

An aerial satellite-style photograph of a tropical cyclone, showing a well-defined eye and spiral cloud bands over a dark blue ocean. The storm is moving towards the bottom left of the frame, where it meets a sandy beach. The water near the shore is a lighter, brownish color, indicating shallow depths and possibly sediment stirred up by waves.

SCIENCE FICTION & CLIMATE CHANGE

A Sociological Approach

Andrew Milner &
J.R. Burgmann

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AND CLIMATE CHANGE

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ANDREW MILNER
AND J.R. BURGMANN

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Riley Milner (born 6 February 2018) and
Hadley Burgmann (born 29 November 2018)
in the hope of a Green future.

And in memory of Dave Shaw, environmental activist
and 'Green Ban' militant in the New South Wales
Builders Labourers' Federation, killed at work on
20 December 1978.

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Contents

Acknowledgements	ix
1. Ice, Fire and Flood: A Short Pre-history of Climate Fiction	1
1. Flood Narratives: Gilgamesh and Noah	3
2. Flood Narratives in Modern Science Fiction	5
3. Ice and Fire	14
4. Conclusion	20
2. A Theoretical Interlude	23
1. Cli-fi and SF	23
2. Ecocriticism, Anthropocentrism and the Anthropocene	28
3. Cli-fi and the Sociology of Literature	35
4. Towards an Ideal Typology of Climate Fictions	40
5. Narrative Strategies and Tactics	48
3. Climate Fiction and the World Literary System	51
1. <i>Heat</i> and <i>The Sea and Summer</i>	51
2. Science Fiction and the World Literary System	55
3. Climate Fiction and the World Literary System	63
4. The Classical Dystopia in Climate Fiction	75
1. Denial	77
2. Mitigation	80
3. Negative Adaptation	82
4. Positive Adaptation	87
5. Gaia	92

5. The Critical Dystopia in Climate Fiction	99
1. Denial	99
2. Mitigation	101
3. Negative Adaptation	103
4. Positive Adaptation	110
5. Gaia	115
6. The Problem of Fatalism in Dystopian Climate Fiction	122
1. Fatalism in the Classical Dystopia	122
2. Fatalism in the Critical Dystopia	129
3. Time-travelling and Fatalism	137
7. Base Reality Texts and Eutopias	146
1. Base Reality Texts	147
2. (Mainly) Critical Eutopias	157
3. Cli-fi Narratives in Summary	168
8. Cli-fi in Other Media	171
1. Other Print Media	171
2. Recorded Popular Music	178
3. Audio-visual Media	182
9. Changing the Climate: Some Provisional Conclusions	190
Bibliography	195
Index	217

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Chapter 1

Ice, Fire and Flood: A Short Pre-history of Climate Fiction

Despite intermittent upsurges of climate change scepticism among conservative politicians and journalists in the Anglosphere, there is now a near consensus among climate scientists – and indeed among most other scientists – that current levels of atmospheric greenhouse gas are sufficient to alter global weather patterns to possibly disastrous effect. Recent projections of the Intergovernmental Panel on Climate Change (IPCC) point to global surface temperature increases of between 0.3 and 4.8 degrees between 1986–2005 and 2081–2100 and global rises in sea level of between 26 and 82 centimetres (Stocker et al., 2013: 23). Subsequent research by the US National Oceanic and Atmospheric Association (NOAA), factoring in the effects of marine ice-sheet instability in Greenland and the Antarctic, points to global rises in sea level of between 30 and 250 centimetres by 2100 (Goodell, 2017: 304). There is also evidence that recent increases in heat waves and flooding are related to climate change; and that these indicate ‘significant vulnerability’ to climate variability on the part of both ecosystems and human systems (Bindoff and Stott et al., 2013: 871; Field et al., 2014: 6). Despite the 25 United Nations climate change conferences held between 1995 and 2019, carbon emissions continue to rise on what the IPCC describes as a ‘business as usual’ basis. The results are already apparent. As Peter Wadhams, Professor of Ocean Physics at Cambridge, observes, whereas during the 1970s sea ice covered some 8 million square kilometres of the surface of the Arctic Ocean, by 2012 this had fallen to only 3.4 million square kilometres; and, by the end of 2015, 238 ships had successfully sailed through the once impassable Northwest Passage (Wadhams, 2016: 2). The science is no longer seriously in question, but nonetheless it is routinely ignored. As Wadhams himself concludes: ‘Everyone knows that exponential growth ... will lead only to disaster, yet every finance minister seeks to encourage economic growth’ (Wadhams, 2016: 173).

How is it, then, that this scientific consensus can be so widely acknowledged and yet simultaneously ignored? For the distinguished Indian novelist and literary critic, Amitav Ghosh, the answer lies in the fact that climate change is a fundamentally collective process, while the dominant culture is one 'in which the idea of the collective has been exiled from politics, economics, and literature alike' (Ghosh, 2016: 80). The third term here – literature – might seem surprising, but it is central to Ghosh's argument that 'ours was a time when most forms of ... literature were drawn into the modes of concealment that prevented people from recognising the realities of their plight' (Ghosh, 2016: 11). This was so, he concludes, because 'serious prose fiction' had become overwhelmingly committed to versions of literary realism that depend for their efficacy on notions of everyday probability. Climate change, by contrast, necessarily involves everyday improbabilities: radically extreme weather events on the one hand, a non-human nature that is both sentient and proactive on the other. The irony of the realist novel, he observes, is that 'the very gestures with which it conjures up reality are actually a concealment of the real' (Ghosh, 2016: 23). Radical improbabilities are therefore normally banished from what is conventionally regarded as 'literary fiction' into the 'generic outhouses' of fantasy, horror and science fiction (henceforth SF) (Ghosh, 2016: 24).

Some obvious objections come to hand: that much modernist fiction is not so much realist as magical-realist; and that SF has of late become increasingly incorporated into the literary mainstream. More seriously, Ghosh's argument remains complicit with the binary opposition between 'literary' and 'genre' fiction it promises to undermine. So, when he tries to come up with the names of 'writers whose imaginative work has communicated a ... sense of the accelerating changes in our environment', Ghosh concludes that 'of literary novelists writing in English only a handful of names come to mind: J.G. Ballard, Margaret Atwood, Kurt Vonnegut Jr, Barbara Kingsolver, Doris Lessing, Cormac McCarthy, Ian McEwan and T. Coraghessan Boyle' (Ghosh, 2016: 124–125). The problem is obvious: Ballard, Vonnegut and Lessing were, by any reasonable standard, 'genre' SF writers; and the particular texts by the other writers that Ghosh has in mind – Atwood's *MaddAddam* trilogy, Kingsolver's *Flight Behavior*, McCarthy's *The Road*, McEwan's *Solar*, Boyle's *A Friend of the Earth* – are again, by any reasonable standards, very clearly science-fictional in character. But his main conclusion stands: if literature (and the other arts) are indeed crucial mechanisms by which human societies come to understand themselves, then our arts have singularly failed to understand the threat posed by 'anthropogenic' climate change, that is climate change caused by human activity; and

that the significant exceptions to this observation lie overwhelmingly in genre fiction, most especially SF. Our purposes here are not so much to mount an indictment of literary fiction, however, as to explore how SF itself has come to terms with climate change. And we do so, moreover, in the hope of further enhancing the genre's colonisation of the literary and cultural mainstream; or, if that metaphor seems too (post-) colonial for comfort, of encouraging its capture of the commanding heights of the literary and cultural economy.

