the world-of-life rendered extinct by human activity. Not unlike the loneliness of the characters in *Blade Runner*. Options for company being fellow members of your drastically overpopulated species, or synthetic proxies of those rendered extinct by your kind.

If You Find Yourself in Hell, Where Hell is Other People . . .

The die is cast; I have consented to return, if we are not destroyed. Thus are my hopes blasted by cowardice and indecision; I come back ignorant and disappointed. It requires more philosophy than I possess, to bear this injustice with patience.

– Mary Shelley, *Frankenstein* (1818)⁴⁷⁰

You know those little snow globes that you shake up? I always thought my brain was sort of like that. You know, where you just give it a shake and watch what comes out and shake it again.

– Gary Larson, interview with Robert Holguin (1994)⁴⁷¹

When all is said and done this entire construct reveals itself for what it is. A joke. That could be the case for life itself, or maybe just the present tense, when empty

⁴⁶⁹ Edward Wilson, *The Creation: An Appeal to Save Life on Earth* (New York: Norton, 2006), 91.

⁴⁷⁰ Shelley, *Frankenstein*, 390.

⁴⁷¹ Gary Larson, interview with Robert Holguin, “Voice From The ‘Far Side’: Gary Larson Opens up About Retiring,” *The Seattle Times*, 14 October 1994, accessed 19 February 2021, <https://archive.seattletimes.com/archive/?date=19941014&slug=1935794>.

gestures are deadly serious, but the prospectus, let alone the cosmic context in which it is embedded, is so laughably absurd that it can only be signed off on by another Gary Larson cartoon.

Here the devil impatiently implores an inductee to hell to choose one of two facing doorways to go through. Left is marked ‘Damned if you Do’, right is marked ‘Damned if you Don’t.’ Like Detective Holden who implores that “You’re not helping. Why is that?” the devil too intones against the inductee’s indecisiveness. With pitchfork prodding into his back, the devil declares it is high time to throw up or throw down: “C’mom, c’mom – it’s either one or the other.”⁴⁷² Where “one” is Do (*The Synthetic Age*) or “the other” is Don’t (*The Age of Loneliness*).

Beyond both pathways being deplorable, they also share a wholeheartedly anthropocentric concern. The former is a world refashioned for civilisation so-called to continue apace, the latter privileges the suffering of the survivors. So why even choose if all roads lead down to the ruination of Rome? Or when the only other option is to not do at all? As if throwing up one’s hands and letting the devil decide would somehow absolve us for letting the crisis deepen to the point where we have wound up with two vying contenders, both trying to be the lesser of two evils. As Soren Kierkegaard surmised in *Either/Or: A Fragment of Life*: “I see it all perfectly; there are two possible situations – one can either do this or that. My honest opinion and my friendly advice is this: do it or do not do it – you will regret both.”⁴⁷³

The three universal sighs of changeability, consequences and comprehension of same are also present in the fiery depths of earth’s mantle, where Larson’s cartoon is set. The universal sighs are atemporal, at least for the duration that life has existed in the universe, because at such a scale any possible ‘whenever’ is bound to happen. And down here exhaling them honestly brings into being a third possibility, though it is not an option in the sense of the two facing doorways. This third possibility is a worldview premised on fidelity to earth’s deep history, the solar system to which it belongs, and then in increasing orders of magnitude, the progressive encompassment of the milky way, through to the universe.

In his section in *Ethics* on “Human Bondage, or the Strength of the Emotions” Benedict de Spinoza found solace in this worldview, with its embrace of the radical asymmetry and radical contingency of human life to cosmic vicissitudes:

⁴⁷² Gary Larson, “Damned if you do, Damned if you don’t,” from *The Far Side*, *New York Daily News*, 10 July 1985.

⁴⁷³ Kierkegaard, *Either/Or*, 396.

Human power is extremely limited, and is infinitely surpassed by the power of external causes; we have not, therefore, an absolute power of shaping to our use those things which are without us. Nevertheless, we shall bear with an equal mind all that happens to us in contravention to the claims of our own advantage.⁴⁷⁴

For our present tense such solace makes for a worthy exhalation of the universal sigh, just as it did for the Stegosaurus atop his Town Hall stage: “the picture’s pretty bleak . . . The world’s climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut.”⁴⁷⁵

For Spinoza, writing about the society that sang the *Three Blind Mice*’s 1609 lyrics, equanimity was a portal to a zoocentric worldview. The third possibility exists precariously within this worldview, precisely because words contain worlds – they become polysemic when people speak one language, but grant different meanings to the same word. Like the chalk-and-cheese difference between the two meanings of petrified, equanimity also has two seemingly irreconcilable meanings. The same word denotes both “equal mind” and “calmness and composure, especially in a difficult situation.”⁴⁷⁶ Therein, equanimity toward the two meanings of petrified means bringing the state of being terrified to bear on the biophysical process of becoming fossilised during a rupture of life on earth.

And from this embrace of equanimity, the third possibility flourishes. A worldview that beholds there were never two doors marked ‘Damned if you Do’ and ‘Damned if you Don’t’, nor a subject faced with the choice. Let alone one cajoled by the devil’s pitchfork prod. There were never two doors and two pathways because there was never a choice to begin with. Come what may, desperate times indeed call for desperate measures. But their measure of desperation reveals that we do not possess any “absolute power of shaping to our use those things which are without us.”

The only response to the devil’s prodding is one measured against the only true correlate of life-at-large and any and all of its pieces: the cosmos. That “we shall bear with an equal mind” the false prospect of two doorways. Because this third possibility need only to remind us that forces that go behind, beneath, beyond and above, from volcanic eruptions to viral irruptions, hold prospect for grinding everything to a halt, from industry to the continued existence of much that is living in the biosphere at present. And, having already been partially woke by the completed unfolding of the Holocene and the advent of the Anthropocene,

474 Benedict de Spinoza, *Ethics Part IV: Of Human Bondage or the Strength of the Emotions*, translated by Robert Elwes (Alexandria: Library of Alexandria, 1901 [1677]), appendix XXXII.

475 Gary Larson, “The Picture’s Pretty Bleak.”

476 “Equanimity,” *Oxford English Dictionary*.

this third possibility shows just how empty a gesture it is to walk through either doorway.

Only a dour demeanour is capable of honouring this fidelity to our new comprehension of the vicissitudes of the cosmos. The rockmelon, née walnut has been thoroughly shaken up, in order to bring our comprehension to bear on cosmic changeability and the consequences of same. But back here on earth, only the demeanour that will throw the dice can honour this fidelity to our guilt for having collectively catalysed the rupture. The dilemma is as impossible as the gesture is empty. There is no resolution for the reasonable mind.

The stakes are without precedent, yet the prevaricating hand remains ambivalent about casting the dice. The hand that holds them tight revels in the uncertainty of how any response may still amount to no more than an empty gesture. “Thus,” writes Shelley “are my hopes blasted by cowardice and indecision.” Turning back, having failed to reach the sought-after destination, gives rise to a humility born of this fidelity, for “it requires more philosophy than I possess, to bear this injustice with patience.” In tandem, our journey appears to have travelled from the Dour, through the Dire, to terminate in the Dice, only to come full circle back to where we began, and where we shall end: the Dour. No more nursery rhymes that make horror palatable. No more empty gestures. Ashes to ashes. Dust to water.

When all is said and done, during a time when all is so rapidly coming undone, abandoning the dour demeanour to run after the human-centred panic of the dire and throw the dice is a zero-sum game. Yet for many thinking humans involved in the details and mechanics of the unfolding rupture (whether social and/or biophysical) a breadcrumb trail appears to lead from Dour to Dire to Dice. Instead, this swansong sings of learning to think like a volcano with humility, rather than hubristically deciding to act like one. This is why the dour demeanour is threaded throughout, to provide both means and encouragement to resist the lure of both the dire demeanour and the demeanour of the dice.

What, then, does the Dour offer? Technically, nothing. Which is precisely in keeping with the emptiness of the cosmos. Though where it is forever trapped inside the human condition with its inescapably human-centred worldview, the Dour does offer something-amidst-the-nothing: fidelity. Thus, to cultivate a dour demeanour rather than giving in to the temptations of the dire or the dice is to recognise beyond common sense (and uncommon sense) that the gig, this gig, our gig, and the gig of everything we have ever known and were ever capable of knowing as life *on Earth*, is well and truly up. *What on earth, on Earth?*

Short of some intervention from the heavens, or a rupture of earth’s surface unprecedented in human memory that issues forth a seismic volcanic eruption, conceits for curbing either the causes or consequences of the unfolding rupture

reveal only empty gestures at hand. Absent a supervolcano or three, the technofix dream of instantaneous mass greenhouse gas sequestration, or any other random acts of impossibility encompassed in Clark's "unforeseeable nonhuman forcing,"⁴⁷⁷ a dour demeanour is the only faithful posture to adopt, no matter how much it may be abhorred.

When Nietzsche asked "if ever I rolled dice with gods at the gods' table of the earth" the answer was as mystical as the stanza is obtuse. Reading a little further to the immediately following text appears to render our own answer disturbingly unambiguous and concrete. Wherein, the result of playing dice with the gods is that "the earth quaked and ruptured and snorted up rivers of fire" on a planet that now "trembles with creative new words and gods' throws."⁴⁷⁸ This new creativity includes whatever will be the dictums of *The New World Coming*. Our own answer is sung by Leonard Cohen, when he intones on his swansong album, *You Want It Darker*, released 19 days before his death: "I'm leaving the table/I'm out of the game."⁴⁷⁹

In the meantime, entranced at the entrance to any doorway, there remains the vulnerable body, open to the volatility of the world itself as the most apt means for living, and dying, during a rupture of life on earth. Equanimity holds out its arms to us in the guise of the Dour, offering an invitation to embrace for impact, rather than to brace. Like the *Three Blind Mice* of 1842, 1609, or 1555 lore, the divergent meanings of words morph when successive societies weave their respective worldviews onto the same word-as-world.

For the present tense, we take this word 'equanimity' and turn it to our purposes: to embrace equanimity between being petrified and becoming petrified is to no longer just "build our houses on the earth." It is to be at home. Not here on some imaginary stable and non-volatile earth that never was. Nor here on an uninhabitable hothouse earth. Not even here on an earth rendered uninhabitable by humanity, our species just one rupture amongst so many, over so much unfathomable time. Rather here in a universe that never promised us anything else. That never promised us anything at all.

Welcome home.

477 Clark, "Volatile Worlds, Vulnerable Bodies," 42.

478 Nietzsche, *Thus Spoke Zarathustra*, 185.

479 Leonard Cohen, "Leaving the Table," track 1 on *You Want It Darker* (Columbia, 2016), LP.

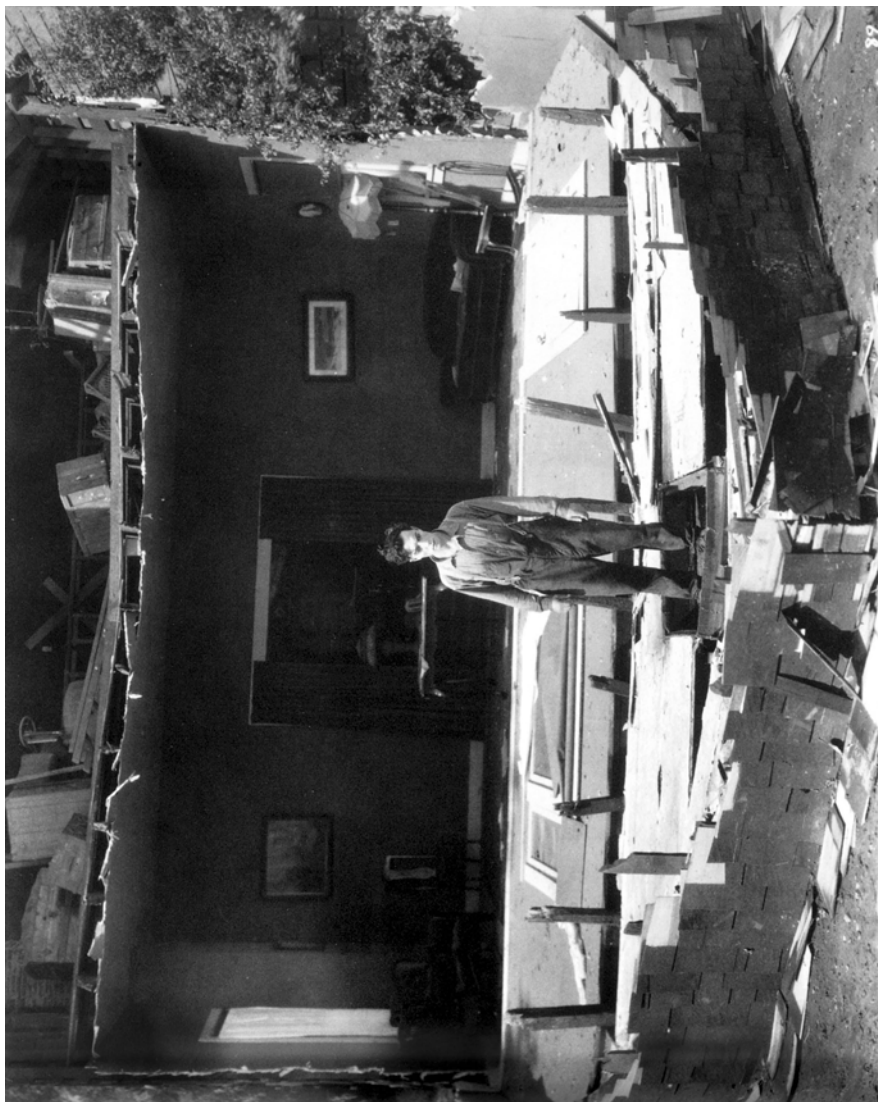


Fig 19: Welcome Back: Buster Keaton, *Steamboat Bill, Jr* (United Artists, 1928).

POSTSCRIPT (posthumous)

Nothing.Last.Forever.

This Space Intentionally Left Blank

In a nutshell:

*First Breath After Coma >
Of Mice and Man >
Hitchhiking v Carjacking >
Life on Earth v Life off Earth >
ENSO on v ENSO forth >
Better Tardy Than Never*

Rubbing Saltation into the Wounds

Heavy misfortunes have befallen us, but let us only cling closer to what remains, and transfer our love for those whom we have lost to those who yet live.

– Mary Shelley, *Frankenstein* (1818)⁴⁸⁰



Fig. 20: A National Guard soldier guards a Nematode capsule from the Columbia space shuttle, Ken's Minit Market, Nacogdoches, Texas, United States of America, 2 February 2003. Photograph by Brad Loper.

Life, in a technical sense, is always petrifying. Conversely, life only occasionally goes through ruptures. Seismic upheavals from asteroids, volcanoes, plate tectonics and so on do not even begin to scratch the surface of the ruptures to life that have occurred on this planet. Dig beneath the surface and lo and behold: shit-fuelled land ho! Ruptures do not only happen to life, but are also caused by life itself.

When one of the earliest lifeforms first began to breathe oxygen, it exhaled a gas toxic to all life on earth at the time, save for the cyanobacteria that invented

⁴⁸⁰ Shelley, *Frankenstein*, 345.

the means to do: photosynthesis. Before this rupture started, 2.4 billion years ago, all life was anaerobic. Then, under the auspices of the Great Oxygen Event/Catastrophe/Crisis/Revolution all anaerobic lifeforms either adapted to tolerate oxygen, or burrowed deep into earth to escape the holocaust happening in the hydrosphere, lithosphere, atmosphere, and nascent biosphere.

The first phase of planetary change, over the following 300 million years, seemed to principally be in the atmosphere, or, rather, the addition of oxygen to an anaerobic atmosphere. However, this phase of the Great Oxygen Event manifested mostly in oceans and seabed rock, which re-absorbed the oxygen back into earth. The oceans produced the most pronounced reactions, their iron-rich waters turning red from life-induced oxidisation. Sedimentary layers of this iron oxide subsequently became a rock known as banded iron formations, distributed extensively around the planet in deposits ranging from a few to a few hundred metres thick. It was as if cyanobacteria had leached all iron from the atmosphere, sequestering it into strata, which then meant their subsequent emissions could oxygenate the atmosphere now that the oceans had absorbed their fill.

This rupture has nothing of the concreteness of Panama, Chicxulub, or the East Africa Rift valley. But it still holds true to the three universal sighs: an anaerobic bacterium could have played ‘Stegosaurus Says . . .’, just substituting ‘aerobic bacterium’ rather than mammals doing the taking over. It would have to speak of the world’s climates ‘being created’ rather than changing, and ‘stimulus response the size of an amoeba’ instead of a “brain about the size of a walnut.” To boot, the picture was indeed “pretty bleak” for those that could not make it through the oxygenation of the atmosphere, rendered extinct or cast deep into the earth as subterranean anaerobic lifeforms.

A significant source of our knowledge concerning the volatility and dynamism of life in/on/to earth is the inexhaustible demand for minerals and fossilised hydrocarbons. The rupture encapsulated in banded iron formations is exhumed, as these formations are the principal source of all iron extraction. Similarly, we know about the evolution of extremophiles (namely, the anaerobic descendants living on an aerobic earth) because of industrial scale mining down shafts kilometres deep. These extremophiles were discovered in the thirst for extracting fossil fuels, just as Chicxulub’s sea-floor crater was accidentally discovered by geophysicists surveying the area for oil in the late 1970s.

Every rupture cracks the walnutshell in disbelief at the cascading consequences from yet another cataclysm upstream. Closer to home, no Chicxulub asteroid means no dinosaur mass extinction, no ecological niche for mammalian evolution, no *homo* genus, no *homo sapiens*, and no current carbon dioxide emissions at the fastest rate since the Chicxulub asteroid. Life, in an affective sense, is always petrifying.

Storytelling is life excised of all the boring bits, especially for drama and tragedy. Take the life of Queen Mary Tudor, amplify the most decisive moments, such as executing the three bishops, and you have the makings of an evening's entertainment for audiences now and half a millennium ago alike. Life is storytelling including every single one of the boring bits, perpetually unfolding in the present tense.

Geologists nicknamed one such period, occurring from around 1.8 to 0.8 billion years ago, as 'The Boring Billion', because nothing much ostensibly happened on earth's lifestyle channel during that time. This billion years marked the second phase of the Great Oxygen Event, when cyanobacteria's exhaled oxygen had exhausted the capacity of the ocean to absorb it, and so was released from the ocean into the atmosphere, only to be absorbed back into terrestrial earth.

Given the dearth of any major evolutionary change, the only soap opera for those billion or so years were moments of microbial high drama. Though this would be no more or less compelling than a Shakespearian tragedy, or watching the Panama Isthmus close, if the viewer's sensibility encompassed the range of scales, modes, and tempos of life itself. With sensibility only attuned to moments of high drama – whether insurrection against a tyrant, or a rupture of life on earth – the mental remote control fast-forwards through eons of relative stasis. After all, evolution and extinction go fishhand-in-fishhand during ruptures. They are the extraordinary events to the billion boring bits of time at the scale of the universe. They are, as Mike Davis reminds us, “a million years of ‘normal’ environmental work condensed into hours, even seconds,” making for “superchargers of geological and biological evolution.”⁴⁸¹

Which means that for those who prefer their probabilities and statistics with a grain of salty tears, all's well that ends well: at least for the 99.9% of all species that have ever lived, being those that have gone extinct. Perhaps it is the generosity of time that makes this seem so woeful. After all, on the balance of probability any lifeform's familiar lifeworld is going to go a cropper and end when being measured against the passage of four billion solar circulations. Alternatively, the inexorable passage from evolution to extinction is cause for celebration. Not of the inconsolable pathos for such loss, but of the seemingly inextinguishable capacity of life to flourish when feasible, resist when necessary, persist when possible, and adapt when-ever.

It is no small pattering of feet that Darwin closes *On the Origin of Species* with a sentence about the how “endless forms most beautiful and most wonderful have been, and are being, evolved.”⁴⁸² His sly slight of poetic hand still holds true:

481 Davis, “Cosmic Dancers on History's Stage?”, 84.

482 Darwin, *On the Origin of Species*, 459.

of the consequences were more devastating than first arrivals onto landmasses over the two centuries following Queen Mary Tudor's reign. The first wave was the insult: WE* aboard colonial and imperial invasions emanating from Europe. The second was the additional injury: stowaway mice and rats. When Cook gifted Tu'i Malila to King Paulaho of Tonga in 1777, mice and rats would have also jumped ship and made uninvited homes on another new island. (Though the *Rattus rattus* aboard these European vessels were actually the third wave, as the first wave was the Pacific rat (*Rattus exulans*) that had already breached Pacific islands three millennia ago, aboard the vessels of the first Polynesians.)

With every invasion of a new land, *Rattus rattus* and the house mouse (*Mus musculus*) ran amok in the footsteps that forged European colonies. The scenario replayed the unification of North and South America, via the Panama Isthmus. For some, a boon. For others, a death knell. Except that the boon was nearly always enjoyed by invading rodents, because native island animals had few comparable defences, having had no evolutionary co-existence with rodents, prior to the arrival of *Rattus exulans*. Although nativity and invasion are slippery terms: all species invade at some stage or another, whenever they encroach upon places other than where they speciated. Conversely, all species are native once they have been in a place since time immemorial. Which, viewed at the scale of last common ancestors, is pretty much wherever they happen to be at any one time.

But this zoocentric demeanour provides cold comfort against the agency for spreading rodents across the globe in the half millennium since Queen Mary inspired the nursery rhyme. The 1555 tyranny to which the first version of *Three Blind Mice* spoke, one so seemingly resolutely human and social, actually begat a biophysical tyranny too. Meaning the original 1609 rhyme still only probed the social limits of life, but by the time the second version was published in 1842 the consequences of the human-mouse relationship was already breaching biophysical limits to life across the world. By the time I sang the rhyme in school, the rupture was already well underway. And by the time I came of age enough to dig beneath, behind, above, and beyond the rhyme, the rupture was well beyond reprieve.

Therein, beholding three blind mice is not a question of "Have you ever seen such a sight in your life . . .?" The sight has been before us the whole time. Now restored to primacy as the eyesore at the centre of this new worldview for a *New World Coming*. Now, by this song, one can answer the question posed by the rhyme: to live during the unfolding rupture is to behold the sight of three blind mice in every moment. And for all that are alive not only *during* a rupture of life on earth, but alive *to* the rupture itself, it is to be and become petrified simultaneously in every moment.

Mouse and human – along with all other modern mammals – share the same irredeemable debt to Chicxulub, but mammalian tenure was never going to be

unlimited. Then for Stegosaurus. Now for us. For *now* is neither the first nor last rupture, but the last for me, my kin, and my entire kind. The confluence thus closes between both states of petrification, bringing together individual mortality with the extinction of one's species. As Batty laments just before exhaling his final breath: "all those moments will be lost in time like tears in rain."⁴⁸⁴ Just as all rivers eventually empty into the sea. Just as the sea very eventually empties into outer space, once the sun's heat burns away the atmosphere.

After all, nothing lasts forever. Even permafrost. Which is meant to denote 'permanent frost.' Except that its permanency is melting, releasing potent methane into the atmosphere, exacerbating global heating, which is melting more permafrost, releasing more methane . . . ENSO on ENSO forth. Nowadays it is melting permanent frost. Or perhaps Frosty the Snowman v Permafrost the Snowperson. Onwards, ever onwards, endings, ever endings. This is the endocrine disruption.

But what of those that we have not only beheld, but restored to the primary focus of our eyesore? From a rodent-centric perspective, this rupture is but one mega-boon that reaps all the fruits of their planetary expansion over the last half millennium. They bode well, not only for living during the unfolding rupture, but through it and into the next *New World Coming*.

And if we are seeing rodents anew, as interlocutors, then so too must we re-appraise some of our other companions, such as pigeons, sea gulls, and cockroaches. Currently besmirched as pests and invasive species, such paragons of evolutionary success will outlive us too, just like the Rodentia that capitalised on the emptied lands following the end of the age of dinosaurs. When all is said and done, they have previously, and will again, make worthy candidates for making it through to the next *New World Coming*. Hark the New New Animals for the New New World Coming. It is theirs whose song will continue to sing. ENSO on ENSO forth.

484 Scott, *Blade Runner*.

The Art of the Fugue

I don't care about me
 feel the animals and the trees
 They got nowhere to go
 I don't care much about you
 I don't give a shit what happens to you
 Now we blew it all away.
 – Anohni, "Hopelessness," 6 May 2016⁴⁸⁵

Dreamers, they never learn
 Beyond the point of no return
 And it's too late
 The damage is done
 This goes beyond me
 Beyond you.
 – Radiohead, "Daydreaming," 8 May 2016⁴⁸⁶

If this song were a guidebook, it would not be a *Hitchhiker's Guide to the Galaxy*, Douglas Adams' handbook for navigating "life, the universe and everything."⁴⁸⁷ A hitchhiker rides high on comet contrails – always at the behest of the driver, their whims, and the uncertain directions where they are headed. Let alone if they are a safe driver or liable to crash *en route*. A hitchhiker makes a living by metabolising what energy is available wherever here and now happen to be, whether with zooxanthellae and their photosynthetic dependence on the sun, extremophile bacteria and their chemosynthetic dependence on hydrothermal vents, or hominids once they learned to control, and thus become dependent on, fire. An act of generosity underpins a hitchhike – the universe gives light, heat, food, ground and the like, and offers us a ride at its behest.

If this song were a guidebook, it would be a Carjacker's Guide to the Galaxy. A carjacker does not wait for consent. Seeing the earth as Fuller's *Spaceship Earth*, carjackers enact violence to get the ride and get their way. Contemporary civilisation carjacked the earth, only to find it was better off being a diligent and conscientious hitchhiker and passenger, without control of the steering wheel. Instead, we forced our way behind the wheel, only to realise we would never be able to learn to drive.

We were never to know how the Spaceship Earth machinery actually operated. Or, that even if we could know how it works, how we would make it work to our

485 Anohni, "Hopelessness," track 10 on *Hopelessness* (Secretly Canadian, 2016), LP.

486 Radiohead, "Daydreaming."

487 Adams, *Life, the Universe and Everything*.

whims. If you are left standing beside the highway in Cormac McCarthy's *The Road*, rather than cruising along in Jack Kerouac's *On The Road*, it is because you did not get picked up for the ride out of town and into the happily-ever-after sunset.

So *what on earth* is the take-home message? What is the song summary rendered neat for a handy plastic take-away food container? There are no neat take-aways, no key concrete message encapsulated in a walnutshell, because there is no such summary. Instead, there is fidelity to being *on Earth*, and to all of its vicissitudes, from those arising deep within its magmatic core, to those irrupting from the outer space of the cosmos.

Indeed, the walnutshell must also grapple with how there is no take-home message because there is no home to take our song too. The turtle carries its shell upon its back, because its back is its shell. The hermit crab also carries its shell upon its back, because it suffuses its mortal coil with its adoptive hand-me-down-home-within-an-empty-shell. The human carries neither shell nor hand-me-down-shell. Instead, we "build our houses on the earth," mistakenly believing the earth to be, solid, permanent, and for us. Collectively forgetting its volatility, except in the form of creation stories and myths in which the earth turns out to be built on an elephant, which was built on a turtle, until it is turtles all the way down . . .

The anthropocentric demeanour appears to have worked well thus far, if the catastrophic extent of human overpopulation can be regarded as something working out well. Never mind the conceit, even when the way we build our houses on the earth is sending it back into a hothouse state. One that is more redolent of the Mid Pliocene Warm Period than the Holocene, mixed with new conditions even more biophysically impossible for our mortal coils. When Dorothy's house is picked up by the tornado in *The Wizard of Oz*, it is relocated to another world – where she survives the journey down the off-world rabbit hole intact. Finally, anthropocentrism will go by the wayside, given all talk of human passage into the *New World Coming* is as fantastical as Dorothy's tornado-delivered home relocation.

Then again, there never was a real home to take the message to. Rewrite the old adage as: *Because there's utopia like home*. Utopia, which means "no place," means utopia is no place like home. Instead, the only place for the take-home message is the cosmos itself. There lies the measure for our response to desperate measures called for by desperate times. There, and only there, can the response be offered. And there and only there can all offerings be revealed as what they amount to: empty gestures.

But cosmic nihilism can be a cheap trick. An easy out of a dilemma, by reframing it in the cold comfort of the cosmos. As if the feeling of being petrified can be nullified by the knowledge of becoming petrified. Those who reject the cheap trick hold that it was never meant to be this way. Others claim that some capacity for recompense lies up our sleeve, such as eradicating invasive mice

from islands through using gene drives to make them all male, and thus incapable of breeding. Thus, giving a lifeline to native species who make homes on ever-shifting islands. No land is an island.

To which cosmic nihilism yawningly plays its trump card: the only card it ever plays. It holds that nothing was meant to be any which way, because nothing has any meaning. It was never *Apocalypse Now*.⁴⁸⁸ It was always Post-Apocalypse Forever! Retrace the long arc of justice that brought Chicxulub or Theia crashing into earth. Recall J002E3 periodically returning to check in on us, before finally being cast off into deep space without return, when all the planetary alignments provide sufficient force for its eccentric orbit to remain solely solar-centric.

We inherit the actions of a universe that long preceded us, and will continue on well without us. And yet, our geological agency influences manifold earthly futures in untoward and unpredictable ways. Sometimes coming back to haunt us, like the first return of J002E3. Sometimes just a harmless scare, as J002E3 turned out to be. But at other times, the return of earlier actions carry the destructive and creative potential of a Chicxulub or a Theia. Now is one of those other-times. Now happens to be a “bad day” in this neck of the universe, a bad day like “whenever a six-mile-wide asteroid hits your planet with the force of over a billion nuclear bombs.”⁴⁸⁹

Mouths Open Wide/Eyes Wide Shut

Uncivilised writing is writing which attempts to stand outside the human bubble and see us as we are . . . Against the civilising project, which has become the progenitor of ecocide, Uncivilised writing offers not a non-human perspective – we remain human and, even now, are not quite ashamed – but a perspective which sees us as one strand of a web rather than as the first palanquin in a glorious procession. It offers an unblinking look at the forces among which we find ourselves.

– Paul Kingsnorth and Dougald Hine, *Uncivilisation: The Dark Mountain Manifesto* (2009)⁴⁹⁰

J002e3 was not only never meant to return to earth, it was also never *intended* to return. Because meaning is to intention as chalk is to cheese. Despite the universe being intrinsically devoid of meaning, human actions abound with discrete intention. With Batty in *Blade Runner*, it was also never intended that he would return to earth, since his remit was solely to be a slave on off-world colonies. As a prod-

488 Francis Ford Coppola, director, *Apocalypse Now* (United Artists, 1979), 70 mm.

489 Brusatte, “Asteroid Killed Dinosaurs.”

490 Kingsnorth and Dougald, *Uncivilisation*, 13.

uct of directed human action, could his unruly return to earth then bear meaning, by way of being born of wayward intentions?

Batty offers up an enigma for his motivation for returning to earth to confront his makers, proclaiming his earthly arrival by misquoting William Blake's *America: A Prophecy*. Entering the science laboratory where the creator of his eyes resides, he announces: "Fiery the angels fell; deep thunder rolled around their shores; burning with the fires of Orc."⁴⁹¹

For Blake, Orcs were the spirit of revolution, including the recent American and French ones that were subject of his *Prophecy* series. Wherein, Batty alludes to how the returning replicants are like Lucifer and the Fallen Angels in *America: A Prophecy*. All were cast off earth, with the intention they never return. Except the replicants, to quote Blake accurately now, "rose, and as they rose deep thunder roll'd/Around their shores: indignant burning with the fires of Orc."⁴⁹² Similarly, Frankenstein's monster turns to confront his creator, Victor Frankenstein, lamenting that "I ought to be thy Adam, but I am rather the fallen angel . . ."⁴⁹³

Given the human intention behind a *Blade Runner* replicant or Frankenstein's monster, was either creation *meant* to turn on its creator? Being unlike Blake's Lucifer and his rebellious angels, because their existence is the result of human, rather than 'divine' vision, was it then meant to be, that the indignant Orcs returned, to burn earth to a cinder?

For Blake, it was the Orcs' uprising from subterranean depths that caused our downfall: "fiery the angels rose." For Batty it was the replicants' coming down from deep space that caused our downfall: "fiery the angels fell." Meaning, or its complete absence aside, we are besieged by forces that include our own failings and errors from below and from above, from the past and by the future. But all life was always already besieged by something. As it was never meant to be, but as it became anyway. So be it. Such was life.

Having met his maker and gotten final confirmation that his imminent mortality was inevitable, Batty's curtain call is to proffer his own answer to "did you ever see such a sight in your life?" where the "ever" is the final summation of a life lived, just as it expires:

I've seen things you people wouldn't believe. Attack ships on fire off the shoulder of Orion. I watched C-beams glitter in the darkness at Tannhäuser Gate. All those moments will be lost in time like tears in rain. Time to die.⁴⁹⁴

⁴⁹¹ Scott, *Blade Runner*.

⁴⁹² William Blake, *America: A Prophecy* (London, 1793).

⁴⁹³ Shelley, *Frankenstein*, 173.

⁴⁹⁴ Scott, *Blade Runner*.