1. Flood Narratives: Gilgamesh and Noah

Climate is an important aspect of fictional scene setting, whether it be geographical – are we in the desert or in the tropics? – or seasonal – is it winter or is it summer? And SF seems particularly predisposed to use climate as explanatory shorthand. So, to take an obvious example, in George Lucas's first *Star Wars* trilogy, Tatooine is rapidly established as a desert planet, Hoth as an ice planet, Endor as a temperate forest moon. These are merely scene-setting devices, however, essentially weather on the grand scale and, thus, rather different from the kind of plot devices in which catastrophic or, at least, potentially catastrophic climate change actually comes to drive the narrative. Treatments of catastrophic climate change in both print and audio-visual SF have tended to be organised around three main tropes: the new ice age, the burning world and the drowned world; or, more succinctly, ice, fire and flood. Of these, only the last has a deep history in the Western mythos, dating back to the story of Noah in *Bereshith/Genesis* VI–IX and arguably, before it, to the story of Ūta-napišti in the *Sha naqba īmuru/Epic of Gilgamesh* Tablet XI. The Biblical flood narrative is part of the Christian 'Pentateuch' or the Jewish 'Sefer Torah', reputedly written down by Moses in the thirteenth century BCE. However, most contemporary scholars regard it as either exilic or post-exilic, which would make it a written rather than an oral text, dating from the sixth to the fourth century BCE. The Gilgamesh flood narrative is very much earlier, dating from the thirteenth to the tenth century BCE. *Bereshith* was written down in Hebrew, probably on papyrus scrolls, the *Sha naqba īmuru* in Cuneiform script, representing the Akkadian language, on clay tablets. *Bereshith* is still part of the common cultural heritage of the monotheistic religions, Judaism, Christianity, Islam, Mormonism and the Bahá'í faith, but its flood narrative probably derives very substantially from the older Akkadian story.

In the stories both of Ūta-napišti and of Noah the causes of their great floods are not so much anthropogenic as what we might call 'theogenic'.

In the *Sha naqba īmuru*, the flood is essentially a device to explain how a human being, Ūta-napišti the Faraway, acquired immortality and, by extension, why the epic hero, Gilgamesh King of Uruk, and other humans cannot do so. Ūta-napišti tells Gilgamesh that the gods Anu, Enlil, Ninurta, Ennugi and Ea decided to send a great flood to destroy humanity; that Ea, however, warned Ūta-napišti of how to escape the flood; that Enlil was subsequently enraged to discover that any humans had survived; that Ishtar and Ea then rebuked Enlil; who, in turn, then relented and granted the gift of immortality to Ūta-napišti and his wife. In outline, this story bears little resemblance to that in *Bereshith*, but many of the details are nonetheless surprisingly similar.¹ In the *Sha naqba īmuru*, Ea tells Ūta-napišti to build a boat, giving him very detailed instructions as to its size and design; Ūta-napišti and his family, his craftsmen and his animals, board the craft (XI: 23–31); there is then a great storm and flood that lasts for six days and seven nights, during which all other human beings are destroyed (XI: 128–131); Ūta-napišti's boat then runs aground on Mount Nimuš; he releases, by turn, a dove, a swallow and a raven; and, when the raven fails to return, he opens the boat and frees its inhabitants (XI: 147–156); he then offers a sacrifice to the gods, who savour its smell and gather around sympathetically (XI: 161–163). In *Bereshith*, God tells Noah to build a boat, giving him very detailed instructions as to its size and design; Noah, his family and his animals board the craft; there is then a great storm and flood which lasts for 40 days and 40 nights, during which all other human beings are destroyed (VII: 23); Noah's boat then runs aground on Mount Ararat; he releases a raven and then three times releases a dove; and, when the dove fails to return, he opens up the boat and frees its inhabitants (VIII: 7–9, 12); he then offers a sacrifice to God, who savours its smell and decides never again to destroy life on earth (VIII: 21). There are important differences between the two texts, of course, not least that the earlier is polytheistic, the later monotheistic. Perhaps as a result, the flood is a matter of divine caprice in the *Sha naqba īmuru*, but of divine justice in *Bereshith* (VI: 5, 7). Perhaps also as a result, while Ūta-napišti and his wife receive merely personal gifts of immortality from Enlil, Noah receives from God a covenant, the so-called 'rainbow covenant', promising never again to use a deluge against humanity (IX: 11, 13).

Whether *Bereshith* derives from the *Sha naqba īmuru* or both from an even older common source, such as the eighteenth century BCE Akkadian epic of *Atra-Hasis*, there is no denying either the power of

¹ Our sources here are George (2003), Elliger and Rudolph (1988) and the Authorised Version of the King James *Bible*.

the flood narrative nor its enduring influence over subsequent Judaeo-Christo-Islamic culture. Prior to the emergence of modern SF, extreme climate change was normally understood as either theogenic or what we might call 'geogenic', that is the result of such terrestrial natural causes as earthquakes. The second motif, although not the first, persists into SF, for example in twentieth century ice age fictions, which extrapolate from the geological record to imagine near catastrophic ends to the current inter-glacial. But, as SF became focussed on the consequences, positive or negative, of human mastery over nature by way of science and technology, so it became possible to conceive of properly anthropogenic climate change. And, once humanity had imagined itself capable of transforming the planet's climate, then it was but a small step to imagine alien species able to produce what we can call 'xenogenic' climate change. The remainder of this chapter is a brief sketch of the (pre-)history of stories of geogenic, anthropogenic and xenogenic climate change.

2. Flood Narratives in Modern Science Fiction

Unsurprisingly, when modern SF began to take shape in the early nineteenth century, it inherited a preoccupation with the Great Flood from its parent cultures: witness, for example, both Mary Shelley's 1826 novel *The Last Man* and Richard Jefferies's 1885 *After London*. There is a good case to be made that Shelley's *Frankenstein*, published in 1818, is the first real SF novel: both Brian Aldiss's history of the genre and John Clute and Peter Nicholls's encyclopedia take it as their starting point (Aldiss, 1973: 7; Clute and Nicholls, 1993: 568); and even the chief ideologue of cyberpunk, Bruce Sterling, regarded it as 'a wellspring of science fiction as a genre', albeit perhaps only of "Humanist" SF' (Sterling, 1990: 39–41). Shelley's second SF novel, *The Last Man*, is fundamentally a plague narrative rather than a climate fiction, the prototype for all the subsequent stories of species-destroying diseases, from Jack London's *The Scarlet Plague* (1912) to Richard Matheson's *I am Legend* (1954) and Terry Gilliam's *12 Monkeys* (1995), just as *Frankenstein* was itself the prototype for all the subsequent stories of insubordinate man-made intelligences, whether robot, android, cyborg or computerised AI. The final chapters of *The Last Man* do, however, bring together representations of a flooded city, a terrible storm, and the destruction of all but one man, in ways that are powerfully reminiscent of *Bereshith* and the *Sha naqba imuru*.

At the beginning of the novel's third volume, the remaining plague survivors decide to abandon England in search of a better climate.

Eventually four of them – the narrator and eventual ‘last man’, Lionel Verney, his close friend, Adrian Earl of Windsor, Verney’s niece Clara, and his son Evelyn – reach Switzerland. The four enjoy comparatively pleasant times in Switzerland, Milan and Como before Evelyn eventually dies of typhus. The three survivors then travel towards Venice, intending to continue to Rome. Venice is normally a city of canals, of course, but bereft of humanity it takes on all the characteristics of a genuinely flooded city: wrecked gondolas, ‘sea weed and sea monsters’ on its marble, salt defacing its ‘matchless works of art’, an ‘appalling ruin of the monuments of man’s power’ and, beyond the Lido, the sea, ‘unspecked by boat’, which invites them ‘to seek refuge from sorrow and fear on its placid extent’ (Shelley, 2013: 261–262). They therefore decide to turn away from Rome and sail to Greece: ‘Ocean, we commit ourselves to thee – even as the patriarch of old floated above the drowned world, let us be saved, as thus we betake ourselves to thy perennial flood’ (Shelley, 2013: 263). The patriarch of old, Noah, was also in a sense a last man, but where he and his family had survived, the terrible storm that now blows up in the Adriatic drowns both Adrian and Clara. Verney swims ashore near Ravenna, travels on to Rome, where he stays for a year while writing *The Last Man*, and finally, in the novel’s closing lines, announces his intention to sail around the world: ‘Thus around the shores of deserted earth, while the sun is high, and the moon waxes or wanes, angels, the spirits of the dead, and the ever-open eye of the Supreme, will behold the tiny bark, freighted with Verney – the LAST MAN’ (Shelley, 2013: 279).

Like *The Last Man*, Jefferies’s *After London* is not strictly speaking a climate fiction, since the flooding of London is an effect of unexplained catastrophe, perhaps overdevelopment, rather than of global warming. It is, however, very definitely a flood narrative. The novel comprises two parts: a five-chapter ‘The Relapse into Barbarism’, which gives an account of the fall of London, written by a much later historian, and includes detailed descriptions of an England reclaimed by nature; and a twenty-eight-chapter ‘Wild England’, which recounts the adventures of Felix Aquila, set many years later in a pseudo-medieval landscape, and includes a visit to the remains of the fallen city. What was once London and the Thames Valley is now occupied by a ‘great Lake in the centre of the island’ (Jefferies, 2007: 25). The future historian speculates that ‘the waters of the river, unable to find a channel, began to overflow up into the deserted streets, and especially to fill the underground passages and drains ... These, by the force of the water, were burst up, and the houses fell in’ (Jefferies, 2007: 26). Most of the lake is clear freshwater, we learn, but over the site of old London there are only vile, tepid

marshes: 'It is a vast stagnant swamp, which no man dare enter, since death would be his inevitable fate ... There are no fishes, neither can eels exist in the mud, nor even newts. It is dead' (Jefferies, 2007: 27). When Felix, the hero-protagonist of Part II, and his canoe are swept into those marshes, he is appalled to discover that: 'The deserted and utterly extinct city of London was under his feet. He had penetrated into the midst of that dreadful place, of which he had heard many a tradition: how the earth was poison, the water poison, the air poison, the very light of heaven ... poison' (Jefferies, 2007: 128). Felix eventually manages to escape, but such is the filth of the city that he and his canoe are both thoroughly blackened by it (Jefferies, 2007: 131). Just as Shelley had invoked the *Bereshith* flood narrative to imagine the end of the human race, so Jefferies invokes it, in ways that anticipate William Morris's *News From Nowhere* (1890), to imagine the end of industrial capitalism.

All these texts, and many others besides, tell of floods that destroy or damage human civilisation, but which are never strictly anthropogenic. There is, however, a limit text, published only four years after *After London*, where anthropogenically produced rising sea levels are anticipated, but nevertheless not actually realised, Jules Verne's 1889 novel *Sans dessus dessous*. If Shelley was the 'mother' of SF, then its 'father' was not the second century CE Lucian of Samosata, so often improbably claimed as such (Suvin, 1979: 54, 97–98; Seed, 2011: 2–3), but rather the nineteenth century Frenchman whose *voyages extraordinaires* exported the genre to the four corners of the globe. After *Vingt mille lieues sous les mers* and *L'île mystérieuse*, Verne's two best-known novels are almost certainly *De la terre à la lune* (1865) and *Autour de la lune* (1870). Much less well-known, however, is the third in this 'Baltimore Gun-Club' trilogy, *Sans dessus dessous*, in which the same three American characters, Impey Barbicane, J.-T. Maston and Captain Nicholl, come out of retirement, planning to use the recoil of a huge cannon – the same technology as in the earlier novels – to shift the tilt of the Earth's axis, so that it becomes perpendicular to the planet's orbit. As a result, the vast coal deposits under the polar ice cap will be made available for mining.

Barbicane explains the project thus to their investors:

[L]e but de notre nouvelle Société est l'exploitation des houillères du Pôle arctique, dont la concession nous a été faite par le gouvernement fédéral. Ce domaine, acquis après vente publique, constitue l'apport de ses propriétaires dans l'affaire dont il s'agit. Les fonds, mis à leur disposition par la souscription ... vont leur permettre d'organiser cette entreprise, dont le rendement produira

un taux d'intérêt inconnu jusqu'à ce jour en n'importe quelles opérations commerciales ou industrielles.

[[T]he object of our Club is to explore the large coal fields situated in the Arctic regions, which we have recently purchased and to which we hold a title from the American Government. The amount of money raised by public subscription will be used for these purposes. The success which will be attained by it surpasses belief and the dividends your money will bring you will be unsurpassed in the commercial or financial history of this or any other country.]² (Verne, 1978: 93)

Interestingly, Barbicane's pitch nicely anticipates twenty-first century concerns about peak oil: 'Il est donc certain ... que la houille, cette substance précieuse entre toutes, s'épuisera en un temps assez limité par suite d'une consommation à outrance. Avant cinq cents ans, les houillères en exploitation jusqu'à ce jour seront vidées' ['It is certain that coal is the most precious substance, and will some day, on account of the large consumption of it; fail in its supply. Before 500 years have passed the coal mines which are at present in use will have stopped giving coal'] (Verne, 1978: 94). The Gun-Club is thus planning for nothing less than intentionally induced anthropogenic climate change, in which the relocation of the poles will result in their being melted by the sun. As Major Donellan, the British representative at the original auction, aptly summarises the project: '[P]uisque l'homme ne peut aller au Pôle, c'est le Pôle qui viendra à lui' ['[A]s people cannot go to the pole, the pole will come to them'] (Verne, 1978: 104). Again, one is struck by Verne's prescience, for this kind of melting and mining, if not the tilting, is exactly what was envisaged by twenty-first century governments in Canada under Stephen Harper and in Russia under Vladimir Putin.

When details of their plan become public, however, the French engineer, Alcide Pierdeux, realises that the recoil from the cannon will buckle the Earth's crust; and that many parts of the world will be flooded, threatening the lives and livelihoods of millions. The committee of inquiry appointed to investigate the matter also concludes that the consequences could be disastrous (Verne, 1978: 137). Despite international attempts to

² Here and throughout we have, wherever possible, quoted from primary texts in their original languages and included a generally acceptable English translation in square brackets immediately thereafter. In this case, the English translation is that used by Project Gutenberg, based on J.G. Ogilvie's 1890 American translation: www.gutenberg.org/ebooks/10547.

obstruct their efforts, Barbicane and Nicholl nonetheless succeed in firing a 180,000-ton steel-braced rock from the cannon located in the side of Mount Kilimanjaro, using a new 'melimelonite' explosive invented by Nicholl. The explosion causes enormous localised damage, but has no apparent effect on the Earth's axis: '[R]ien n'était changé à l'état de choses, sauf les désastres produits dans le Wamasai, en partie rasé par cette trombe artificielle, et les naufrages provoqués par le déplacement des couches aériennes' ['Nothing had been changed in the state of worldly affairs save the terrible disasters produced in Wamasai, which was partly deluged by the artificial waterspout, and the shipwrecks which were produced by the current of air'] (Verne, 1978: 196).

The Gun-Club has succeeded in producing a man-made tsunami and flood, but failed in its attempt to melt the ice caps. The explanation is reassuringly simple: Maston had made a crucial mistake in his calculations, by accidentally erasing three zeros during a telephone call from the widowed Mrs Scorbitt, who largely financed their project. As Alcide reveals: '[I]l l'a portée à *quarante mille mètres* au lieu de *quarante mille kilomètres* ... cet oubli de trois zéros a produit une erreur de *douze zéros* au résultat final' ['[H]e figured it at 40,000 metres in place of 40,000,000 metres ... this forgetting of three zeros has made a change at the end of the calculation of twelve naughts'] (Verne, 1978: 204). The novel's conclusion is equally reassuring: '[L]es habitants du globe peuvent dormir en paix. Modifier les conditions dans lesquelles se meut la Terre, cela est au-dessus des efforts permis à l'humanité' ['[T]he inhabitants of the earth may sleep in peace. To modify the conditions in which the earth is moving is beyond the efforts of humanity'] (Verne, 1978: 208). But twenty-first century readers might sleep less well. For, although it is still not possible to shift the Earth's axis, other powerful processes are now at work that could indeed melt the ice caps and make it practicable to mine for coal or drill for oil in both the Arctic and Antarctica.