Like Frankenstein's monster, Batty evokes compassion, alongside the more obvious revulsion to human experiments that run amok. Even when they make their maker fear for their life. And especially when they make their maker petrified. Contrary to Deckert's original remit to assassinate Batty, by the time the two have battled, Deckert has come to view him with compassion:

All he'd wanted were the same answers the rest of us want. Where did I come from? Where am I going? How long have I got? All I could do was sit there and watch him die.⁴⁹⁵

Wherein, Deckert gets his own answer as to "did you ever see such a sight in your life?" And we have received the same answer to the desert tortoise dilemma: "all I could do was watch him die." In the here and now, all the while that we have been watching the upturned turtle dehydrate, becoming resigned to the utter helplessness of its predicament, a strange attractor has emerged between the interlocked human and reptile eyes. Such is the "unblinking look at the forces among which we find ourselves" of The Dark Mountain's *Uncivilisation Manifesto*.

We have been dehydrating, all the while we have watched the tortoise do same. The tortoise has been dehydrating, all the while watching us do same. Exhaling the universal sigh of changeability, consequence and comprehension of same, we recognise that our fates are as interlocked as our eyes. The entwining of our imminent extinction confirms that the act is done, the deed despicable, the cataclysm unleashed, the rupture unearthed.

The first universal sigh is the ever-changeable nature of changeability: the only constant is change. Scaled down here from the cosmic rate of inflation, to climatic change on any and all planets. Good planets go bad: picture the halcyon days of lore at near neighbours Venus and Mars, before they broke bad. Bad planets turn good: picture early states of earth, so vastly different from both each other and the present tense as to herald alien worlds, some of which more closely resembled Venus and Mars as they exist nowadays.

The second universal sigh is the consequences of such changeability for evolution and its twin, extinction. Cataclysms clear out the old and make way for the new, where new are forms so alien from the old as to herald worlds alien to one another. An earth with separate continents, flowering trees, reptiles, insects, plants, and other homely placemakers constitutes only the most recent tenth of this planet's history.

The third universal sigh is the comprehension of such changeability and its consequences. A worldview premised on the first two universal sighs presents a once-in-a-species opportunity to see the world anew, from the abyssal predicament of an ever-present event horizon, to whatever worlds may manifest and

495 Scott, *Blade Runner*.

whatever new forms may fill niches made vacant by our kind and kindred species, unable as they were to live on through. It remains to be seen whether the walnut's plasticity can embrace equanimity between these worlds. Equanimity between being petrified and becoming petrified.

For our present tense, the portal to the cosmos via the universal sigh yields a comprehension of petrification that can only be celebratory. Life, always at the behest of cataclysms that are always upstream. Changeability, more volatile, dynamic, and complex than we dare imagine. Consequences, more dire than we dare care for. To embrace comprehension of same is to live with fidelity to cosmic vicissitudes. Becoming petrified, side by side with the turtle we flipped, and alongside all else. Ashes to ashes. Dust to water.

Yet that feigned attempt to embrace for impact cannot answer the question following Radiohead's recognition that "the ocean blooms" and this is "what keeps me alive." The line that follows asks "So why does this still hurt?" To which they can only counter:

Don't blow your mind with why
I'm moving out of orbit
Turning in somersaults
A giant turtle's eyes.⁴⁹⁶

Such Was LIFE

This is a present from a small, distant world, a token of our sounds, our science, our images, our music, our thoughts and our feelings. We are attempting to survive our time so we may live into yours.

– President Jimmy Carter's message on the Golden Record sent on Voyager 1, 20 August 1977⁴⁹⁷

Once I understood Bach's music, I wanted to be a concert pianist. Bach made me dedicate my life to music, and it was that teacher who introduced me to his world.

– Nina Simone, *I Put a Spell on You: The Autobiography of Nina Simone* (1992)⁴⁹⁸

Over and out: the end of LIFE on earth in 2012, 35 years after Jimmy Carter's message was launched with Voyager 1, was an experiment that terminated in an acci-

⁴⁹⁶ Radiohead, "Bloom."

⁴⁹⁷ Jimmy, Carter, *Voyager Spacecraft Statement by the President*, 29 July 1977, <https://www.presidency.ucsb.edu/documents/voyager-spacecraft-statement-the-president>.

⁴⁹⁸ Nina Simone, *I Put a Spell on You: The Autobiography of Nina Simone* (New York: Pantheon, 1992), 22.

dent gone off the rails, when the Living Interplanetary Flight Experiment attempted an interplanetary mission to obtain Martian samples for analysis back on earth. Stowaways hitchhiked aboard the spacecraft, inside a sealed wallet-sized container holding ten types of organisms, each in triplicate. These were Closed Ecological Systems designed to self-perpetuate throughout the three-year round-trip to the Martian moon Phobos.

That was the plan, but the spaceship in question could not punch the surly bonds of gravity and never escaped earth's orbit. Crash-landing in a watery grave beneath the Pacific Ocean, LIFE on earth ended on 15 January 2012. Like J002E3, the intention went wayward. An empty gesture if ever there was one, LIFE put into action Jimmy Carter's sentiments, encoded onto a golden record plastered to both Voyager spacecraft exteriors when they left earth in 1977.

Had they found safe passage aboard their ark, the organisms in their wallet-sized package would have demonstrated that transpermia may be possible. Namely, that life can hitchhike inside rocks, thereby surviving interplanetary travel. Beyond this lies the panspermia theory, which holds that life did not originate on earth, but that it hitchhiked here inside asteroids, meteoroids, or comets. Beyond that lies directed panspermia, meaning human attempts to sow life on other planets.

Such is the aim of The Panspermia Society, who also go by the name Society for Life in Space. Their vision is encapsulated in a manifesto by the founder, Michael Mautner: *Seeding the Universe with Life – Securing Our Cosmological Future*.⁴⁹⁹ In this vision, directed panspermia is a means to live on beyond this planet, over and out into the cosmos. Inextricably entangling the web of life between planets as well as within.

How far can that web stretch? The most distant human-made object in space, currently travelling beyond the heliosphere, is Voyager 1. The Golden Record riding aboard the spacecraft's exterior carries a music selection intended to be broadly representative of cultures across the world, as part of Carter's "token" of human expressivity. The empty gesture taken via LIFE was not, however, comparable to this token, but rather a literal attempt "to survive our time so we may live into yours." Where "our time" is the present tense, but the "we" that may live into the time of this new planetary future eviscerates any anthropocentric-we, or even a biocentric-we. The "we" that "may live into yours" can only be a zoocentric-we.

Because, the only anthropocentric-we that will live into the time of an interplanetary other will be human expressivity after all. The intention behind the Golden Record was that Voyager should continue its lonely space odyssey and,

499 Michael Mautner, *Seeding the Universe with Life – Securing Our Cosmological Future* (Weston, Florida: Legacy Books, 2004).

upon discovery, that the music will provide a portal for otherwise incomprehensible communication. After all, the medium is the most mystical of human expression, with Beethoven finding it to be “the one incorporeal entrance into the higher world of knowledge which comprehends mankind but which mankind cannot comprehend.”⁵⁰⁰

Beethoven would perhaps turn in his grave to discover two pieces of his music included on this ultimate *Desert Island Disk*. After all, space is at a premium in space – all the sounds, images, and text had to be transcoded into the physical format of the standard sized record grooves of a double-sided LP. The album closes with a movement from one of Beethoven’s late String Quartets, written when he was already deaf. Meaning the composer never got to hear it, just as the Golden Record may never be heard either. The joke now closes in on itself in an eternal golden braid.

Bach took the honour of having the most pieces of music by the same artist. An honour reflecting his status, which Max Richter aptly expresses: “there is Bach, and then there is everything else.”⁵⁰¹ A sentiment echoed by biologist Lewis Thomas, when asked what message he would choose to send with Voyager:

I would send the complete works of Johann Sebastian Bach . . . But that would be boasting . . . Perhaps the safest thing to do at the outset, if technology permits, is to send music. This language may be the best we have for explaining what we are like to others in space, with least ambiguity. I would vote for Bach, all of Bach, streamed out into space, over and over again. We would be bragging of course, but it is surely excusable to put the best possible face on at the beginning of such an acquaintance. We can tell the harder truths later.⁵⁰²

However, the harder truths will never be told, as there will be no one left to tell them. Any such acquaintance will now only be with human artefacts that outlive the aftermath of human extinction. The music, Bach’s music, will only speak for itself, travelling out endlessly into a void, never to be heard, save for the infinitesimal chance an alien lifeform picks up the signal.

Putting “the best possible face” for “such an acquaintance,” the Golden Record includes microfiche-like photographs, to be viewed by whatever chances upon Voyager during a day in the life of the universe. The photographs make a family album of sorts, each representing facets of different human cultures, rife with nostalgia for the long-departed portraitists and subjects alike.

500 Ludwig van Beethoven, quoted in letter from Elizabeth Brentano to Goethe, 28 May 1810, cited in John Sullivan, *Beethoven: His Spiritual Development* (New York: Alfred A. Knopf, 1936), 5.

501 Max Richter, “Inside Max Richter’s Vinyl Collection: Aphex Twin, Bach, Grouper and More,” *The Guardian*, 2 September 2015, accessed 27 August 2018, <https://www.theguardian.com/music/musicblog/2015/sep/01/aphex-twin-bach-grouper-max-richter-vinyl-playlist>.

502 Lewis Thomas, *Lives of a Cell: Notes of a Biology Watcher* (New York: Penguin, 1978), 43.

Closer to home, 100 portraits of people adorn satellite EchoStar XVI, in geostationary orbit 36,000 kilometres above earth. The artwork is entitled *The Last Pictures*, by US artist Trevor Paglan.⁵⁰³ Like the Golden Record, the portraits are enclosed in a gold disk, affixed to the satellite exterior. However, these photographs are visible to the naked eye, as tiny thumbnails that make up one contiguous rectangular grid. Their subject is similar to those depicted on the Golden Record: the complexity, absurdity, and anxiety of modern human history. But their intended audience is terrestrial earthlings, since they are anchored to a satellite that can go nowhere other than the geostationary orbit to which it is wedded.

During the first 15 years following its September 2012 launch, *Last Pictures* will share the stage with EchoStar's function, which is to beam high definition television to the US. Then, around 2027, the satellite will go dark, no longer beaming images, but still continuing its graveyard orbit, along with hundreds of prior ones already doing likewise. *The Last Pictures* exhibition will be on show for the following 800,000 years, being the anticipated duration during which EchoStar XVI will hover in that particular locale over earth, before its own fiery closing ceremony.

Drawing closer to home, another US artist, Byron Rich, made *M-Ark I (Microbiome Ark)*,⁵⁰⁴ a fictitious device for re-seeding evolution in the event of human earthly extinction. The conceit is that the entire human microbiome is housed within a biocapsule the shape and size of a chicken egg, aboard an orbiting micro-satellite the shape and size of a basketball. This micro-satellite is programmed to jettison once humanity is annihilated, to return in a controlled descent to earth, safely delivering its payload of indispensable microorganisms for making anew a primordial MADDADAM⁵⁰⁵ Adam and Eve for that *New World Coming*.

As much as *M-Ark I* is made to look like it could technically perform these functions, its functionality is pure fiction. The work, commissioned for the *In Case of Emergency* exhibition at Science Gallery Dublin in 2017, is a critique of the conceit of rebooting a new season of humans, not a slipping in of MAD science-as-art. While the Panspermia Society is dead-set earnest in their desire to begin *Seeding the Universe with Life – Securing Our Cosmological Future*, Rich's *M-Ark I* rubbishes the conceit and the hubris of so doing.

Returning to earth's surface and actual action (rather than satire), another US artist, Sean Connaughty, launched *Arc of the Anthropocene* on the shores of Lake

503 Trevor Paglan, *The Last Pictures*, 2012, <https://creativetime.org/projects/the-last-pictures>.

504 Byron Rich, *M-Ark I (Microbiome Ark)*, 2017, <https://www.byronrich.com/M-Ark-I-Microbiome-Ark-2017>.

505 Margaret Atwood, *The MaddAddam Trilogy* (New York: Penguin, 2009).

Superior, the largest freshwater lake on the planet.⁵⁰⁶ The two-metre wide sphere contained a selection of plants, soil, and microorganisms that were intended to be a self-perpetuating Closed Ecological System, much like Latimer's terrarium, except with a range of plants rather than just one. Resembling a science experiment more than an artwork, the floating sculpture featured a glass portal at its top to allow the plants to absorb sunlight, alongside solar panels to provide further electric light within.

An experiment, nonetheless, and one where the instigator anticipates being outlived by the duration it would take for the results to bear fruit. Launching the arc on 2 September 2014, Connaughty declared that his intention was for it to only open to the external world after the aftermath of the ecological crisis had subsided. The incubating plants crawling out to become the new progenitors, having "survive[d] our time so we may live into yours." Like the LIFE that failed to leave earth, the arc sank within hours of being launched, leading Connaughty to crowd-fund money to raise the first arc from the lake bottom, and to rebuild one that would swim, not sink.

A few months earlier on 15 July 2014, in another part of the US, Japanese artist Azuma Makoto launched *Exobiotanica – Botanical Space Flight*, 30 kilometres above Black Rock Desert.⁵⁰⁷ Lifting a camera, bonsai plants, and bouquets of arranged flowers into earth's atmosphere via a weather balloon, the artwork killed its subjects, as the altitude breached the biophysical limits of plant, microorganism, and bacteria alike. Unlike Connaughty, Makoto had no intention of designing an ark for the living planet. Instead, this is life persisting as a *memento mori*. The remains of the day being photographs of life frozen in death and frozen in time, like *The Last Pictures*.

Further afield, aboard the International Space Station, in 2009 NASA experimented with making an actual ark of life in space. Taking aboard seeds of four Australian plant species for six months to test the effects of microgravity and ionising radiation on the seed's propagation afterwards, back on earth. Tim Entwisle, one of the project collaborators, and then executive director of the Royal Botanical Gardens Trust in Sydney, declared that the *Seeds in Space* experiment concerned the efficacy of off-world seed banks, as a backup to the potential destructions of on-world seed banks, alongside the actual riverbanks on which they need to survive.⁵⁰⁸

Seeds in Space proved that space incubation is no place for seeds, since the returned travellers could not propagate back on earth. Though, even if seeds were to show a capacity to propagate after near-earth orbital storage, what biosphere would

506 Sean Connaughty, *Arc of the Anthropocene*, 2014, <https://www.seanconnaughty.com/ark-of-the-anthropocene>.

507 Azuma Makoto, *Exobiotanica – Botanical Space Flight*, 2014, <http://exobiotanica.com/award>.

508 Richard Macey, "Lofty Ambitions for Zero-Gravity Native Seeds," *The Sydney Morning Herald*, 7 August 2008.

such temporary-extra-terrestrial-earthlings return to grow up in? Those from the old world going have no home in the *New World Coming*, unless they can evolve in step, becoming something else altogether in so doing.

Post-Apocalypso Forever!

We have through sorrow and joy
gone hand in hand;
From our wanderings, let's now rest
in this quiet land.
– Richard Strauss, *Four Last Songs* (1948)

I don't need a pardon
There's no one left to blame
I'm leaving the table
I'm out of the game.
– Leonard Cohen, "Leaving the Table" (2016)

Whatever the vein, however earnest or cynical the expression, pestilence runs through all such future imaginaries. Whether off-world, or thoroughly down to earth, a persistent strain runs through these human views from the present tense, all of which imagine life going on, with or without us. Yet the present tense portal into life-at-large is constrained by being petrified in the present tense. Every waking moment presents a new tragedy, a new emergency, a new crisis that forecloses the event horizon. This mode of being is integral to being petrified in the long emergency that is the-twenty-first-and-last century.

With no end in sight, the only promise lies beyond, both of the temporal and the evolutionary. Because being overwhelming preoccupied with the immediate here and now is at the expense of wonder about the then and the there. About Lucy becoming petrified. About the endless cycling of plate tectonics. About how, 100 million years hence, an average of "the stratigraphic thickness of a piece of cigarette paper" will constitute the Anthropocene strata across earth.⁵⁰⁹

Voyager 1 is a continual reminder of the way worldviews preoccupied with the present tense have lost their sense of wonder about the then and the there. The further it gets from earth, the less often it reaches yet another milestone of performing an event never before done in astronomy, and so the less it makes the news. But when it does, these intrusions into the daily news manage to puncture the present tense and re-open the portal.

509 Zalasiewicz, *The Earth After Us*, 89.

The first fly-bys of our two immediate neighbours, Venus and Mars, provided their closest yet observation, yielding critical insights into how, when, and where they both had a liquid ocean, atmosphere, volcanism, and other resemblances. Both fly-bys were major news events. After all, understanding that good planets go bad is of critical importance for locating the “cataclysm upstream.”

When Voyager 1 reached Uranus, however, the fly-by was marked by a particularly telling intrusion of the ‘here-and-now’ into the ‘then-and-there.’ It began with a major NASA media briefing on 28 January 1986, to announce the fly-by results. But much closer to home, the Challenger spacecraft exploded while the briefing was being held. Word spread like wildfire throughout the auditorium, which emptied as the journalists promptly left to file live broadcasts about the explosion.