The origins of modern SF are in the overlap between the bourgeois novel and the bourgeois theatre, in Britain and in France, during the early to mid nineteenth century. Shelley and Verne were crucial for the theatrical variant of the genre as well as for the novelistic. Between 1823 and 1887 there were 18 different stage adaptations of Shelley's *Frankenstein* for the British or French commercial theatre (Forry, 1990: 121–122); between 1874 and 1900, there were more than 2,000 performances of the stage version of Verne's *Le Tour du monde en 80 jours*, so that its author 'became virtually overnight a ... wealthy playwright' (Margot, 2005: 153–154). If the narrative variant of the genre tended to specialise in strange ideas, the dramatic variant tended to concentrate on translating those ideas into special effects. In the twentieth century

both variants were radically popularised, the narrative by way of the development of much cheaper forms, initially the famous 'pulp' magazines and comic books, later paperback novels, the dramatic by way of the development of SF cinema, radio and television. Both processes were initiated in Europe: the earliest SF film, loosely based on Verne's *De la terre à la lune*, was Georges Méliès's *La Voyage dans la lune*, produced in 1902, less than seven years after the Lumière brothers' first film projections; the earliest SF magazines were the Swedish *Stella* (1886–8) and the Austrian/German/Swiss *Der Orchideengarten* (1919–21) (Aldiss, 1986, 202). But both developments were much more fully realised in the United States, respectively in Hollywood and in the New York pulps.

Early SF cinema seems to have been oddly uninterested in catastrophic floods, even if Felix E. Feist's *Deluge* did have earthquakes generate tidal waves that inundate first California, then New York (Feist, 1933). The original American SF pulp, Hugo Gernsback's *Amazing Stories*, was launched in April 1926, opening up a new space in the market, to be occupied in turn by a series of similar magazines, notably *Wonder Stories* (1930–6) and its successor, *Thrilling Wonder Stories* (1936–55), *Galaxy Science Fiction* (1950–80), *Astounding Stories*, founded in 1930, and rebranded as *Astounding Science-Fiction* by John W. Campbell Jr in 1938 and as *Analog Science Fact and Fiction* in 1960. Gernsback published a complete English translation of *Sans dessus dessous*, under its British title, *The Purchase of the North Pole*, in the September and October 1926 issues of *Amazing Stories*. Thereafter, catastrophic floods became a pulp staple.

In *Amazing Stories* itself, Geoffrey Hewelcke had the Earth beset by earthquakes, floods and tidal waves, in a desperate attempt to shift its orbit so as to avoid collision with a comet; Clare Winger Harris had earthquakes and floods caused by a deliberate Martian attempt to use the Earth as a Sun shield; A. Hyatt Verill, massive tidal waves brought about by a shift in the moon's orbit; Victor Endesby had Ben, his new Noah, build an ark to escape the flooding of California; J. Lewis Burtt, the ice caps melt and flood the Earth as an indirect result of a meteor strike on the moon; Stanley G. Weinbaum had earthquakes cause the flooding of Central America and thence far-reaching changes in global climate; Thornton Ayre, cyclical changes in the Earth's climate generate the greatest floods in the planet's history (Hewelcke, 1928; Harris, 1928; Verill, 1931; Endesby, 1936; Burtt, 1936; Weinbaum, 1937; Ayre, 1938). In *Wonder Stories*, J.M. Walsh had a comet shift the Earth's tilt, leading to melting of the ice caps, global flooding and the destruction of most of humanity; Lloyd Arthur Eshbach had alien invaders melt the ice-caps and flood the world; Morrison Colladay, a meteor strike cause earthquakes and tidal waves that flood New Orleans and eventually the

entire lower Mississippi (Walsh, 1932; Eshbach, 1932; Colladay, 1932). In *Astounding*, M.F. James told of how a gigantic alien spaceship caused tidal waves, earthquakes and the disappearance of the Atlantic Ocean into the sky (James, 1936).

These American pulp fictions are clearly indebted to *Bereshith* – and thus indirectly perhaps to the *Sha naqba imuru* – and some also to *Sans dessus dessous*, but none seem closely related to scientific concerns about the real possibilities for global warming. Much the same is true of the two main British SF flood narratives of the 1950s and early 1960s, John Wyndham's *The Kraken Wakes* (1953) and J.G. Ballard's *The Drowned World* (1962). Although both were possibly inspired by the flooding of London in 1953, neither exhibits much interest in climate science: in *The Kraken Wakes*, floods are part of 'Phase Three' of an alien invasion by kraken sea creatures; in *The Drowned World*, they are the effect of persistent solar flares. Unlike Wyndham, Ballard makes the connection between warming and flooding, but neither novel is interested in scientifically plausible models of global warming. Wyndham was perhaps the best-known British SF writer of the 1950s, Ballard a key figure in the British SF 'New Wave' of the 1960s. Literary history has judged Ballard more kindly than Wyndham, but, at least in his accounts of the relations between scientists, the media and the general public, the latter might nonetheless be the better guide to futurology.

For, of course, *The Drowned World* is not really about climate change. It was widely applauded for the introduction of a new seriousness into the genre, especially for the psychoanalytic preoccupations of both its author and its central protagonist, Dr Robert Kerans. As Kerans observes, in lines that summarise Ballard's own central conceit, 'as psychoanalysis reconstructs the original traumatic situation in order to release the repressed material, so we are now being plunged back into the archaeopsychic past, uncovering the ancient taboos and drives' (Ballard, 2012: 42–43). As the planet reverts to the Triassic, so individual psychology reverts to the lizard brain. As science this is nonsense, as is the immediately following non sequitur that humans are 'as old as the entire biological kingdom, and our bloodstreams are tributaries of the great sea of its total memory' (Ballard, 2012: 43). As fiction, however, it allows for a hauntingly dreamlike transformation of central London into a landscape of exotically beautiful tropical lagoons. It is as if Shanghai had come home to Chiswick; which, in a way, it had.

The Kraken Wakes is perhaps the most famous of all stories of xenogenic climate change. Here, Wyndham gives us a detailed account of both the catastrophe and, more importantly, the human responses thereto. The kraken force the polar ice caps to calve into myriad

icebergs, which in turn increases sea levels by hundreds of feet, thus producing drastically decreased global temperatures. Wyndham's story is narrated by Mike Watson, reporter for a thinly disguised BBC, and describes the human reactions to the kraken by way of his own reportage and that of his wife Phyllis. The leading scientist character, Professor Alastair Bocker, realises that the effects of melting will be progressive: 'first a trickle, then a gush, then a torrent ... The only certainty is that the sea-level would indeed rise ... I draw attention to the fact that in January of this year the mean sea-level at Newlyn, where it is customarily measured, was reported to have risen by two and a half inches' (Wyndham, 1978: 238). Phyllis berates Bocker for this combination of understatement and alarmism: 'The anti-climax ... After your build-up it sounded so tiddly that everyone feels annoyed with you for alarming them — those that don't just laugh, and say: "Ha! ha! These Professors!"' (Wyndham, 1978: 239–240). Especially interesting here is the way Wyndham's fiction prefigures more contemporary debates between climate scientists and climate sceptics. The outcome might also be prefigurative: water streams along the Thames Embankment, bursts through the riverside walls, and 'pours in a great muddy cascade on to the roadway' (Wyndham, 1978: 257).

This tradition of *Bereshith*-inspired flood narratives, divorced from any scientific concerns over climate change, clearly continues into the twenty-first century. In the British SF novel, Stephen Baxter's *Flood* grounded often powerfully plausible depictions of inundation as catastrophe on the most tenuous of scientific bases, the existence of underground oceans located beneath the Earth's mantle (Baxter, 2008: 472–473). In American SF cinema, Roland Emmerich's *2012* based its spectacularly successful special effects on the spurious notion that a barrage of neutrinos unleashed by solar flares would produce global earthquakes and megatsunamis (Emmerich, 2008). Both Baxter and Emmerich gesture toward their Hebrew sources: both make extensive use of the notion of a flooded Mount Everest, the obvious contemporary counterpart to the *Bereshith*'s Mount Ararat; the sequel to *Flood* is entitled *Ark*, although there are actually three arks rather than one (Baxter, 2009); *2012* also has three surviving arks, which endure a twenty-seven-day deluge to converge on the Drakensberg Mountains at the Cape of Good Hope, in a scene that, once again, clearly alludes to Noah at Ararat.

If neither Wyndham nor Ballard, Baxter nor the Emmerich of *2012*, countenanced the possibility of anthropogenically produced rising sea levels, the same cannot be said of Japanese writer Kōbō Abe's novel 第四間氷期/*Dai-Yon Kamyōki/Inter Ice Age 4*, which is often claimed as the foundational text of post-war Japanese SF. It was first published in the

magazine *世界/Sekai/World* during 1958–59, and subsequently translated into Russian in 1964, Hungarian in 1969, English in 1970, Finnish in 1972, Dutch in 1973, German in 1975 and Serbian in 1979. Its combination of paranoid apocalypse, cruel evolutionism and the weirdly surreal sometimes seems reminiscent of Ballard, but also anticipates Haruki Murakami. Certainly, both Abe and Murakami are heavily indebted to traditions of Western fantasy and SF writing. The primary concerns in *第四間氷期* are not with climate change, but rather with the philosophical dilemmas created for its protagonist, Professor Katsumi, when the computer system he develops to predict human behaviour begins to predict his own actions. The computer also predicts that rising sea levels will threaten humanity and, as a result, government scientists plan to genetically engineer gilled humans, to be known as ‘aquans’. This is the novel’s – and Katsumi’s – central dilemma: whether or not to cooperate in the development of the aquans.

Moreover, the main cause of rising sea levels is not human CO₂ emissions, but rather an apparently unprecedented level of volcanic activity on the ocean floor. Tomoyasu, a member of the committee directing the future predictor, notes that ‘これについちゃ、もうかなり前から、太陽黒点のせいであるとか、人間のエネルギー消費の増大による炭酸ガスの増加であるとか、いろいろ言われてきましたが’ [‘Various explanations have been offered for some time now: sunspots, the increase in carbon dioxide brought on by the step-up in human energy output’] (Abe, 1964: 228–229; Abe, 1970: 189–190). But the weight of his and the novel’s explanation falls elsewhere:

つまり、海底火山が大々的に活動しはじめたという場合ですな。だいたい、火山ガスというのは、そのほとんどが水蒸気で、現在の海水も、もとはといえば、この火山ガスから生まれたというのだから、(中略) こういうことが、大体、五千万年から、九千万年に一度くらいの割で、必ずあったものらしい・・・そして、しらべてみると、どうも太平洋と大陸の境界線あたりに怪しい動きがある。いわゆる太平洋の火の環とよばれている、あの地震地帯です・・・・・・ (中略) そうだとすると、この気温や海面の上昇は、ただの間氷期的現象なんかではなくて、どうやらその五千万年に一度の大変動ということになるらしい・・・・・・これがつまり、その第四間氷期終末説というものなんですが・・・・・・

[[S]ubterranean volcanoes are beginning to be active on a large scale. Volcanic gas is almost all steam; the present sea water itself originally came from such gases ... An event like this happens generally at a rate of about once every fifty to ninety million years and is apparently inevitable. When you look into it, you see that the areas around the Pacific coastal belt move strangely. This

is a region of earthquakes known as the Pacific Fire Circle ... If all this is true, the rise in temperature and in sea level is not an inter-ice-age phenomenon but very likely the result of one of these great cataclysms that occur once in fifty million years. This is a run-down on the hypothesis about the end of the Fourth Inter Ice Age.] (Abe, 1964: 229–230; Abe, 1970: 190–191)

With Abe, we reach yet another limit text, one that actually acknowledges the possibility of anthropogenically induced global flooding, but only so as to set it aside.

3. Ice and Fire

Cooling and warming are more recent preoccupations than flooding, dating essentially from the widespread acceptance of ice age theory, following the publication of James Croll's *Climate and Time, in Their Geological Relations* in 1875, and of greenhouse theory, following that of Svante Arrhenius's 'On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground' in 1896. For most of the twentieth century both science and SF were more interested in cooling than in warming. In geological terms, the period we inhabit, the 'Holocene' as it is termed, is an 'interglacial', that is a comparatively warm period within the longer, colder 'ice age' defined by the 'Quaternary period'. When located in relation to the so-called 'Milankovitch cycles', which measure the effects of orbital variation on the Earth's climate, we can be seen to live in a time of cooling that has lasted some 6,000 years. So, the most likely future climate change was widely anticipated to be a return to the ice age. This motif recurs throughout the SF of the period, from American pulp SF, through John Christopher's *The World in Winter* (1962) to Michael Moorcock's 'The Ice Schooner' (1966), Douglas Orgill and John Gribbin's *The Sixth Winter* (1979) and Jean-Marc Rochette and Jacques Lob's graphic novel *Le Transperceneige* (1984).

Pulp SF borrowed the ice motif from climate science, but normally without much interest in or understanding of ice age theory. Only two of the stories we examined were predicated on reasonably plausible versions thereof: the ending of R.F. Starzl's 'If the Sun Died', published in *Astounding Stories*, has the human race in the far distant future discover that their sun has not actually died, but rather that the planet has undergone periodic glaciation; Warner Van Lorne's 'Winter on the Planet', published in the same magazine, has humanity respond to a new ice age by living underground in ice caves (Starzl, 1931; Van Lorne,

1937). Elsewhere, however, freezing turns out to be significantly less plausible scientifically. So, when Paul H. Lovering's Earth grew cold in *Amazing Stories Quarterly*, it was because an 'ice nebula' had enveloped the solar system; when Bruno H. Buerger's did in *Wonder Stories Quarterly*, because it passed through a cosmic cloud that cut off solar radiation; when Henry J. Kostkos's did in *Amazing Stories*, a planetoid had stripped away the Earth's atmosphere; when Chan Corbett's did in *Astounding Stories*, the sun had simply cooled; as it did for Eando Binder, again in *Astounding Stories* (Lovering, 1929; Buerger, 1931; Kostkos, 1935; Corbett, 1935; Binder, 1937).

Sometimes the freezing was a result of human action: Jack West's 'When the Ice Terror Came', published in *Amazing Stories*, had scientist August Hess invent freeze machinery as a means to end the war in Europe; Arthur J. Burks's 'White Catastrophe', published in *Thrilling Wonder Stories*, had scientist Jose Pindobal aim to win fame by making the Tapajos River freeze over; Frederick Pohl's 'The Snowmen', published in *Galaxy Science Fiction*, had the reckless use of domestic heat pumps lower outside temperatures to the point of an anthropogenically generated new ice age (West, 1940; Burks, 1949; Pohl, 1959). Occasionally, these ice ages can be xenogenic: Jack Williamson's 'The Ice Entity', published in *Thrilling Wonder Stories*, had an alien capable of mind control attempt to blot out the sun (Williamson, 1937).