The panel now addressed an empty room. Revelations from the first fly-by of Uranus were rendered silent because Challenger, like LIFE, failed to leave Earth in line with human intentions. While the LIFE journey crashed trying to pierce upwards through the atmosphere, and Challenger broke apart shortly after take-off, the Colombia shuttle crashed on trying to pierce downwards through the atmosphere in 2003. Disintegrating on its return to earth, hundreds of pieces of the shuttle and its human passengers landed across Texas. Like the Challenger disaster, the sheer violence and visible spectacle of the Colombia astronauts’ death became the focal point of public mourning.

Yet there was cause for celebration too. The debris brought back to earth the nematode *Caenorhabditis elegans* that had been on board, part of the experiments being conducted on how space travel affects terrestrial organisms. Like the organisms aboard LIFE, the one-millimetre worms too had been in Closed Ecological Systems: petri dishes inside aluminium canisters. Not only did they return to earth alive, having thus survived the spacecraft disintegration, atmospheric re-entry, and crashing into the ground, but they had successfully bred throughout. Since their life cycle completes in less than ten days, their discovery, weeks after the incident, meant that these were fourth or fifth generation descendants from those that had left earth.

While an anthropocentric worldview would find little cause to celebrate this, a biocentric worldview may rejoice in the knowledge of successful passage from a fellow traveller from the Animalia domain. Though the real cause for celebration lies in a zoocentric worldview, as a stowaway lifeform survived too. A bacterium, *Microbispora*, was discovered in the debris as well, causing consternation as it was not meant to be on board.

Subsequent research concluded that the *Microbispora* must have been a contaminant accidentally introduced before launch, which only adds fuel to the fire that a stowaway lifeform survived the same extremes as the nematode worms.

Whereas LIFE had failed, the scientists who discovered the stowaway managed to dig proof out of the disaster that panspermia is possible, declaring that since “this organism survived disintegration of the space craft, heat of re-entry, and impact, it supports the possibility of a natural mechanism for the interplanetary spread of life by meteorites,” whereby, “our findings provide experimental support for biological survival given the atmospheric-passage, heat and impact of a space-borne object, such as might occur during panspermia.”⁵¹⁰

Indeed, the fields of aerobiology and aeroecology have revealed the extent of aerospheric life, from bacteria that live ten kilometres above earth’s surface, riding atmospheric winds between continents, to sea plankton and other microorganisms found living on the International Space Station exterior. None of this was lost on The Panspermia Society, who included three fellow eukaryotes in their LIFE mission: from Fungus, *Saccharomyces cerevisiae* (yeast); from Plantae, *Arabidopsis thaliana* (mouse-ear cress seeds); and from Animalia, *Tardigrades* (water bears).

While the *Tardigrades* aboard LIFE must have met with a watery grave in the Pacific Ocean, these curious ‘water bears’ have been found pretty much everywhere and anywhere one would not expect to find animals. Members of this maximum one-millimetre-sized phylum (roughly the same size as the *Caenorhabditis elegans* nematode) range in habitat from hot springs to volcanic mud, the tropics to the poles, mountain tops six kilometres above sea level to the deep sea four kilometres below, and can survive temperatures of 2°C above absolute zero through to 150°C, as well as ionising radiation in the order of an atom bomb or gamma-ray bursts, and the vacuum of outer space. Their tolerance for extremes is coupled with an ability to enter suspended animation, living without food or water for upwards of 30 years, by turning their metabolism dormant like that of a plant seed. When they do so they curl up into a ball, only to unfurl and spring back to life when reanimated by water.

Bleak, after all, is in the eye of the beholder – and from a *Tardigrade’s* point of view the present tense is just yet more “endless forms most beautiful.” These water bears shatter notions of life, and its limits – even here, right next to us in the Animalia kingdom. Measured against the scale of the cosmos, desperate times do not call for desperate measures, so well may we cease “attempting to survive our time” by making it through this particular rupture of life on earth, and instead take cold comfort in how we’ll meet again some sunny day, given how something – and we will never know what – “may live into yours.”

Did you ever see such a sight in your life?

⁵¹⁰ Robert McLean, Allana Welsh, and Valerie Casasanto, “Microbial Survival in Space Shuttle Crash,” *Icarus* 181, no. 1 (2006): 323–325.



Fig. 21: Of Mice & Man: Western European house mouse (*Mus musculus domesticus*) meets wise human (*Homo sapien*), 11 December 2018. Photograph by Dorian Moro.

Glossary

abiotic (opposite: biotic) non-biotic, meaning absent of organic life

aleatoric (see also: stochastic) unintentional, defined by chance or undefined elements

aerobic (opposite: anaerobic) only possible in the presence of oxygen, or relating to the consumption of oxygen and capacity to do the same

amoeba one-celled protozoa that move by projecting non-permanent pseudopodia, devoid of permanent organelles

anthro-genesis the study of humanity's origins from the beginning of known time, across all scientific and humanistic disciplines

anthropocentric (see also: human exceptionalism) a stance that prioritises humanity and/or imposes human values, features or perspectives upon non-human life

Anthropocene geological epoch following the Holocene, during which the cumulative effects of human activity became the dominant force of biological, chemical and geological processes on earth

anthropogenic an event or phenomenon which is human caused, especially the cumulative impact or influence of humanity upon the entire non-human world

anthropos Greek term for human

assisted evolution a defined range of active interventions aimed at predicting and accelerating ordinary or natural evolutionary processes, especially in conservation biology

australopithecus extinct genus of early hominids inhabiting southeastern Africa, includes the immediately prior ancestor to the *Homo* genus

axial tilt (see also: eccentricity and precession) the angle of a planet's rotation axis within the plane of orbit, on earth responsible for seasons and – in concert with related phenomena – causing the onset and termination of glacial periods; also known as obliquity

bataille-esque (see also: fuller-esque) referring to Georges Bataille (1867 to 1962), a French writer who explored notions of excess across academic and artistic genres

biocentric (see also: zoocentric) a stance which notionally regards many forms of sentient life as possessing inherent or intrinsic value, but with an implicit bias toward the human, as in regarding 'biography' as meaning 'the life of a person'

bioengineering (see also: synthetic biology) the use of interventionist techniques to engineer modified versions of naturally occurring organisms

biogenesis life that is generated from pre-existent life

biogeochemistry the cyclic rotation or separation of chemical elements or compounds between the living and non-living aspects of an ecosystem

Biomass Energy Carbon Capture and Storage (BECCS) the trapping and (supposed) 'long-term' storage of CO₂, harnessed when particular biomass is converted into fuels or directly burned to generate energy

biomedical engineering the application of engineering principles and techniques to biology and medicine

biomes major types of ecological communities (such as intertidal ocean zones, rainforest, or desert)

biophysical the combination of biological and physical entities, especially the study of the physical quantities in biological systems

biotic from, of, or caused by living organisms

Cambrian geological period beginning ca. 540 million years ago, and ending ca. 485 million years ago

Carboniferous geological period beginning ca. 360 million years ago, and ending ca. 290 million years ago

Carbon Dioxide Removal (see also: climate engineering) the capturing of CO₂ from the atmosphere and its (supposed) removal and 'long-term' storage

cataclysm an event or series of events characterised by extreme destruction and upheaval of a previously existing state of an abiotic and/or biotic system

catastrophism the geological theory positing that alterations in the earth's crust were caused suddenly by violent events of a type and/or scale unknown today

Cenozoic the (arguably) current geological era, beginning 66 million years ago, with the end of the non-avian dinosaurs

chemosynthetic the use of energy of living organisms, derived from inorganic chemical reactions to produce a synthesis of organic compounds

Chixcubulub name given to an asteroid, circa 10 kilometres in diameter, that struck earth 66 million years ago, causing cataclysmic climatic and geological events that constitute the start of the Cenozoic era

clade (evolutionary biology) a group of biological classifications including all the known descendants of a single common ancestor

class (evolutionary biology) a taxonomic rank in biological classification, here running from largest to smallest: life, domain, kingdom, phylum, class, order, family, genus, and species

closed ecological system an isolated ecological system that – which the exception of energy – operates independently, and, without exchanges outside the closure of the system

contusioned 'contusion' meets 'confusion', owing to a contusion (on the brain), begetting the wrong word ('contusioned'), in favour of the correct word ('confused')

court jester (theory of evolution) (see also: red queen) posits that the major driving forces in evolutionary processes causing speciation are abiotic forces, including planetary climate, and not biotic competition between species

Cretaceous-Paleogene boundary the stratigraphic boundary marking the end of the Cretaceous period and the beginning of the Paleogene period, also known as the K-Pg boundary

cryobank (conservation biology) a facility that collects biological samples, stored by means of minutely controlled freezing, for potential later use in conservation

cryosphere the section of the earth's surface distinguished by the constant presence of frozen water

cyanobacteria a major group of photosynthetic single-celled bacteria that nonetheless create filament-, sheet-, or sphere colonies, found in varying environments

deep time a recently coined term for geologic or cosmic time, denoting timescales of billions upon billions of years

disequilibrium the absence or lack of equilibrium, or balance in a system, whether abiotic and/or biotic

distal (opposite: proximal) located at a distance from the point of origin, remote from the point of attachment or central point of the whole

Devonian geological period beginning ca. 420 million years ago, and ending ca. 360 million years ago

dour literally harsh, severe and obstinate, here referring to a mental posture that reflects these values in refusing to soften, censor or otherwise mitigate the fact of the current extinction and climate cataclysm in any way

earth system science the integrated examination of biological, physical, and chemical processes that collectively shape abiotic and biotic conditions on earth

earthia (see also: melartheia) the planet earth is, more accurately, earTheia, as it is the sum of the hypothesised collision between the early earth, and the planet Theia

eccentricity (see also: axial tilt and precession) the deviation of an astronomical orbit from perfect circularity

ecocide the wilful and knowing destruction of earth's ecosystems by humans

ecological niche the niche occupied by a lifeform or species within its ecosystem, referring to both the conditions necessary for its survival and its role in the maintenance of the system

ecosystem (includes: ecology) a community of deeply interdependent organisms and their environment, forming a functional ecological unit, or ecology

El Niño Southern Oscillation (ENSO) unpredictable and volatile global climate phenomenon resulting from variations in wind systems and ocean surface temperature across the tropical Pacific

elliptical in astronomy, elliptical orbits that are oval rather than circular, and in language, deliberate obscurity, avoidance, or extreme reduction of facts

entropy (opposite: negentropy) generally the level of chaos and uncertainty within a system, specifically the degradation of universal energy and matter towards a final state of inert uniformity

environmentalism a socio-cultural and economic-political movement aiming for the protection, preservation and restoration of earth's ecosystem and environment

eon formally, the largest geological unit of time, generally, one billion years

epistemology (see also: world turtle) a branch of philosophy examining the definition and origins of knowledge, particularly referring to its limitations and absolute validity

epoch a geological unit of time less than a period but greater than an age, generally an extended time period distinguished by distinctive new developments or trends

epochal consciousness a contested term for the collective experience of humans living within their epoch or times and the way it affects their perspective, thinking and self-awareness

eras (geology) one of the largest units of geological time, less than an eon but more than a period

eukaryotes one of the three major domains of life forms, which features one or multi-celled organisms with evident nuclei and organelles, including animals, plants, seaweeds, fungi, and single-celled organisms

existentialism collection of twentieth century philosophical stances focussed on the examination of individual existence in an unfathomable universe, and the dilemma of individuals assuming absolute responsibility for their exercise of free will without any guarantee of 'right' or 'wrong'

extremophiles organisms, most commonly from the domain archaea, which survive and/or thrive under extreme environmental conditions such as drastic cold or heat, deep ocean pressure or high altitudes

family (evolutionary biology) a rank of biological classification greater than a genus and lesser than an order, usually including multiple genera

fitness (biology) a quantitative measure of individual reproductive success; also called Darwinian fitness

Frankensteinian referring to Mary Shelley's *Frankenstein; or, the Modern Prometheus*, a nineteenth-century gothic horror novel exploring many themes, but most pertinently notions of human hubris and blind faith in scientific invention despite the risk of fatal outcomes

Fuller-esque referring to Buckminster Fuller (1895 to 1983), an American designer, engineer and inventor whose work explored a mechanistic and managerial mindset of human relations to earth systems and non-human life

gametes mature male or female germ cells capable of initiating the creation of a new individual by fusion with a gamete of the opposite sex

gene drives so-called 'selfish' genetic aspects that are transmitted to progeny at frequencies greater than 50%, used in laboratory settings to reduce the prevalence of vector-borne diseases, crop pests and non-native invasive species

genome a single haploid set of chromosomes, including all genes they contain; more generally, all genetic material of an organism

genotype all or part of the genetic makeup of an individual or group of living organisms

genus biological classification greater than a species but lesser than a family, comprising related species or single species with unusual differentiation

geocentric a perspective centred on the earth, literally to, from or as if observed from the earth's centre

geodesic a method of construction using light straight building elements that form a curved surface, mostly secured using mutual tension

geoengineering (see also: climate engineering) a range of interventionist techniques designed to directly and consciously impact and alter the planetary climate, in order to mitigate human-caused climate change

geomorphology the science of examining the relief features of the earth (or other celestial bodies) and interpreting them in terms of origin and development

geostationary the state of possessing an equatorial orbit at an altitude of circa 36,000 kilometres, with an identical angular velocity to the earth, so that the orbiting object remains in a fixed position with respect to the earth

ghost in the shell the sense of ancient ancestral hominid ghosts lurking in our modern *homo sapiens* selves, here referring to Oshii Mamoru's eponymous 1995 film, which express this idea

global heating a general term for the overall increase in average temperatures of all zones of the biosphere due to earth's current net positive energy imbalance, having replaced 'global warming' and 'climate change' due to how innocuous these terms became

global dimming the decrease in sunlight reaching earth's surface caused by atmospheric particles (particularly sulphate aerosols from human-caused pollution), first observed in the 1950s and worsening by 4 to 5% per decade up to the 1980s, when the trend was partially reversed

great oxygen/oxygenation event a period beginning circa 2.4 billion years ago and ending circa 2 billion years ago, during which the amount of free oxygen in the earth's atmosphere and shallow seas first significantly increased, making them toxic to the then-largely anaerobic organisms on earth and believed to have caused their mass extinction; also known as great oxygen holocaust/crisis/catastrophe/revolution

guttural the quality of something being like a gutter

Hadean earliest defined eon of geological time, beginning with the planet's formation circa 4.6 billion years ago and ending circa 4 billion years ago

heliocentric centred literally or figuratively on the sun

heliosphere the region around a sun influenced by the sun directly or through solar winds

Holocene recent epoch of geological time, beginning circa 11,700 years ago and arguably running until the present (although this is contested by those who define the current epoch as the Anthropocene, beginning in the eighteenth century with the Industrial Revolution)

homeostasis a fairly stable equilibrium (or tendency towards the same) achieved between various interdependent parts of an organism, population or other group

hominid any member of the biological family *hominidae*, comprising erect bipedal primates, including modern *homo sapiens* as well as extinct ancestral and related species and all great apes

homo sapiens and homo sapiens sapiens the two modern human species (literally 'thinking man'): *homo sapiens*, which emerged in Africa circa 300,000 years ago from the species *homo heidelbergensis* (descendants of *homo erectus*) and eventually spread globally, interbreeding with and ultimately replacing all other archaic humans and becoming *homo sapiens sapiens* roughly 160,000 years ago

hotspots extremely vast accumulations of igneous rocks formed by the passage of magma through the earth's crust towards the surface, leading to extensive volcanism

human exceptionalism to posit that human life is fundamentally of greater value than non-human life, by asserting that humans are qualitatively differentiated from the rest of the biosphere and possess moral primacy, an attitude now often characterised as speciesism or unjustified bias towards other species

hydrosphere the aqueous elements of the earth's biosphere, including all bodies of water and atmospheric aqueous vapor

intervention ecology the intentional alteration of both biotic and abiotic processes and structures in an ecosystem

Intergovernmental Panel on Climate Change (IPCC) intergovernmental body of the United Nations, activated in 1988 and integral to the United Nations Framework Convention on Climate Change

isostatic rebound the rise of land masses following the lifting of the weight of massive ice sheets following the end of an ice age; also called crustal rebound

jabberwocky meaningless speech or written matter, from Lewis Carroll's 1872 poem titled "Jabberwocky" in his book *Through the Looking-Glass and What Alice Found There*

Jurassic geological period beginning ca. 201 million years ago, and ending ca. 145 million years ago

Kafkaesque referring to the work of Franz Kafka (1883 to 1924), an Austrian-Czech writer whose narratives are famous for their often nightmarishly illogical, inhumane and maze-like qualities

karst an area of irregular limestone region characterised by sinkholes, subterranean streams and caverns

kingdom (evolutionary biology) a major biological classification greater than a phylum and lesser than a domain

Last Universal Common Ancestor (LUCA) the hypothesised common ancestral unicellular lifeform from which the three domains of life on earth emerged: bacteria, archaea and eukaryota

lithosphere the exposed outer solid layer of a celestial body, on earth comprising the crust and the outermost mantle, around 100 kilometres in thickness

macrocosm a complex that constitutes a larger-scale version of one of its constituents (similarly microcosm, a smaller scale version, and mesocosm, a mid-scale version)

marine cloud brightening making clouds brighter in order to mitigate solar radiation by reflecting a small percentage of sunlight back into space, achieved by generating a fine mist of seawater salt and delivering this mist into stratocumulus cloud banks via ships

mass extinction event a rarely occurring event in which 75% or more of all living species on earth die out within a short period of geological time, usually due to catastrophic natural phenomena, now associated mostly with human impacts, as per the Anthropocene

Mesozoic second most recent era of geological time, beginning circa 252 million years ago and ending circa 66 million years ago

metaphysics branch of philosophy examining the fundamental nature of existence and reality

microfiche largely obsolete form of physical data storage, wherein a sheet of microfilm contains images of printed pages, which can be read using a microfiche machine

Mid-Pliocene Warm Period (MPWP) a period during the Pliocene epoch, beginning circa 3.3 million years ago and ending circa 3 million years ago, during which the average temperature of earth was 2 to 3°C higher than today, and global sea levels 25 metres higher

melarthetaia (see also: *eartheia*) melarthetaia is the name given to the theoretical by-product of a future collision between *eartheia* and a rogue planet, like the planet Melancholia in the eponymous Lars von Trier film, which results in the end-of-the-planet itself, as per the film's final

ModCon abbreviation for Modern Conveniences, meaning all human technology not strictly necessary for survival but designed to make life more convenient or more comfortable, and its corollary: Modern Conservation, where said technology is used to offset the effects of such conveniences on the biosphere, through intervention ecology, assisted evolution, synthetic biology, and climate engineering

Negative Emissions Technologies (NETS) a range of proposed technologies for the removal of carbon dioxide from earth's atmosphere and (so-called) 'securely' storing or converting it into a form that sequesters the greenhouse gasses

nematode long cylindrical worms that are parasitic in animals and plants, but live free in soil and water feeding on microscopic organisms

net positive energy balance (opposite: net negative energy balance) an energy balance in a system, such as a cell or an atmosphere, wherein the intake of energy exceeds its expenditure

nihilism a philosophy that denies any fundamental truths, rendering existence meaningless and senseless

Non-Linear System Dynamics (N-LSD) the study of shifts and complex interactions within and between systems over time, emerging from mathematical analysis of chaos and complexity

northern hemisphere glaciation the process of intense glaciation at the north pole, which gained momentum circa 3.5 million years ago and has defined the current (Quaternary) geological period, with the hitherto unprecedented situation of both poles remaining glaciated

Northern Polar Jet Stream and Northern Polar Vortex two circles of rapidly moving air centred around the Arctic, which impact global weather patterns significantly; the Polar Jet Stream is tropospheric, characterised by a belt of wind blowing west to east in the lowest layer of the atmosphere; the Polar Vortex is stratospheric (higher) and is still not fully understood, but is more volatile than the Jet Stream

obliteration obliterated literature – well may we have written ourselves into the geology of the planet, but in so doing we have written ourselves out of history

ocean acidification reduction of global ocean acidity, largely caused by the uptake of carbon dioxide into the atmosphere and threatening all current ocean ecosystems

ontology area of metaphysics focussed on the nature and interconnections of existence or being; also a specific stance on what things can actually be said to exist

order (evolutionary biology) biological classification greater than a family and lesser than a class

Ordovician geological period beginning ca. 485 million years ago, and ending ca. 445 million years ago

osmosis diffusion or absorption caused by the movement of a solvent through any semipermeable barrier, that tends to balance the composition of the substances on both sides of that barrier; also used as a metaphor for the same

Palaeolithic of or from the period known as the Stone Age, the first known period of humans using stone tools, beginning circa 3.3 million years ago and ending circa 3000 BCE

Palaeocene-Eocene Thermal Maximum (PETM) a geologically brief period, beginning circa 55.8 million years ago and lasting circa 200,000 years, during which average global temperatures rose 5 to 8°C and there was massive carbon input into both the ocean and atmosphere

panspermia evolutionary theory, originating in nineteenth century, that living organisms exist and reproduce throughout the universe, wherever conditions are favourable to their needs

periodicity the state of being regularly occurring, or occurring in periods

permafrost the layer of the earth's surface (erroneously) considered 'permanently frozen', occurring at and to varying depths in the coldest regions of earth, and now melting

perturbation the disrupting of a course, motion, state of balance or status quo; astronomically the disturbance of the normal motion of any celestial body

petrification literally the conversion of organic matter into a hard and resilient substance by means of mineral deposit; generally the process of becoming lifeless, unchanging and rigid

Permian geological period beginning ca. 300 million years ago, and ending ca. 250 million years ago

permineralized a state of being fossilised by a process of minerals being deposited into organic tissue via water, which later evaporates

phenotype features or traits of any organism caused by its interaction of its genotype and the environment, literally the observable expression of one or more genes

phosphate salt or ester from phosphoric acid; organic compound of phosphoric acid wherein the acid is bonded to nitrogen or carboxyl in a manner that allows energy to be released

photosynthesis production of carbohydrates using carbon dioxide and any source of hydrogen (such as water) in the chlorophyll rich cells of green plants when exposed to favourable forms of light

phylum (evolutionary biology) biological classification lesser than a kingdom and greater than a class, also any group that displays the unity of a biological phylum

planetology area of astronomy focussed on studying planetary systems, particularly planets and celestial bodies within the solar system

plate tectonics the generally accepted theory that the earth's lithosphere is made up of vast tectonic plates, which have been in motion for around 3 to 4 billion years

Pleistocene relatively recent geological epoch, beginning circa 2.58 million years ago and ending circa 11,700 years ago, during which much of the evolution of the genus *Homo* occurred

Pliocene geological epoch beginning circa 5.33 million years ago, and ending circa 2.58 million years ago, during which the genus *Homo* first appeared

postwar referring to the period following the end of World War II in 1945, often seen as ending with the beginning of the Vietnam War

precession (see also: axial tilt and eccentricity) relatively slow gyration of the rotational axis of any rotating body around an intersecting line, describing a ‘cone’ of motion

proprioceptive of stimuli, occurring within an organism, and especially to do with the position or movement of a body

proximal (see also: distal) located close to the point of origin, point of attachment or central point of the whole

Quaternary current geological period beginning circa 2.58 million years ago

red queen (theory of evolution) (see also: court jester) the red queen hypothesis of evolution, first proposed in 1973, posits that species must undergo constant adaptation, evolution and multiplication to survive in sometimes violent competition with other similarly constantly evolving species

refugia regions of relatively unchanged climate, inhabited by organisms during periods of critical climate change, creating ecosystems where otherwise decimated species may potentially survive, and re-emerge following the cessation of climatic change

rupture literally to physically break apart by violence or force, also used to indicate a breaking of existing accords in a violent manner

saccharomyces cerevisiae a species of yeast (single celled fungal microorganisms) fundamental to baking and beer brewing, intensely studied as a model of eukaryotic organisms and engineered in synthetic biology

saltation (evolutionary biology) an hypothesis of sudden and drastic evolutionary change, where the origination of novel species or higher biological classification can occur within a single evolutionary step

Silurian geological period beginning ca. 445 million years ago, and ending ca. 420 million years ago

Sixth Extinction Event (see also: Mass Extinction Event) the Mass Extinction Event currently occurring, differing from prior mass extinction events in that it has been caused by human activity, including agriculture, habitat destruction, deforestation, diversion of freshwater and massive biophysical and atmospheric pollution

Solar Radiation Management (see also: climate engineering) proposals to limit global heating by increasing the percentage of sunlight reflected back into space and by reducing the capture of thermal radiation from the sun within earth’s atmosphere

stochastic (see also: aleatoric) somehow dependent upon or involving a random variable or chance

synecdoche a linguistic device wherein a part stands for the whole or the whole stands for a part (such as all hands-on-deck where hands refers to workers), or the composite material stands for the thing produced (walking the boards for walking onstage)

synthetic biology (see also: bioengineering) a branch of bioengineering using multidisciplinary research to engineer or manipulate naturally emergent biological systems, for application in biomanufacturing, biofuels, conservation, and, much more recently, global heating mitigation

Stratospheric Sulphur Particle Injection (SSPI) a proposed method of climate engineering designed to reduce global heating by introducing aerosols into the stratosphere to produce solar dimming, only naturally seen during a volcanic winter

superfamily (evolutionary biology) biological classification lesser than an order and greater than a family

symbiosis a state of mutually beneficial co-existence or union between two disparate organisms

tardigrade microscopic eight-legged invertebrates that usually live in water or moss but can survive in extremely inhospitable environments, largely due to their ability to dehydrate and enter a form of suspended animation before rehydrating and reviving; also known as water bears

technofix literally 'technological-fix': a rapid, short-term intervention in a problem, reliant on technology and not integrated into a long-term plan for positive outcomes

technoscience the human development of, relationship to, and reliance upon technological science, often with emphasis upon human hubris in technological development (as in synthetic biology, climate engineering, and assisted evolution)

temporal relating to earthly life, or secular life; also relating to time, as opposed to space, or eternity

tensegrity a feature of any structure that comprises both parts with continuous tension (such as wires) and parts with non-continuous compression (such as any kind of metal tube), which together produce a rigid form

thermodynamics (second law) law of physics positing that heat must always move from hotter to colder areas of matter, from which the concept of entropy arises, wherein disorder in an isolated system tends to increase, leading to universal heat death (see below)

thermohaline circulation a part of the massive ocean circulation powered by surface heat and freshwater fluxes; for example, wind powered surface current like the Gulf Stream move polewards from the equatorial Atlantic, producing a cooling effect en route

thermonuclear of or related to the alterations in the nuclei of atoms possessing low atomic weight (such as hydrogen), which require an extremely high temperature for the initiation or inception of such changes

tolerance thresholds (evolutionary biology) the upper and lower limits to the range of particular environmental factors (such as light, temperature, availability of water) within which an organism can survive

transmogrifying to cause extreme transformation, often with repulsive or comical effects

Triassic geological period beginning ca. 250 million years ago, and ending ca. 200 million years ago

Triassic-Jurassic extinction event extinction event between the Triassic and Jurassic periods, circa 201 million years ago, arguably caused by massive volcanic activity and the associated release of carbon dioxide

vicissitude fluctuation of situation or condition, whether naturally occurring or consciously caused; also the state of being volatile or unstable

world turtle referring to the problem of infinite regress, expressed by the mythic theme of a giant turtle or tortoise supporting or enclosing the earth, which appears in Hindu and ancient Chinese mythology, as well as the mythologies of certain indigenous peoples of the Americas, and is referenced in various schools of epistemology concerning limits to possible human knowledge

United Nations Framework Convention on Climate Change (UNFCCC) convention for the governance of anthropogenic climate change, signed in 1992 by 154 nations, and activated in 1994

universal heat death hypothesis on the ultimate fate of the universe, which posits that the universe will progress towards a state in which there is no more thermodynamic free energy, ceasing all processes that increase entropy, thereby achieving thermodynamic equilibrium

upper palaeolithic revolution the transition from the Middle Palaeolithic to Upper Palaeolithic, occurring around 50,000 to 40,000 years ago, marked by a revolution in the technological and social development of humankind

zeitgeist from the German, refers to the overall cultural, social, ethical, intellectual, creative atmosphere of a given time period

zoocentric (see also: biocentric) a stance which regards all forms of life as possessing inherent or intrinsic value

zooxanthellae symbiotic marine plankton (dinoflagellates) dwelling inside the bodies or cells of other organisms (such as coral polyps)

Author bio

Dr Joshua Wodak is an artist, writer, and Senior Research Fellow at the Institute for Culture and Society, Western Sydney University, Australia.

Bibliography

- 50 Reefs – The Ocean Agency. “A Global Plan to Save Coral Reefs.” Accessed 11 September 2017. <http://www.50reefs.org>.
- Adams, Douglas. *Life, the Universe and Everything*. London: Pan Books, 1982.
- Adams, Douglas. “Is there an Artificial God?” Transcript of speech delivered at *Digital Biota 2*, Magdelene College Cambridge, September 1998. Accessed 11 September 2021. <https://digitalspace.com/biota.org/people/douglasadams>.
- Adams, Douglas. *The Salmon of Doubt: Hitchhiking the Galaxy One Last Time*. New York: Random House, 2002.
- Aesop. “The Boy Who Cried Wolf.” In *Aesop’s Fables: Timeless Moral Stories*. The Child’s World, Inc., 2022.
- AFI’S 100 years . . . 100 laughs: The 100 Funniest American Movies Of All Time. “3rd Funniest American Movie of All Time.” Accessed 25 July 2024. <https://www.afi.com/afis-100-years-100-laughs>.
- Ager, Rob. *The Essence of War: An in depth analysis of Stanley Kubrick’s Dr. Strangelove*. Accessed 16 February 2021. <http://www.collativelearning.com/downloadables/Dr%20Strangelove%20analysis%20-%20chapters%2001-04.pdf>.
- Al-Ansari, Nadhir, Nasrat Adamo, Issa Issa, and Varoujan Sissakian. “Mystery of Mosul Dam, the Most Dangerous Dam in the World: Dam Failure and its Consequences.” *Journal of Earth Science and Geotechnical Engineering* 5, no. 3 (2015): 95–111.
- Albrecht, Glenn. *Earth Emotions: New Words for a New World*. Cornell: Cornell University Press, 2019.
- Andersen, Hans Christian. *Fairy Tales Told for Children*. Copenhagen: C.A. Reitzel, 1837.
- Anderson, Kevin. “Climate Change Going Beyond Dangerous: Brutal Numbers and Tenuous Hope.” *Development Dialogue* 61 (2012): 16–19.
- Anderson, Kevin. “Real Clothes for the Emperor: Facing the Challenges of Climate Change.” Paper presented at The Cabot Institute, University of Bristol, 6 November 2012. Accessed 13 December 2015. <http://www.bristol.ac.uk/cabot/events/2012/194.html>.
- Anderson, Kevin. “Talks in the City of Light Generate More Heat.” *Nature* 528 (2015): 437.
- Anderson, Kevin, and Alice Bows. “Beyond ‘Dangerous’ Climate Change: Emission Scenarios for a New World.” *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 369 (2010): 20–44.
- Anohni. “Hopelessness.” Track 10 on *Hopelessness*. Secretly Canadian, 2016, LP.
- Archer, David. *The Long Thaw: How Humans Are Changing the Next 100,000 Years of Earth’s Climate*. Princeton: Princeton University Press, 2016.
- Arrhenius, Svante. “On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground.” *Philosophical Magazine and Journal of Science* 5, no. 41 (1896): 237–276.
- Attenborough, David, director. *Zoo Quest*, episode 2, “Zoo Quest for the Paradise Birds.” Aired British Broadcasting Corporation, 17 November 1957.
- Attenborough, David. *Be Part of the Largest Green Turtle Recovery Project in History* poster. Department of Environment and Heritage, Queensland Government, 2016.
- Atwood, Margaret. *The MaddAddam Trilogy*. New York: Penguin, 2009.
- Balbo, Laurie. “50 Year Old Record-Busting Bottled Terrarium – And It’s Not from Dubai!” *Green Prophet*, 29 May 2013. Accessed 16 June 2016. <http://www.greenprophet.com/2013/05/terrarium-david-latimer>.