Robert Silverberg was a regular contributor to *Amazing*, *Astounding*, *Galaxy* and other pulps, but his *Time of the Great Freeze* was actually published as a separate young adult fiction (Silverberg, 1964). Set in 2650 AD, some 350 years after the onset of the next ice age, the human race now lives in plausibly realised underground cities. Dr Raymond Barnes, his son Jim, and a small party of would-be explorers, suspect that the ice has begun to thaw, are given permission to travel to the surface, make radio contact with survivors in London, and then make their way eastwards from New York across the frozen wastes of what was once the Atlantic Ocean. The novel is very loosely indebted to geological ice age theory, although its few centuries of ice represent a disconcertingly short period by comparison with the 95,000 years of the last glacial. Christopher's *The World in Winter* and Orgill and Gribbin's *The Sixth Winter* are each by comparison much more scientifically plausible. Both envisage the next ice age as an essentially natural cyclical process, as it almost certainly will be; both are set in the near future; both represent the onset of glaciation as occurring very rapidly, which is a matter for dispute among climate scientists; and, although all three authors were English, only *The World in Winter* is written from a distinctly British vantage point.

In *Christopher*, the freeze develops over the course of a single prolonged English winter, so that food stocks fall dangerously low, rationing is introduced, and martial law imposed. While those with the wherewithal flee south to the tropics, the protagonist, television producer Andrew Leedon, remains behind in the 'London Pale', the UK Government's protected area, cordoned off from its wider territory, which has in effect been consigned to starvation. Hence, the memorable opening sequence in the British Museum Reading Room: 'Leedon rubbed his hands against the silver Victorian muff-heater Madeleine had given him ... He blew through the small holes in the side and watched the red glow brighten ... The people reading here were not so foolish as to expect a reprieve – for the library or for themselves. It was that he envied' (*Christopher*, 1968: 7–8). Eventually, Leedon and Madeleine Cartwell, his lover but not his wife, escape to Nigeria, where European refugees from the frozen north live in slums and are typically either unemployed or employed only in low-status jobs. This reversal of roles between the one-time imperial metropolis and its one-time colonies is what most interests *Christopher*, but the new ice age is the key science-fictional motif nonetheless. The novel offers the reader a much less 'cosy' version of catastrophe than those in Wyndham; and, although there is some slight hope at its conclusion, it must have seemed far less reassuring than *The Kraken Wakes* to English middle-class readers of the 1950s.

Orgill and Gribbin's *The Sixth Winter* is yet more persuasive scientifically, as might be expected from a writer like Gribbin who was, by profession, an astrophysicist. Its protagonist, climatologist Dr William Stovin, warns the US president at a meeting of the National Science Council that the transition to the new ice age will occur rapidly rather than gradually: 'We are seeing ... the catastrophic beginnings of a new Ice Age ... 15,000 years of warmth ... have lulled us into thinking that climatic history is over ... The future will not be like that. The future is ice' (Orgill and Gribbin, 1980: 31). Stovin is invited to Novosibirsk in the Soviet Union, where the initial crisis appears at its most extreme, and is witness to the dramatic disruption of Siberian material and social structures, as he and his Russian and American colleagues flee towards Alaska. The strong sense that this is a natural cyclical phenomenon, as evident, for example, in how wolves possess a kind of collective memory of previous ice ages, a recurrent motif from first page to last (Orgill and Gribbin, 1980: 9, 349), powerfully attests to the logic of ice age theory.

At one level *The Sixth Winter* is the story of a great trek across a hostile icescape, an echo of the closing sequences of Ursula Le Guin's *The Left*

Hand of Darkness. The same motif had also informed Moorcock's *The Ice Schooner*. Moorcock is best known for his editorship of the British New Wave magazine *New Worlds* from 1964 to 1971; his championship of Ballard as 'the first clear voice of a movement ... for dealing with the world of the future contained ... in the world of the present' (Moorcock, 1966: 2); and his Jerry Cornelius novels. *The Ice Schooner* was originally serialised in Keith Roberts's British SF magazine *Science Fantasy/Impulse* during 1966. In his introduction to the 1993 reprint, Moorcock claims retrospectively that 'ecological issues were as important to the writers of the 1960s as they are to today's public ... British SF in particular, exemplified by Brian W. Aldiss and J.G. Ballard, has been obsessed with environmental change' (Moorcock, 1993: iii). The contrast between British and American SF is well taken, although Aldiss fits Moorcock's case better than Ballard. But, as for *The Ice Schooner* itself, Moorcock surely protests too much.

The novel depicts a plausibly human distant-future society, which has successfully adjusted to the extreme conditions of the next ice age. The Eight Cities of the great ice plateau, which 'covered the part of the world once known as the Matto Grosso' (Moorcock, 1993: 2), now inhabit an entirely Arctic world. The novel's protagonist, Konrad Arflane, is a man of the ice, a captain of ice ships, hunter of strange whale-like creatures who have evolved to live on the ice, and a fervent believer in the religion of the 'Ice Mother'. His certainties are tested, however, when the Lord Rorsefne insists that the legendary city of New York does in fact exist: 'I have seen New York. Its towers thrust upward from a gleaming field of smooth ice ... Perhaps the Ice Mother's court is there, perhaps that part is myth' (Moorcock, 1993: 47). So Arflane and his crew set off on their own trek across the ice, in search of the ice city and the Ice Mother. All this is well handled, but New York itself turns out to be disappointingly trite. Peter Ballantine, the condescendingly superior man of the future who saves Arflane from barbarians, simply explains away the latter's entire world in a few short pages. The ice age was not a natural cyclical development, it turns out, but rather the effect of nuclear war; the people of the Eight Cities are the descendants of scientist-survivors from Antarctica, the high-tech New Yorkers those of scientist-survivors from Greenland; and now, at last, the world is warming and the New Yorkers will lead the way into a happier future (Moorcock, 1993: 175–177). A powerfully imagined ice world – and with it the novel's only truly interesting character – is discarded in favour of the most banal of techno-utopias.

Le Transperceneige, drawn by Jean-Marc Rochette and scripted by Jacques Lob, is what we would today term a 'graphic novel', but might

once have been described as a ‘comic book’. The SF comic book was initially a development from the interwar SF pulps: both were primarily American innovations, both used the magazine format, both were printed on pulp paper, both were geographically centred on New York; but, where pulp fictions were told in written text, comic books used the now familiar combination of pictures and text balloons. The first SF comic book, DC’s *Action Comics*, was launched in 1938 as a platform for Jerry Siegel and Joe Shuster’s Superman. A plethora of similar titles followed in rapid succession: DC launched the Bat-man in *Detective Comics* in 1939 and Wonder Woman in *All Star Comics* in 1940; its chief rival, Marvel, countered with the Human Torch in *Marvel Comics* in 1939 and Captain America in *Captain America Comics* in 1941. Franco-Belgian ‘bandes dessinées’, or BDs, also date from the 1930s: Hergé’s *Les Aventures de Tintin* was first published in *Le Petit Vingtième*, a youth supplement to *Le Vingtième Siècle*, between 1929 and 1939. But distinctly science-fictional BDs appeared only after the Second World War, *Fantax* (1946–49), *L’An 2000* (1953–54), *Meteor* (1953–62), *Barbarella* (1964–82) and, eventually, *Métal Hurlant* (1974–87, 2002–4). Casterman, the Belgian publisher based in Tournai, which took over publication of *Le Petit Vingtième* and with it *Tintin* in 1934, soon emerged as one of the key players in Francophone magazine publishing. And it was Casterman that published *Le Transperceneige* in 1984.