- Banita, Georgiana. "Voting for American Energy: Elections, Oil, and US Culture." In *Electoral Cultures*, editors Georgiana Banita and Sascha Pohlmann, 99–129. Heidelberg: Heidelberg University Press, 2015.
- Barnosky, Anthony. "Distinguishing the Effects of the Red Queen and Court Jester on Miocene Mammal Evolution in the Northern Rocky Mountains." *Journal of Vertebrate Paleontology* 21, no. 1 (2001): 172–185.
- Bataille, Georges. *Accursed Share: Volume 1: Consumption*. London: Zone Books, 1991.
- The Beatles. "She Said, She Said." Track 7 on *Revolver*. Parlophone, 1966, LP.
- The Beatles. "Lucy in the Sky with Diamonds." Track 3 on *Sgt. Pepper's Lonely Hearts Club Band*. Parlophone, 1967, LP.
- The Beatles. "Because." Track 8 on *Abbey Road*. Parlophone, 1969, LP.
- Beattie, Peter, and Lindy Nelson-Carr. "World's largest green turtle rookery given highest protection status." Ministerial statement, Record of Proceedings, First Session of the Fifty-Second Parliament of Queensland, 22 August 2007.
- Beck, Ulrich. *Risk Society: Towards a New Modernity*. London: Sage, 1992 [1986].
- Behling, Noriko, Mark Williams, Thomas Behling, and Shunsuke Managi. "Aftermath of Fukushima: Avoiding Another Major Nuclear Disaster." *Energy Policy* 126 (2019): 411–420.
- Bendick, Rebecca, and Roger Bilham. "Do Weak Global Stresses Synchronize Earthquakes?" *Geophysical Research Letters* 44 (2017): 8320–8327.
- Bennett, Timothy, director. *What A Way To Go: Life at the End of Empire*. VisionQuest Pictures, 2007, DVD.
- Bernstein, Jeremy. "How About a Little Game?" *The New Yorker*, 5 November 1966. Accessed 5 December 2015. <https://www.newyorker.com/magazine/1966/11/12/how-about-a-little-game>.
- Berry, Wendell. *Standing by Words*. San Francisco: North Point Press, 1983.
- Blake, William. *America: A Prophecy*. London: William Blake, 1793.
- Blake, William. "And Did Those Feet in Ancient Time." In *Milton: A Poem in Two Books*. London, William Blake, 1810.
- Borger, Julian. "Mosul Dam Engineers Warn It Could Fail at Any Time, Killing 1m People." *The Guardian*, 2 March 2016. Accessed 1 May 2017. <https://www.theguardian.com/world/2016/mar/02/mosul-dam-engineers-warn-it-could-fail-at-any-time-killing-1m-people>.
- Brain, Tega, and Sam Lavigne. *Intergovernmental Panel on Capitalism*, 2015. Accessed 13 December 2015. <http://intergovernmentalpaneloncapitalism.org>.
- Brecht, Bertolt. "Deutsches Lied." In *Bertold Brecht, Poems 1913–1956*, editors John Willett, Ralph Manheim, and Erich Fried. London: Eyre Methuen, 1976.
- Bristol Airport, day and night temperature records for 6 November 2012. Accessed 10 June 2016. <https://weatherspark.com/h/y/39587/2012/Historical-Weather-during-2012-in-Bristol-United-Kingdom>.
- Broder, John. "Nearly Absent in the Campaign: Climate Change." *The New York Times*, 25 October 2012. Accessed 10 June 2016. <http://www.nytimes.com/2012/10/26/us/politics/climate-change-nearly-absent-in-the-campaign.html>.
- Broderick, Mick. *Reconstructing Strangelove: Inside Stanley Kubrick's 'Nightmare Comedy'*. New York: Columbia University Press, 2017.
- Broecker, Wallace. "Climatic Change: Are we on the Brink of a Pronounced Global Warming?" *Science* 189, no. 4201 (1975): 460–463.
- Broecker, Wallace. "Unpleasant Surprises in the Greenhouse?" *Nature* 328, no. 6126 (1987): 123–126.
- Brown, Harrison. *The Challenge of Man's Future: An Inquiry Concerning the Condition of Man During the Years That Lie Ahead*. New York: Viking Press, 1954.

- Bryan, Chris. *Biggest Teahupoo Ever*, 27 August 2011. Accessed 18 December 2015. <https://vimeo.com/35328567>.
- Buck, Holly Jean. *After Geoengineering: Climate Tragedy, Repair, and Restoration*. London: Verso, 2019.
- Bulletin of the Atomic Scientists. "Doomsday Clock." *Bulletin of the Atomic Scientists*. Accessed 19 July 2024. <https://thebulletin.org/doomsday-clock>.
- Büscher, Bram, Wolfram Dressler, and Robert Fletcher, editors. *Nature Inc.: Environmental Conservation in the Neoliberal Age*. Tucson: University of Arizona Press, 2014.
- Cahill, Tim. "The Rolling Stone Interview: Stanley Kubrick in 1987." *Rolling Stone*, 7 March 2011. Accessed 16 February 2021. <https://www.rollingstone.com/movies/movie-news/the-rolling-stone-interview-stanley-kubrick-in-1987-90904>.
- Calvert, Jane. "Synthetic Biology: Constructing Nature?" *Sociological Review* 58, no. 1 (2010): 95–112.
- Calvin, William. *A Brain for All Seasons: Human Evolution and Abrupt Climate Change*. Chicago: University of Chicago Press, 2002.
- Cameron, James, director. *Terminator 2: Judgement Day*. TriStar Pictures, 1991, 35 mm.
- Cann, Charlotte Du, Anthea Lawson, and Tom Smith. "Introduction." In *Dark Mountain: Refuge – Ten Years on the Mountain*. Oxford: Dark Mountain Books, 2018.
- Capra, Frank. "Metora: The Unchained Goddess." *The Bell System Science Series*, episode 4, director Richard Carlson. Aired National Broadcasting Corporation, 12 February 1958.
- Carroll, Lewis. *Through the Looking-Glass, and What Alice Found There*. London: Macmillan, 1871.
- Carruth, Shane, director. *Upstream Colour*. VHX, 2013, DVD.
- Carter, Jimmy. *Voyager Spacecraft Statement by the President*, 29 July 1977. Accessed 16 February 2021. <https://www.presidency.ucsb.edu/documents/voyager-spacecraft-statement-the-president>.
- Chang, Kenneth. "Quake Moves Japan Closer to US and Alters Earth's Spin." *The New York Times*, 13 March 2011. Accessed 24 November 2020. <http://www.nytimes.com/2011/03/14/world/asia/14seismic.html>.
- Chaplin, Charlie, director. *The Great Dictator*. United Artists, 1940, 35 mm.
- Cheng, Lijing, Kevin Trenberth, John Fasullo, John Abraham, Tim Boyer, Karina von Schuckmann, and Jiang Zhu. "Taking the Pulse of the Planet." *Eos: Transactions American Geophysical Union* 98, no. 1 (2017): 2–10.
- Churchill, Winston. "Debate on the Address speech in United Kingdom Parliament." Transcript of speech delivered at United Kingdom Parliament, HC Deb vol 317 cc1081–155, 12 November 1936. Accessed 6 May 2019. <https://api.parliament.uk/historic-hansard/commons/1936/nov/12/debate-on-the-address>.
- Clark, Nigel. "Ex-Orbitant Globality." *Theory, Culture & Society* 22, no. 5 (2005): 165–185.
- Clark, Nigel. "Volatile Worlds, Vulnerable Bodies: Confronting Abrupt Climate Change." *Theory, Culture & Society* 27, nos. 2–3 (2010): 31–53.
- Clark, Nigel. *Inhuman Nature: Sociable Life on a Dynamic Planet*. London: Sage, 2011.
- Clark, Nigel. "Rock, Life, Fire: Speculative Geophysics and the Anthropocene." *Oxford Literary Review* 34, no. 2 (2012): 259–276.
- Clark, Nigel. "Geoengineering and Geologic Politics." *Environment and Planning A: Economy and Space* 45, no. 12 (2013): 2825–2832.
- Clark, Nigel. "Geo-politics and the Disaster of the Anthropocene." *The Sociological Review* 62, no. 1 (2014): 19–37.
- Clark, Nigel. "Anthropocene Incitements: Toward a Politics and Ethics of Ex-orbitant Planetaryity." In *The Politics of Globality Since 1945: Assembling the Planet*, editors Rens van Munster and Casper Sylvest, 126–144. London: Routledge, 2016.

- Clark, Nigel. "Anthropocene Bodies, Geological Time and the Crisis of Natality." *Body & Society* 23, no. 3 (2017): 156–180.
- Clark, Nigel. "Bare Life on Molten Rock." *SubStance* 47, no. 2 (2018): 8–22.
- Clark, Nigel, Alexandra Gormally, and Hugh Tuffen. "Speculative Volcanology: Time, Becoming, and Violence in Encounters with Magma." *Environmental Humanities* 10, no. 1 (2018): 273–294.
- Clinton, Bill. "Remarks on Earth Day, 21 April 1993." Transcript of speech delivered at US Botanic Gardens, 21 April 1993. Accessed 6 May 2019. <https://www.govinfo.gov/content/pkg/WCPD-1993-04-26/pdf/WCPD-1993-04-26-Pg630.pdf>.
- Chakrabarty, Dipesh. "The Climate of History: Four Theses." *Critical Inquiry* 35, no. 2 (2009): 197–222.
- Chakrabarty, Dipesh. "The Human Condition in the Anthropocene." Paper presented at The Tanner Lectures in Human Values, Yale University, 18–19 February 2015.
- Chakrabarty, Dipesh. "Anthropocene Time." *History and Theory* 57, no. 1 (2018): 5–32.
- Coen, Deborah. "Big Is a Thing of the Past: Climate Change and Methodology in the History of Ideas." *Journal of the History of Ideas* 77, no. 2 (2016): 305–321.
- Cohen, Judah, James Screen, Jason Furtado, Mathew Barlow, David Whittleston, Dim Coumou, Jennifer Francis, Klaus Dethloff, Dara Entekhabi, James Overland, and Justin Jones. "Recent Arctic Amplification and Extreme Mid-Latitude Weather." *Nature Geoscience* 7, no. 9 (2014): 627–637.
- Cohen, Leonard. "Leaving the Table." Track 1 on *You Want It Darker*. Columbia, 2016, LP.
- Cohen, Leonard. "Everybody Knows." Track 3 on *I'm Your Man*. Columbia, 1988, LP.
- Condon, Zach. "The Rip Tide." Track 6 on *The Rip Tide*. Pompeii Records, 2011, LP.
- Connaughty, Sean. *Arc of the Anthropocene*, 2014. <https://www.seanconnaughty.com/ark-of-the-anthropocene>.
- Coppola, Francis Ford, director. *Apocalypse Now*. United Artists, 1979, 70 mm.
- Crutzen, Paul. "Albedo Enhancement by Stratospheric Sulphur Injections: A Contribution to Resolve a Policy Dilemma?" *Climatic Change* 77 (2006): 211–220.
- Crutzen, Paul, and Will Steffen. "How Long Have We Been in the Anthropocene Era?" *Climatic Change* 61, no. 3 (2003): 251–257.
- Crutzen, Paul, and Christian Schwägerl. "Living in the Anthropocene: Toward a New Global Ethos." *Yale E360*, 24 January 2011. Accessed 17 February 2021. https://e360.yale.edu/features/living_in_the_anthropocene_toward_a_new_global_ethos.
- Darwin, Charles. *On the Origin of Species by Means of Natural Selection, Or the Preservation of Favoured Races in the Struggle for Life*. London: J. Murray, 1859.
- Dauterive, Les. *Rigs-To-Reef Policy, Progress, and Perspective OCS Report*. Washington, DC: US Department of the Interior, 2000.
- Davis, Michael, and Anne Sommerfield, directors. *Great Barrier Reef*, episode 3. Aired British Broadcasting Corporation, 13 January 2016.
- Davis, Mike. "Cosmic Dancers on History's Stage? The Permanent Revolution in the Earth Sciences." *New Left Review* 217 (1996): 48–84.
- Dawkins, Richard. *The Selfish Gene: 30th Anniversary Edition*. Oxford: Oxford University Press, 2006 [1976].
- Dawkins, Richard. *River Out of Eden: A Darwinian View of Life*. London: Hachette, 2014.
- Delamar, Gloria. *Mother Goose, From Nursery to Literature*. Lincoln, Nebraska: iUniverse, 1987.
- Dick, Phillip K. *Do Androids Dream of Electric Sheep?* New York: Doubleday, 1968.
- Donhauser, Justin. "Environmental Robots and Climate Action." In *Handbook of Philosophy of Climate Change*, editors Pellegrino Gianfranco and Marcello Di Paola, 151–161. London: Springer Nature, 2023.

- “Dr. Strangelove: A Continuity Transcript.” *The Kubrick Site*. Accessed 16 February 2021. <http://www.visual-memory.co.uk/amk/doc/0055.html>.
- Duggan, Joe. *Is This How You Feel?* Accessed 14 February 2015. <https://www.isthishowyoufeel.com/this-is-how-scientists-feel.html>.
- Dunstan, Andrew, and Katharine Robertson. *Raine Island Recovery Project: 2016–17 Season Technical Report to the Raine Island Scientific Advisory Committee and Raine Island Reference Group*. Brisbane: Department of National Parks, Sport and Racing, Queensland Government, 2017.
- Dylan, Bob. “A Hard Rain’s a-Gonna Fall.” Track 6 on *The Freewheelin’ Bob Dylan*. Columbia, 1963, LP.
- Dylan, Bob. “Love Minus Zero/No Limit.” Track 4 on *Bringing It All Back Home*. Columbia Records, 1965, LP.
- Early, James. “Space-based Solar Shield to Offset Greenhouse Effect.” *Journal of the British Interplanetary Society* 42 (1989): 567–569.
- Ekhholm, Nils. “On the Variations of the Climate of the Geological and Historical Past and Their Causes.” *Quarterly Journal of the Royal Meteorological Society* 27 (1901): 1–61.
- Eliot, T.S. *The Hollow Men*. London: Faber & Faber, 1925.
- Emmerich, Roland, director. *The Day After Tomorrow*. 20th Century Studios, 2004, 35 mm.
- Espy, James Pollard. *The Philosophy of Storms*. New York: C.C. Little and J. Brown, 1841.
- Fallot, Mathilde. *Golab Waminrg* poster, International Poster Festival of Chaumont, 2007. Accessed 13 December 2015. <https://mathildefallot.com/golab-waminrg>.
- Fiantis, Dian, Frisa Ginting, Gusnidar Nelson, and Budiman Minasny. “Volcanic Ash: Insecurity for the People but Securing Fertile Soil for the Future.” *Sustainability* 11, no. 11 (2019): 1–19.
- Fichte, Johann. *Concerning the Conception of the Science of Knowledge Generally*. Translated by Adolph Ernst Kroeger. London: CreateSpace Independent Publishing Platform, 2017 [1794].
- Fitzgerald, F. Scott. *The Last Tycoon*. New York: Charles Scribner’s Sons, 1941.
- The Flaming Lips. “All We Have Is Now.” Track 10 on *Yoshimi Battles The Pink Robots*. Warner Bros., 2002, LP.
- Fleming, Victor, director. *The Wizard of Oz*. Metro-Goldwyn-Mayer, 1939, 35 mm.
- Francis, Jennifer, and Stephen Vavrus. “Evidence Linking Arctic Amplification to Extreme Weather in Mid-Latitudes.” *Geophysical Research Letters* 39, no. 6 (2012): 1–6.
- Fuller, Buckminster. *Operating Manual for Spaceship Earth*. Carbondale: Southern Illinois University Press, 1969.
- Gadagkar, Raghavendra. “The True Origin of Agriculture: Credit Goes to the Ants.” *Resonance* 5 (2000): 76–79.
- Galarraga, Maialen, and Bronislaw Szerszynski. “Making Climates: Solar Radiation Management and the Ethics of Fabrication.” In *Engineering the Climate: The Ethics of Solar Radiation Management*, editor Christopher Preston, 221–235. Lanham, MD: Lexington Books, 2012.
- Gibson, Laura. “Where Have All Your Good Words Gone?” Track 6 on *Beasts Of Seasons*. Jealous Butcher Records, 2009, LP.
- Gibson, William, interview with Neal Conan. *NPR Talk of the Nation*, 30 November 1999. <https://www.npr.org/programs/talk-of-the-nation/1999/11/30/12966633/>.
- Gibbens, Sarah. “Why this Giant Crack Opened up in Kenya.” *National Geographic News*, 4 April 2018. Accessed 22 February 2021. <https://www.nationalgeographic.com/news/2018/04/east-african-great-rift-valley-crack-spd>.
- Gonzalez, Anthony. “Lower Your Eyelids to Die with the Sun.” Track 15 on *Before the Dawn Heals Us*. Goom, 2005, LP.
- Gore, Al. *An Inconvenient Truth*, director Davis Guggenheim. Paramount Classics, 2006, DVD.

- Goreau, Thomas. "Biorock Arks: The Last Hope for Coral Reefs." *Global Coral Reef Alliance*. Accessed 6 January 2018. http://www.globalcoral.org/_oldgcra/biorock%20arks.htm.
- Great Barrier Reef Foundation. "Mission Accomplished to Re-Shape Raine Island." Media release, 19 September 2017. Accessed 30 July 2020. <https://www.barrierreef.org/news/media-release/mission-accomplished-to-re-shape-raine-island>.
- Greene, Charles, Jennifer Francis, and Bruce Monger. "Superstorm Sandy: A Series of Unfortunate Events?" *Oceanography* 26, no. 1 (2013): 8–9.
- Guest, Val, director. *The Day the Earth Caught Fire*. British Lion Films, 1961, 35 mm.
- Haacke, Hans. *Condensation Cube*, 1963. <https://www.macba.cat/en/obra/r1523-condensation-cube>.
- Halliwell-Phillipps, James. "Three Blind Mice." In *Nursery Rhymes of England*. London: Percy Society, 1842.
- Hansen, James. "Wolf in the Greenhouse." *The New York Times*, 1 August 1989. Accessed 13 December 2015. <http://www.nytimes.com/1989/08/01/opinion/l-let-s-not-count-on-the-earth-to-heal-itself-wolf-in-the-greenhouse-972189.html>.
- Hansen, James. "Why I Must Speak out about Climate Change." Paper presented at TED Conference, Longbeach, US, 28 February 2012. Accessed 13 December 2015. https://www.ted.com/talks/james_hansen_why_i_must_speak_out_about_climate_change/transcript?language=en.
- Hamilton, Clive. "The Banality of Ethics in the Anthropocene." *The Conversation*, 13 July 2015. Accessed 18 February 2021. <https://theconversation.com/the-banality-of-ethics-in-the-anthropocene-part-1-44568>.
- Hamilton, Clive. *Defiant Earth: The Fate of Humans in the Anthropocene*. Cambridge: Polity Press, 2017.
- Hardin, Garrett. "Living on a Lifeboat." *BioScience* 24, no. 10 (1974): 561–568.
- Hardin, Garrett. *Living Within Limits: Ecology, Economics, and Population Taboos*. Oxford: Oxford University Press, 1993.
- Harrison, George. "What Is Life?" Track 5 on *All Things Must Pass*. Apple, 1970, LP.
- Harrison, George. "The Light That Has Lighted The World." Track 3 on *Living in the Material World*. Apple, 1973, LP.
- Hatch, Alden. *Buckminster Fuller: At Home in the Universe*. New York: Hatch, 1974.
- Hickman, Leo. "US Election 2012: Romney and Obama Avoid the Climate Change Elephant." *The Guardian*, 24 August 2012. Accessed 10 June 2016. <http://www.theguardian.com/environment/blog/2012/aug/24/us-election-2012-romney-obama-climate>.
- Hobbes, Thomas. *Leviathan*. London: Bloomsbury Publishing, 2006 [1651].
- Hobbs, Richard, Lauren Hallett, Paul Ehrlich, and Harold Mooney. "Intervention Ecology: Applying Ecological Science in the Twenty-first Century." *BioScience* 61 (2011): 442–450.
- Hoegh-Guldberg, Ove. "Climate Change, Coral Bleaching and the Future of the World's Coral Reefs." *Marine and Freshwater Research* 50, no. 8 (1999): 839–866.
- Hoegh-Guldberg, Ove. "Announcement of the 50 Reefs Initiative." *World Ocean Summit 2017: Financing the Sustainable Ocean Economy*, 22–24 February 2017. Bali, Indonesia.
- Hoegh-Guldberg, Ove, Elvira Poloczanska, William Skirving, and Sophie Dove. "Coral Reef Ecosystems under Climate Change and Ocean Acidification." *Frontiers in Marine Science* 4, no. 158 (2017): 1–20.
- Hopley, David. *Raine Island: Its Past and Present Status and Future Implications of Climate Change: Project Report*. Townsville: School of Earth and Environmental Sciences, James Cook University, 2008.
- Hume, David. *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects*. Auckland: The Floating Press, 2009 [1739].

- Hume, David. "Of Commerce. 1752." In *Essays: Moral, Political, and Literary Part II*, 253–267. Indianapolis: Liberty Classics, 1987 [1777].
- Hume, David. *Dialogues Concerning Natural Religion*. London: Penguin Books, 1990 [1779].
- Hume, David. "On Suicide." In *Essays, Moral, Political, and Literary*, editors Thomas Grose and Thomas Green. London: Longmans, Green, & Co., 1875 [1783].
- Igel, Heiner, Maria-Fernanda Nader, Dieter Kurrle, Ana Ferreira, Joachim Wassermann, and Ulrich Schreiber. "Observations of Earth's Toroidal Free Oscillations with a Rotation Sensor: The 2011 Magnitude 9.0 Tohoku-Oki Earthquake." *Geophysical Research Letters* 38, no. 21 (2011): 1–5.
- Jamieson, Dale. *Reason in a Dark Time: Why the Struggle Against Climate Change Failed and What It Means for Our Future*. Oxford: Oxford University Press, 2014.
- Jaspers, Karl. *The Atom Bomb and the Future of Man*. Translated by Ernst Ashton. Chicago: University of Chicago Press, 1963.
- Jensen, Michael, Camryn Allen, Tomoharu Eguchi, Ian Bell, Erin LaCasella, William Hilton, Christine Hof, and Peter Dutton. "Environmental Warming and Feminization of One of the Largest Sea Turtle Populations in the World." *Current Biology* 28, no. 1 (2018): 154–159.
- Jurgensen, John. "Hollywood's Favourite Cowboy." *The Wall Street Journal*, 20 November 2009. Accessed 1 July 2019. <https://www.wsj.com/articles/SB10001424052748704576204574529703577274572>.
- Kauffman, Stuart. *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. Oxford: Oxford University Press, 1995.
- Keaton, Buster, director. *Steamboat Bill, Jr.* United Artists, 1928, 35 mm.
- Keats, John. "Ode on a Grecian Urn." In *Annals of the Fine Arts for 1819, Volume IV*, editor James Elmes, 638–639. London: Sherwood, Neely, and Jones, 1820.
- Kerouac, Jack. *On the Road*. New York: Viking Press, 1957.
- Kierkegaard, Soren. *Either/Or: A Fragment of Life*. Translated by Alastair Hannay. London: Penguin, 1992 [1843].
- King, Martin Luther, Jr. "I Have a Dream." Transcript of speech delivered at the Lincoln Memorial, Washington, DC, 28 August 1963. Accessed 6 May 2019. <https://www.americanrhetoric.com/speeches/mlkihavedream.htm>.
- Kingsnorth, Paul, and Dougald Hine. *Uncivilisation: The Dark Mountain Manifesto*. Oxford: Dark Mountain Books, 2009.
- Kintisch, Eli. *Hack the Planet: Science's Best Hope or Worst Nightmare for Averting Climate Catastrophe*. Washington, DC: Wiley, 2010.
- Kolbert, Elizabeth. *The Sixth Extinction: An Unnatural History*. New York: Henry Holt and Company, 2014.
- Kosner, Edward. "No Hugging, No Learning: The 'Seinfeld' Credo." *The Wall Street Journal*, 12 August 2016. Accessed 16 February 2021. <https://www.wsj.com/articles/no-hugging-no-learning-the-seinfeld-credo-1471032667>.
- Kubrick, Stanley. Handwritten note card. Archive file SK/11/1/21. University of the Arts London, 1962.
- Kubrick, Stanley, director. *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb*. Columbia Pictures, 1964, 35 mm.
- Kubrick, Stanley. "Stanley Kubrick and Joseph Heller: A Conversation, 1964." In *The Stanley Kubrick Archives*, editor Alison Castle, 352–368. Cologne: Taschen, 2005.
- Kunzig, Robert. "The Sixth Extinction: A Conversation With Elizabeth Kolbert." *National Geographic News*, 19 February 2014. Accessed 17 February 2021. <https://www.nationalgeographic.com/news/2014/2/140218-kolbert-book-extinction-climate-science-amazon-rain-forest-wilderness>.
- Larson, Gary. "Damned if you do, Damned if you don't," from The Far Side. *New York Daily News*, 10 July 1985.

- Larson, Gary. "The Picture's Pretty Bleak," from *The Far Side*. *New York Daily News*, 7 November 1985.
- Larson, Gary, interview with Robert Holguin. "Voice From The 'Far Side': Gary Larson Opens up About Retiring." *The Seattle Times*, 14 October 1994. Accessed 19 February 2021. <https://archive.seattletimes.com/archive/?date=19941014&slug=1935794>.
- Latour, Bruno. "Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern." *Critical Inquiry* 30 (2004): 225–248.
- Latour, Bruno. "Waiting for Gaia: Composing the Common World through Arts and Politics." Transcript of speech delivered at the French Institute, London, 2 November 2011. Accessed 6 May 2019. http://www.bruno-latour.fr/sites/default/files/124-gaia-london-speap_0.pdf.
- Latour, Bruno. *An Inquiry into Modes of Existence: An Anthropology of the Moderns*. Translated by Catherine Porter. Cambridge, MA: Harvard University Press, 2018.
- Laurence, Janet. *Deep Breathing: Resuscitation for the Reef*, 2015. <https://www.janetlaurence.com/natural-history>.
- Lee, D., G. Pitari, V. Grewe, K. Gierens, J. Penner, A. Petzold, M. Prather, U. Schumann, A. Bais, T. Bernsten, D. Iachetti, L. Lim, and R. Sausen. "Transport Impacts on Atmosphere and Climate: Aviation." *Atmospheric Environment* 44, no. 37 (2010): 4678–4734.
- Leopold, Aldo. "Thinking Like a Mountain." In *A Sand County Almanac and Sketches Here and There*, 129–133. Oxford: Oxford University Press, 1949.
- Lovich, Jeffrey, Joshua Ennen, Mickey Agha, and Whitfield Gibbons, "Where Have All the Turtles Gone, and Why Does It Matter?" *BioScience* 68, no. 10 (2018): 771–781.
- Low, Tim. *The New Nature*. Sydney: Penguin, 2002.
- Macmillan International Dictionary of Films and Filmmakers Volume 1*, editor Christopher Lyon. New York: Firethorn Press, 1984.
- Makoto, Azuma. *Exobotanica – Botanical Space Flight*, 2014. <http://exobotanica.com/award>.
- Margulis, Lynn. "Symbiogenesis and Symbioticism." In *Symbiosis as a Source of Evolutionary Innovation Speciation and Morphogenesis*, editors Lynn Margulis and René Fester, 1–20. Cambridge, MA: MIT Press, 1991.
- Margulis, Lynn, and Dorion Sagan. *What Is Life?* New York: Simon & Schuster, 1995.
- Marx, Karl, and Friedrich Engels. *Manifesto of the Communist Party*. Chicago: CH Kerr and Company, 1906 [1848].
- Mattocks, Neil. "Natural History and Research and Management of Raine Island's Green Turtle Rookery." *eAtlas*, 12 August 2014. Accessed 6 May 2019. <https://eatlas.org.au/ts/raine-turtles>.
- Macey, Richard. "Lofty Ambitions for Zero-Gravity Native Seeds." *The Sydney Morning Herald*, 7 August 2008.
- MacFarlane, Robert. "What Lies Beneath: Robert Macfarlane Travels 'Underland.'" *The Guardian*, 4 April 2019. Accessed 1 July 2019. <http://www.theguardian.com/books/2019/apr/20/what-lies-beneath-robert-macfarlane>.
- MacKay, Charles. *Extraordinary Popular Delusions and the Madness of Crowds*. London: Simon and Schuster, 2012 [1841].
- Mann, Barry, and Cynthia Weil. *New World Coming*. Columbia Music, 1970.
- Martin, John. "Woods Hole Oceanographic Institution Journal Club lecture." Transcript of speech delivered at Woods Hole Oceanographic Institution, Massachusetts, US, July 1988. Accessed 18 February 2021. <https://earthobservatory.nasa.gov/features/Martin>.
- Mautner, Michael. *Seeding the Universe with Life – Securing Our Cosmological Future*. Weston, Florida: Legacy Books, 2004.
- McCalman, Iain. *The Reef: A Passionate History*. London: Scribe Publications, 2014.
- McCarthy, Cormac. *The Road*. New York: Alfred A. Knopf, 2006.

- McCarthy, Cormac. *The Sunset Limited*. New York: Vintage International, 2008.
- McLean, Robert, Allana Welsh, and Valerie Casasanto. "Microbial Survival in Space Shuttle Crash." *Icarus* 181, no. 1 (2006): 323–325.
- McNeil, John. *Something New Under the Sun: An Environmental History of the Twentieth-Century World*. New York: W. W. Norton & Company, 2000.
- Meadows, Donella. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. New York: Universe, 1972.
- Meeker, Joseph. "The Comedy of Survival." *The North American Review* 257 (1972): 11–17.
- Meeker, Joseph. *The Comedy of Survival: Studies in Literary Ecology*. New York: Scribner, 1974.
- Merica, Dan. "Sandy Reminds Us of Climate Change and Other Forgotten Campaign Issues." *Cable News Network*, 30 October 2012. Accessed 10 June 2016. <http://www.cnn.com/2012/10/30/politics/forgotten-campaign-issues/index.html>.
- Michaelson, Jay. "Geoengineering: A Climate Change Manhattan Project." *Stanford Environmental Law Journal* 17, no. 73 (1998): 1–86.
- Michaelson, Jay. "Geoengineering and Climate Management: From Marginality to Inevitability." *Tulsa Law Review* 14 (2010): 1–39.
- Milankovitch, Milutin. *Canon of Insolation of the Earth and Its Application to the Problem of the Ice Ages*. Translated by Israel Program for Scientific Translation. Washington, DC: US Department of Commerce and the National Science Foundation, 1969.
- Milligan, Spike, director. *The Goon Show*. Season 5, episode 3, "The Dreaded Batter Pudding Hurler. Of Bexhill-On-Sea." Aired British Broadcasting Corporation, 12 October 1954.
- Minchin, Liz. "Scientist's 'Russian Roulette' Climate Warning." *The Age*, 29 January 2007. <https://www.theage.com.au/national/scientists-russian-roulette-climate-warning-20070129-ge43g4.html>.
- Missouri Botanical Garden. "Climatron: Geodesic Dome Conservatory." *Missouri Botanical Garden*. Accessed 16 June 2016. <http://www.missouribotanicalgarden.org/gardens-gardening/our-garden/gardens-conservatories/conservatories/climatron.aspx>.
- Mooney, Chris. "What We're Doing to the Earth Has No Parallel in 66 Million Years, Scientists Say." *Washington Post*, 22 March 2016. Accessed 4 February 2019. <https://www.washingtonpost.com/news/energy-environment/wp/2016/03/21/what-were-doing-to-the-earth-has-no-parallel-in-66-million-years-scientists-say/>.
- Morton, Oliver. *The Planet Remade: How Geoengineering Could Change the World*. Princeton: Princeton University Press, 2017.
- Morton, Timothy. *The Ecological Thought*. Cambridge, Mass: Harvard University Press, 2012.
- The Mothers of Invention. *Freak Out!* Verve Records, 1966, LP.
- Muir, John. *My First Summer in the Sierra*. Boston: Houghton Mifflin, 1988 [1911].
- Munch, Edvard, "Nice 22 January 1892," diary entry.
- Munch, Edvard, *The Scream*, 1893.
- Murphy, Daniel, S. Solomon, R. Portmann, K. Rosenlof, P. Forster, and T. Wong. "An Observationally Based Energy Balance for the Earth since 1950." *Journal of Geophysical Research* 114, no. 17 (2009): 1–14.
- Nietzsche, Friedrich. *Thus Spoke Zarathustra*, editor Robert Pippin. Cambridge: Cambridge University Press, 2006 [1884].
- O'Dea, Aaron, Harilaos Lessios, Anthony Coates, Ron Eytan, Sergio Restrepo-Moreno, Alberto Cione, Laurel Collins, Alan de Queiroz, David Farris, Richard Norris, Robert Stallard, Michael Woodburne, Orangel Aguilera, Marie-Pierre Aubry, William Berggren, Ann Budd, Mario Cozzuol, Simon Coppard, Herman Duque-Caro, Seth Finnegan, German Gasparini, Ethan Grossman, Kenneth Johnson, Lloyd Keigwin, Nancy Knowlton, Egbert Leigh, Jill Leonard-Pingel, Peter Marko,

- Nicholas Pyenson, Paola Racheo-Dolmen, Esteban Soibelzon, Leopoldo Soibelzon, Jonathan Todd, Geerat Vermeij, and Jeremy Jackson. "Formation of the Isthmus of Panama." *Science Advances* 2, no. 8 (2016): 1–11.
- O'Neill, Luke, and Michael Murphy, editors. *What is Life? The Next Fifty Years: Speculations on the Future of Biology*. Cambridge: Cambridge University Press, 1995.
- Oppenheimer, Clive. "Limited Global Change due to the Largest Known Quaternary Eruption, Toba ≈74kyr BP?" *Quaternary Science Reviews* 21 (2002): 1593–1609.
- Oram Lyte, Eliphalet. "Row, Row, Row Your Boat." In *The Franklin Square Song Collection*. New York: Harper & Brothers, 1881.
- Oxford English Dictionary. Oxford: Oxford University Press. Sixth Edition, 2007.
- Paglan, Trevor. *The Last Pictures*, 2012. <https://creativetime.org/projects/the-last-pictures>.
- Parker, Ross, and Hughie Charles. *We'll Meet Again*. Michael Ross Limited, 1939.
- Parker, Trey, director. *South Park*. Season 9, episode 8, "Two Days Before The Day After Tomorrow." Aired Comedy Central, 19 October 2005.
- Parker, Trey, director. *South Park*. Season 22, episode 6, "Time to Get Cereal." Aired Comedy Central, 7 November 2018.
- Parker, Trey, director. *South Park*. Season 22, episode 7, "Nobody Got Cereal?" Aired Comedy Central, 14 November 2018.
- Patterson, John. "Dr. Strangelove: No 6 Best Comedy Film of All Time." *The Guardian*, 18 October 2010. Accessed 16 February 2021. <https://www.theguardian.com/film/2010/oct/18/dr-strangelove-kubrick-comedy>.
- Praetorius, Summer, Alan Mix, Britta Jensen, Duane Froese, Glenn Milne, Matthew Wolhowe, Jason Addison, and Fred Prah. "Interaction Between Climate, Volcanism, and Isostatic Rebound in Southeast Alaska During the Last Deglaciation." *Earth and Planetary Science Letters* 452 (2016): 79–89.
- Preston, Christopher. "Introduction: Climate Justice and Geoengineering." In *Climate Justice and Geoengineering: Ethics and Policy in the Atmospheric Anthropocene*, editor Christopher Preston, vii–iii. New York: Rowman & Littlefield International, 2016.
- Preston, Christopher. *The Synthetic Age: Outdesigning Evolution, Resurrecting Species, and Reengineering Our World*. Massachusetts: MIT Press, 2018.
- Purdy, Jedediah. *After Nature: A Politics for the Anthropocene*. Cambridge, MA: Harvard University Press, 2015.
- Queensland Parks & Wildlife Service and Partnerships. "Raine Island National Park (Scientific): Resource Information." Queensland Parks & Wildlife Service and Partnerships, 2021. Accessed 25 July 2024. https://parks.des.qld.gov.au/__data/assets/pdf_file/0016/230290/raine-island-res-info.pdf.
- Radiohead. "Idioteque." Track 8 on *Kid A*. Parlophone, 2000, LP.
- Radiohead. "2+2=5." Track 1 on *Hail to the Thief*. EMI, 2003, LP.
- Radiohead. "Bodysnatchers." Track 2 on *In Rainbows*. XL, 2007, LP.
- Radiohead. "Bloom." Track 1 on *The King of Limbs*. XL, 2011, LP.
- Radiohead. "Daydreaming." Track 2 on *A Moon Shaped Pool*. XL, 2016, LP.
- Radiohead. "Present Tense." Track 9 on *A Moon Shaped Pool*. XL, 2016, LP.
- Ravenscroft, Thomas. "Three Blind Mice." In *Deuteromelia or The Seconde part of Musicks Melodie, or Melodius Musicke of Pleasant Roundalajes*. London: Thomas Adams, 1609.
- Redford, Kent, and William Adams. *Strange Natures Conservation in the Era of Synthetic Biology*. Yale: Yale University Press, 2021.