The novel is set during a near future ice age, at a time when all surviving human beings inhabit a single train called le Transperceneige. As the opening frames tell us: ‘Parcourant la blanche immensité d’un hiver éternel et glacé d’un bout à l’autre de la planète roule un train qui jamais ne s’arrête ... C’est le Transperceneige aux mille et un wagons’ [‘Across the white immensity of an eternal winter, from one end of the frozen planet to the other, there travels a train that never stops ... This is the Snowpiercer, one thousand and one carriages long’] (Rochette and Lob, 1984: 9; Lob and Rochette, 2014: 1). The human society aboard the train is highly stratified between the elites living in luxury towards its front and the masses living in squalor towards its rear. Proloff, the protagonist, escapes from the rear and, with his eventual lover, Adeline Belleau, an activist campaigning for aid to third class carriages, is led through the train, observing and resisting its cruelties and hypocrisies. Proloff is finally rescued by Alec Forester, the engineer who created le Transperceneige, but only in order to become his successor as caretaker to ‘Olga’ the engine.

In 2013 a Korean film adaptation directed by Bong Joon-ho was released by Moho Films as *설국열차/Seolgunnyeolcha*, appearing in the United States the following year as *Snowpiercer*. The film quite specifically

claims that its new ice age is the result of a spectacularly over-effective attempt to counter global warming. There is no such suggestion in the original BD. Nor, however, is it here the result of natural cyclical processes. Rather, Rochette and Lob strongly hint that the world has been destroyed by fiercesome new climate weapons. So, when Proloff and Belleau are finally introduced to the president, who disclaims all responsibility for the plight of the train's rear, Proloff insists: 'Qui donc a déclenché cette guerre si ce n'sont pas les militaires et les politicards ...?' ['Who started the war that ended everything, if not the ... military and the ... politicians ...?'] (Rochette and Lob, 1984: 71; Lob and Rochette, 2014: 54). Later, he discusses the causes of catastrophe with Al, the train's archivist and historian and thus, in effect, the regime's tame intellectual. Al claims that 'On n'a jamais eu de certitudes sur la causes du bouleversement' ['We've never been sure about the cataclysm's cause'], but Proloff responds 'C'est quand même étrange que ça se soit produit juste au moment où la guerre a éclaté, non?' [But kind of strange that it happened just when the war broke out, no?']. He continues: '[Q]uelque part en gare se trouvait un super-train d'luxe, prêt à partir, un super-train avec une machine extraordinaire ... Ouais, un train miraculeusement prêt à embarquer les grosses têtes, les militaires et les officiels avec leur famille' ['S]omehow there was a luxury super-train with an extraordinary engine – just sitting in a station, ready to go ... Yes, a train miraculously ready to welcome the big shots, the military and the upper classes ... along with all their families'] (Rochette and Lob, 1984: 82; Lob and Rochette, 2014: 63). This is closer to Moorcock than to Bong, its real-world referent nuclear war, metaphorically recast as climate war.

Like *The Ice Schooner*, *Le Transperceneige* is centred on a powerfully imagined ice world, here comprising both the recurring image of the train's 1,001 carriages ploughing through the surrounding snowbound landscapes, and the vicious social structures that operate aboard them. Unlike in *The Ice Schooner*, no easy techno-utopian solution is available to the travellers aboard *le Transperceneige*. Indeed, the conclusion, with the passengers and crew apparently wiped out by plague and Proloff himself left entirely alone to tend to Olga, is much darker than that in Moorcock.³ Nonetheless, both novels use the ice age trope in the same fashion as the American pulps, that is without much evidence of interest

³ This ending – in which the final frame replicates the first – seems definitive. The three sequels (Legrand and Rochette, 1999; Legrand and Rochette, 2000; Bocquet and Rochette, 2015) date from well after Lob's death in 1990.

in or knowledge of current scientific speculation about the possibility or likelihood of a new real-world ice age.

By comparison with the extensive use of flood and ice narratives in twentieth century SF, warming – as distinct from flooding – seems only rarely to have engaged the genre. Lowell Howard Morrow's 'Omega, The Man', in *Amazing Stories*, imagined a far distant future Earth having lost both atmosphere and water, but this was more a matter of dying out than of drying out (Morrow, 1933). The one key SF text that does focus very deliberately on warming is Ballard's 1964 *The Burning World*, which addresses the issue in characteristically apocalyptic terms. The novel opens in the township of Hamilton, located somewhere on the shores of a rapidly disappearing inland lake. The main characters – Dr Charles Ransom, his estranged wife Judith, his friend Philip Jordan, Jordan's blind foster father, the witch-like Mrs Quilter, and the zookeeper Catherine Austen – all sooner or later join the exodus towards the sea, where desalinisation remains possible. This global drought has been caused by long-term pollution of the seas, which eventually produced a 'thin but resilient mono-molecular film formed from a complex of saturated long-chain polymers', which prevents 'almost all evaporation of surface water into the air space above', thus permanently stalling the evaporation–precipitation cycle (Ballard, 2012: 47). This does not sound terribly plausible scientifically, but Ballard's main concerns, here as in *The Drowned World*, are not so much with climate science and climate change as with reverse evolution to the primeval lizard brain. And, as in *The Drowned World*, this dubiously post-Jungian exploration of the collective unconscious is combined with spectacularly surreal images of a desolate post-urban landscape: 'They had reached the margins of the river estuary ... The hundreds of vehicles parked among the dunes and hillocks had sunk up to their axles in the soft sand, their roofs tilting in all directions' (Ballard, 2012: 130). The specifically literary qualities of Ballard's catastrophes are far more impressive than their futurological pretensions. It does seem odd, then, that Fredric Jameson should recently have associated the 'crucial historical moment when the genre began to ... produce works of original literary quality' 'only' with Philip K. Dick, Ursula K. Le Guin, Stanisław Lem, and Arkady and Boris Strugatsky, but not with Ballard (Jameson, 2016: 100–101).

4. Conclusion

To summarise the findings of this short pre-history: of the three main tropes of ice, fire and flood only the last has a long history, dating at least

from *Bereshith*, and arguably from the *Sha naqba imuru*, and extending right through into modern SF; these texts tell of disastrous floods that are nonetheless never strictly anthropogenic and are only rarely associated with scientific concerns about global warming; cooling is a much more recent concern, dating primarily from the twentieth century; these texts borrow the new ice age trope from climate science, while nonetheless hardly ever making use of the science itself; warming is an even more recent and even less developed science-fictional concern, and it too is only tangentially related to the real-world concerns of climate science.

This last observation requires radical qualification, however, for the period covering the closing quarter of the twentieth century and the first decades of the twenty-first. Widespread scientific concern that anthropogenic warming might more than offset longer-term cooling dates primarily from the 1970s. In 1979, both the US National Research Council and the World Meteorological Organization published predictions that then current levels of CO₂ emission would result in increases in average global temperature. In the early 1980s, Eugene F. Stoermer coined the term ‘Anthropocene’ to describe the two centuries since the beginning of the Industrial Revolution and in 2000 he and Paul Crutzen formally proposed it to the International Geosphere-Biosphere Programme (Crutzen and Stoermer, 2000); in 1988, the World Meteorological Organisation and the United Nations Environmental Programme combined to establish the IPCC; and in 1990 it completed its *First Assessment Report*. This concluded that emissions from human activities had substantially enhanced the natural greenhouse effect; that CO₂ emissions were responsible for more than half the enhanced greenhouse effect; and that if emissions proceeded on a ‘business as usual’ basis this would result in levels of global warming during the twenty-first century greater than those seen in the previous 10,000 years (Houghton et al., 1990: xi).