- Regis, Ed. *What Is Life? Investigating the Nature of Life in the Age of Synthetic Biology*. Oxford: Oxford University Press, 2009.
- Revelle, Roger, Wallace Broecker, Charles Keeling, Harmon Craig, and J Smagorinsky. *Restoring the Quality of Our Environment: Report*. Washington, DC: The President's Science Advisory Committee: Environmental Pollution Panel, 1965.
- Rich, Byron. *M-Ark I (Microbiome Ark)*, 2017. <https://www.byronrich.com/M-Ark-I-Microbiome-Ark-2017>.
- Richards, Mark, Walter Alvarez, Stephen Self, Leif Karlstrom, Paul Renne, Michael Manga, Courtney Sprain, Jan Smit, Loïc Vanderkluyzen, and Sally Gibson. "Triggering of the largest Deccan Eruptions by the Chicxulub Impact." *GSA Bulletin* 127, nos. 11–12 (2015): 1507–1520.
- Richerson, Peter, Robert Boyd, and Robert Bettinger. "Was Agriculture Impossible During the Pleistocene but Mandatory During the Holocene? A Climate Change Hypothesis." *American Antiquity* 66, no. 3 (2001): 387–411.
- Richter, Max. *Sleep*. Deutsche Grammophon, 2015, LP.
- Richter, Max. "Inside Max Richter's Vinyl Collection: Aphex Twin, Bach, Grouper and More." *The Guardian*, 2 September 2015. Accessed 27 August 2018. <https://www.theguardian.com/music/musicsblog/2015/sep/01/aphex-twin-bach-grouper-max-richter-vinyl-playlist>.
- Rizzo, Anthony, director. *Duck and Cover*. Archer Productions, 1952, 16 mm.
- Rosenfelt, Rachel. "This Civilization Is Over. And Everybody Knows It." *Versobooks* blog post, 21 April 2015. Accessed 18 February 2021. <https://www.versobooks.com/blogs/1950-this-civilization-is-over-and-everybody-knows-it>.
- Sage, Rowan. "Was Low Atmospheric CO₂ During the Pleistocene a Limiting Factor for the Origin of Agriculture?" *Global Change Biology* 1 (1995): 93–106.
- Sammarco, Paul, 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): 129–143.
- Sanders, Robert. "Did Dinosaur-Killing Asteroid Trigger Largest Lava Flows on Earth?" *Berkeley News*, 29 May 2015. Accessed 8 January 2018. <https://news.berkeley.edu/2015/04/30/did-dinosaur-killing-asteroid-trigger-largest-lava-flows-on-earth>.
- Schopenhauer, Arthur. *The World as Will and Idea*. Translated by R. Haldane and J. Kemp. London: Routledge & Kegan Paul, 1907 [1818].
- Schopenhauer, Arthur. *Studies in Pessimism: The Essays*. Translated by Thomas Saunders. Whitefish, MT: Kessinger Publishing, 2004 [1893].
- Scott, Ridley, director. *Blade Runner*. Warner Bros., 1982, 35 mm.
- Sendak, Maurice. *Where the Wild Things Are*. San Francisco: Harper & Row, 1963.
- Serres, Michel. *The Natural Contract*. Translated by Elizabeth MacArthur and William Paulson. Ann Arbor: University of Minnesota Press, 1995 [1992].
- Shabecoff, Philip. "Global Warming Has Begun, Expert Tells Senate." *The New York Times*, 24 June 1988. Accessed 13 December 2015. <http://www.nytimes.com/1988/06/24/us/global-warming-has-begun-expert-tells-senate.html>.
- Shakespeare, William. *King Lear*. Oxford: Oxford University Press, 1957 [1606].
- Shakespeare, William. *As You Like It*. Oxford: Oxford University Press, 2008 [1623].
- Shaw, Elizabeth. *Visionary Architecture* Press Release. New York: New York Museum of Modern Art, 1960.
- Shea, John. "Homo Sapiens is as Homo Sapiens was: Behavioral Variability vs. 'Behavioral Modernity' in Paleolithic Archaeology." *Current Anthropology* 52, no. 1 (2011): 1–35.
- Shelley, Mary. *Frankenstein, or the Modern Prometheus*. New York: Open Road Media, 2014 [1818].
- Shelley, Percy. "Ozymandias." *The Examiner* 524, 11 January 1818, 24.

- Silverman, David, director. *The Simpson's Movie*. 20th Century Fox, 2007, 35 mm.
- Simone, Nina. "An Artist's Duty." *Black Journal*, episode director William Greaves. Aired National Educational Television, 27 October 1969.
- Simone, Nina. *I Put a Spell on You: The Autobiography of Nina Simone*. New York: Pantheon, 1992.
- Siraj, Amir, and Abraham Loeb. "Breakup of a Long-Period Comet as the Origin of the Dinosaur Extinction." *Scientific Reports* 2 (2021): 3803.
- Skeptical Science*. "Our Climate has Accumulated 4,901,982,836 Hiroshima Atomic Bombs of Heat Since 1970 as of 11:08:59 am, 21 February 2021." Accessed 21 February 2021. <http://skepticalscience.net/widgets>.
- Slezak, Michael. "Asteroid Killed Dinosaurs by Setting Oil Aflame and Spreading Soot, Says Study." *The Guardian*, 14 July 2016. Accessed 6 May 2019. <https://www.theguardian.com/science/2016/jul/14/asteroid-killed-dinosaurs-by-setting-oil-aflame-and-spreading-soot-says-study>.
- Smil, Vaclav. "Harvesting the Biosphere: The Human Impact." *Population and Development Review* 37, no. 4 (2011): 613–636.
- Smith, Felisa, Rosemary Smith, Kathleen Lyons, and Jonathan Payne. "Body Size Downgrading of Mammals over the Late Quaternary." *Science* 360, no. 6386 (2018): 310–313.
- Smith, Kristianna. "Beirut: A Jet-Setter Settles Down." *NPR.org*, 10 September 2011. Accessed 7 December 2015. <http://www.npr.org/2011/09/10/140318038/beirut-a-jet-setter-settles-down>.
- Sorensen, Asger. "On a Universal Scale: Economy in Bataille's General Economy." *Philosophy & Social Criticism* 38, no. 2 (2012): 169–197.
- Sovacool, Benjamin, Chad Baum, Sean Low, and Livia Fritz. "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.
- Sullivan, John. *Beethoven: His Spiritual Development*. New York: Alfred A. Knopf, 1936.
- Spencer, Herbert. *Principles of Biology*. New York: D. Appleton and Company, 1864.
- Spinoza, Benedict de. *Ethics Part IV: Of Human Bondage or the Strength of the Emotions*. Translated by Robert Elwes. Alexandria: Library of Alexandria, 1901 [1677].
- Stevens, Sufjan. "The Only Thing." Track 7 on *Carrie & Lowell*. Asthmatic Kitty, 2015, LP.
- Strauss, Richard. *Four Last Songs*. London: Boosey & Hawkes, 1948.
- Suess, Eduard. *Die Entstehung der Alpen*. Vienna: Braumüller Verlag, 1875.
- Szerszynski, Bronislaw. "Colouring Climates: Imagining a Geengineered World." In *Routledge Handbook of the Environmental Humanities*, editors Ursula Heise, Jon Christensen, and Michelle Niemann, 82–90. London: Routledge, 2017.
- Taylor, Jason de Cares. *Museum of Underwater Art*, 2017. <https://www.moua.com.au>.
- Tennyson, Alfred Lord. *In Memoriam A. H. H.* London: Edward Moxon, 1850.
- Tezuka, Osamu, director. *Astro Boy*, episode 29, "The Great Meltdown." Aired Nippon TV, 12 November 1982.
- Thatcher, Margaret. "Speech to the United Nations General Assembly, (Global Environment)." Transcript of speech delivered at the United Nations Building, New York, 8 November 1989. Accessed 6 May 2019. <https://www.margaretthatcher.org/document/107817>.
- 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>.
- Thomas, Lewis. *Lives of a Cell: Notes of a Biology Watcher*. New York: Penguin, 1978.
- Thunberg, Greta. "Our House Is On Fire." Transcript of speech delivered at the World Economic Forum, Davos, Switzerland, 25 January 2019. Accessed 6 May 2019. <https://awpc.cattcenter.ias.tate.edu/2019/12/02/address-at-davos-our-house-is-on-fire-jan-25-2019>.

- Thunberg, Greta. "It's 2019. Can we all now please stop saying 'climate change' and instead call it what it is: climate breakdown, climate crisis, climate emergency, ecological breakdown, ecological crisis and ecological emergency? #ClimateBreakdown #EcologicalBreakdown." Twitter. 3:14 am, 5 May 2019. Accessed 6 May 2019. <https://twitter.com/gretathunberg/status/1124723891123961856?s=11>.
- Travis, David, Andrew Carleton, and Ryan Lauritsen. "Contrails Reduce Daily Temperature Range." *Nature* 418 (2002): 601.
- Trier, Lars von, director. *Melancholia*. Nordisk Film, 2011, 35 mm.
- Trier, Lars von. "Director's Statement – Lars von Trier." *Melancholia* Press Kit. Magnolia Pictures, 2011.
- Trier, Lars von, interview with Juul Carlsen. "The Only Redeeming Factor is the World Ending." *Danish Film Institute*, 4 May 2011. Accessed 18 February 2021. <http://www.dfi.dk/Service/English/News-and-publications/FILM-Magazine/Artikler-fra-tidsskriftet-FILM/72/The-Only-Redeeming-Factor-is-the-World-Ending.aspx>.
- Tyndall, John. "The Bakerian Lecture: On the Absorption and Radiation of Heat by Gases and Vapours, and on the Physical Connexion of Radiation, Absorption and Conduction." *Philosophical Transactions of the Royal Society* 151 (1861): 1–36.
- United Nations General Assembly 43rd session, 1988–1989. *Protection of Global Climate for Present and Future Generations of Mankind*. A/RES/43/53. New York: United Nations, 1989.
- Valen, Leigh van. "A New Evolutionary Law." *Evolutionary Theory* 1 (1973): 1–30.
- Vesna, Victoria. "Introduction to Buckminster Fuller." *Buckminster Fuller Institute*. Accessed 16 June 2016. <https://bfi.org/about-fuller/biography/introduction-buckminster-fuller>.
- Villeneuve, Denis, director. *Blade Runner 2049*. Warner Bros. Pictures, 2017, 35 mm.
- Vitorino, Ana Paula, 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.
- Wade, Nicholas. "Crying Wolf in the Greenhouse." *The New York Times*, 3 July 1989. Accessed 13 December 2015. <http://www.nytimes.com/1989/07/03/opinion/the-editorial-notebook-crying-wolf-in-the-greenhouse.html>.
- Walker, Gabrielle. *An Ocean of Air: A Natural History of the Atmosphere*. London: Bloomsbury, 2010.
- Wallace, Alfred Russel. *The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas as Elucidating Past Changes of the Earth's Surface*. New York: Harper, 1876.
- Wallace-Wells, David. *The Uninhabitable Earth: Life after Warming*. New York: Tim Duggan Books, 2019.
- Walsh, Bryan. "Why Climate Change Has Become the Missing Issue in the Presidential Campaign." *Time*, 23 October 2012. Accessed 10 June 2016. <http://science.time.com/2012/10/23/why-climate-change-has-become-the-missing-issue-in-the-presidential-campaign>.
- Weber, Max. *The Protestant Ethic and the Spirit of Capitalism*. London: George Allen & Unwin, 1930 [1905].
- Week, Abby. "How Obama Softened on Climate Change," *ABC News*. 2 November 2012. Accessed 10 June 2016. <http://abcnews.go.com/blogs/politics/2012/11/barack-obamas-evolution-on-climate-change-a-brief-history>.
- Welch, Craig. "99% of Australian Green Sea Turtles Studied Turning Female From Climate Change." *National Geographic*, 8 January 2018. Accessed 6 May 2019. <https://www.nationalgeographic.com/science/article/australia-green-sea-turtles-turning-female-climate-change-raine-island-sex-temperature>.
- Wexler, Harry. "On the Possibilities of Climate Control." In James Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control*. New York: Columbia University Press, 2010.
- Whale, James, director. *Frankenstein*. Universal Pictures, 1931, 35 mm.

- Wilde, Oscar. "Lady Windermere's Fan." In *The Importance of Being Earnest and Other Plays*. London: Penguin, 1940 [1895].
- Wilkes, David. "The Sealed Bottle Garden Still Thriving After 40 Years Without Fresh Air or Water." *Daily Mail Online*, 24 January 2013. Accessed 16 June 2016. http://www.dailymail.co.uk/science_tech/article-2267504/The-sealed-bottle-garden-thriving-40-years-fresh-air-water.html.
- Williams, John, Jessica Blois, Jacquelyn Gill, Leila Gonzales, Eric Grimm, Alejandro Ordonez, Bryan Shuman, and Samuel Veloz. "Model Systems for a No-Analog Future: Species Associations and Climates during the Last Deglaciation: No-Analog Species Associations and Environments." *Annals of the New York Academy of Sciences* 1297 (2013): 29–43.
- Williams, Tennessee. *The Milk Train Doesn't Stop Here Anymore*. New York: Dramatists Play Service, Incorporated, 1998 [1963].
- Wilson, Edward, *The Future of Life*. New York: Vintage, 2003.
- Wilson, Edward, *The Creation: An Appeal to Save Life on Earth*. New York: Norton, 2006.
- Yorke, Thom. "And It Rained All Night." Track 7 on *The Eraser*. XL, 2006, LP.
- Yorke, Thom. "Interference." Track 3 on *Tomorrow's Modern Boxes*. XL, 2014, LP.
- Yu, Hongbin, Mian Chin, Tianle Yuan, Huisheng Bian, Lorraine Remer, Joseph Prospero, Ali Omar, David Winker, Yuekui Yang, Yan Zhang, Zhibo Zhang, and Chun Zhao. "The Fertilizing Role of African Dust in the Amazon Rainforest: A First Multiyear Assessment Based on Data from Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations." *Geophysical Research Letters* 42 (2015): 1984–1991.
- Yusoff, Kathryn. "The Geoengine: Geoengineering and the Geopolitics of Planetary Modification." *Environment and Planning A* 45, no. 12 (2013): 2799–2808.
- Zalasiewicz, Jan. *The Earth After Us: What Legacy Will Humans Leave in the Rocks?* Oxford: Oxford University Press, 2008.
- Zeebe, Richard, Andy Ridgwell, and James Zachos, "Anthropogenic Carbon Release Rate Unprecedented During the Past 66 Million Years." *Nature Geoscience* 9, no. 4 (2016): 325–329.