Where science had led – and also, in a small way, Kōbō Abe too – global SF would follow. As early as 1977 the American Arthur Herzog explored the fictional possibilities of a runaway greenhouse effect in his novel *Heat*. The Australian George Turner’s *The Sea and Summer* appeared in 1987, depicting a world of mass unemployment and social polarisation, in which global warming had produced rising sea levels and consequent inundation of the city of Melbourne’s Bayside suburbs, and was awarded the 1988 Arthur C. Clarke Award for best SF novel published in the United Kingdom.⁴ These and the many climate fictions

⁴ There is, in fact, a passing mention of global warming in Ursula Le Guin’s novelette, ‘The New Atlantis’ (1975). But, as with Kōbō Abe, this text

that would follow in their wake will be our primary concern here. First, however, we need to pause for a brief theoretical and methodological interlude. In this short pre-history, we have discussed both SF in general and climate fiction in particular without any attempt at a definition of either; we have ranged across time and space, from Mesopotamia in the thirteenth century BCE to late twentieth century America and Japan, and across different cultural technologies, from the clay tablet to the graphic novel, without providing any coherent rationale for this range and scope; we have discussed dominant 'motifs' where many SF scholars would prefer the term 'novum'; and we have carefully avoided the concepts of eutopia and dystopia, while knowing all the while that many of our texts are clearly one or the other and some both. The time has come, then, to examine these issues and to explain what exactly we mean, or at least what exactly we intend to mean. Those who prefer their climate fictions neat should therefore turn quickly to Chapter 3, where we will recommence our discussion of Herzog and Turner. But those who choose to follow us into the maze of contemporary SF theory in the chapter that immediately follows, will perhaps learn something to their advantage.

explicitly downplays the significance of anthropogenic climate change in favour of a focus on tectonic and volcanic changes and, even more centrally, political authoritarianism. We might also have included Brian Aldiss's *Helliconia* trilogy (1982–85) here, except that its subject matter is climate change on another planet rather than on Earth. In the first two volumes, the narrative is driven by the climate change produced by the Great Year of Helliconia and the Batalix-Freyr binary system that determines it. In the third volume, this role is played by the Original Beholder on Helliconia and Gaia on Earth, which turns it into a kind of 'deep ecology' SF. This is how we will approach the trilogy in Chapter 4 below.

Chapter 2

A Theoretical Interlude

According to Brian Merchant, Daniel Bloom coined the term ‘cli-fi’ to denote climate fiction in 2007 (Merchant, 2013). Bloom, Merchant and others have subsequently prosecuted the case for cli-fi to be considered a new literary genre in its own right. We have no objections to the term cli-fi, other than a fairly longstanding aversion to the prototypical ‘sci-fi’, from which Bloom’s neologism derives. Nonetheless, this claim to identify a new genre should not be accepted without some serious theoretical scrutiny.

1. Cli-fi and SF

Genre is an aspect of the more general phenomenon of cultural ‘form’, traditionally subject to distinctly ‘formalist’ modes of analysis preoccupied with systems of formal classification. But, as John Rieder makes clear in an article specifically addressed to SF, more recent cultural criticism has tended towards a ‘newer paradigm’ that ‘considers generic organizations and structures to be ... messily bound to time and place’ (Rieder, 2010: 193). Rieder draws a sharp distinction between ‘the pre-existing classical and academic genre system that includes the epic, tragedy, comedy, satire, romance, the lyric’ and the emergence during the nineteenth century of ‘a genre system associated with mass publication that came to include science fiction ... the detective story, the modern romance, the Western, horror, fantasy, and other similar genres’. The two genre systems, the classical-academic and what he later termed ‘the mass cultural genre system’ are, in Rieder’s view, distinct from and in tension with each other (Rieder, 2010: 199; Rieder, 2017).

Like Rieder’s, our approach is historical rather than formalist in character, but we would go further in stressing the necessarily social character of form as a kind of cultural ‘force of production’, a mechanism

for enabling and facilitating cultural communication. As Raymond Williams put it, form is not a matter of classification, but of social relationship, 'a social process which ... becomes a social product. Forms are ... the common property ... of writers and audiences or readers, before any communicative composition can occur' (Williams, 1977: 187–188). While we have no doubt that a new system of genre classification did indeed emerge in the nineteenth century, we nonetheless wish to argue that it functions at a different level of analysis – both sociologically and formally – from the classical system and that the two are not thereby necessarily in conflict. Here again, we resort to Williams, who distinguished three different 'levels of form' denoted as, respectively, 'modes', 'genres' and 'types'. He reserved the term 'mode' for the deepest level of form, as in the distinction between the 'dramatic mode', in which the action is performed before an audience, the 'lyrical mode', that is the non-mimetic composition of a single voice, and the 'narrative mode', where action is recounted as a tale told to an audience by a teller. Historically, these persist through quite different social orders: 'the level of relations involved ... can be more accurately referred to an anthropological or societal dimension than to the sociological in the ordinary sense ... they are very general, and their reproduction is at least relatively autonomous' (Williams, 1981: 194). Williams nominated the term 'genre' for relatively persistent instances of each mode, as for example in the distinction between tragedy and comedy within the dramatic mode or epic and romance within the narrative mode. Such genres are 'significantly more subject to variation between different epochs and different social orders', he observes, noting that neither the epic nor the romance survived into the modern, bourgeois epoch 'at least without radical redefinition' (Williams, 1981: 195). Still more variable and still more dependent on particular social relations are what Williams termed 'types', that is 'radical distributions, redistributions and innovations of interest, corresponding to the specific and changed social character of an epoch' (Williams, 1981: 196). His examples include 'bourgeois drama' and the 'realist novel'. On this model SF is a 'type' established in nineteenth century Europe through a radical redistribution of interests towards science and technology within the novel and short story genres of the narrative mode. In the twentieth century, the same concentration of interests persists within the novel and short story genres, but is also redeployed into various theatrical, film, radio and television genres of the dramatic mode.

If form is a social construct, then the obvious question arises as to how exactly this particular type is socially constructed. Two of Williams's more general key theoretical concepts, 'selective tradition' and 'structure

of feeling', can productively be applied to SF at this point. Williams used the term 'selective tradition' to denote the way cultural tradition entails 'a continual selection and re-selection of ancestors' (Williams, 1965: 69). For Williams, this argument was directed primarily at the high literary canon, but it can clearly also be applied to what Suvin calls the 'SF tradition' (Suvin, 1979: 220). This too is necessarily a retrospectively selective attempt to establish and maintain kinds of predisposed continuity. So, the genre initially identified as 'scientific romance', later as 'scientifiction', later still as 'science fiction', developed by way of a series of competitive struggles to redefine its own tradition selectively by reselecting its ancestors. The most famous example is Hugo Gernsback in 1926 describing the range and scope of *Amazing Stories* as 'the Jules Verne, H.G. Wells and Edgar Allan Poe type of story' (Gernsback, 1926: 3). But these definitions and redefinitions are in no sense arbitrary; rather, they are focussed and refocussed around the role of science and technology in industrial and post-industrial societies. Here, Williams's concept of 'structure of feeling' becomes relevant, as a way to theorise the 'historical formation' of a 'structure of meanings' as 'a wide and general movement in thought and feeling' (Williams, 1963: 17). Williams was particularly insistent that the new industrial science and its technologies were a crucial element in the emergent structure of feeling of mid-nineteenth century Britain. The 'excitement of this extraordinary release of man's powers', he observed, became 'central to the whole culture' (Williams, 1965: 88). It is precisely this element that most clearly distinguishes the new worlds of nineteenth century SF from older fantastic voyages and utopian islands. And this is surely also the significance of Shelley's *Frankenstein*, that it imagined biological science as practically applicable to medical technology. This is why Aldiss was right to trace the 'origins of the species' to Shelley (Aldiss, 1986: 25–52). It is also why Victor Frankenstein is still actively present in SF, continuously available as an intertextual reference point in SF literature, film, radio and television, in a way that is simply not true of either Lucian of Samosata's King Endymion or Thomas More's Raphael Hythlodæus.

We would argue that contemporary climate fiction is a sub-genre of SF rather than a distinct and separate genre for two main reasons. First, both its texts and practitioners – writers, readers, publishers, film directors, fans, etc. – relate primarily to the SF selective tradition. Most of its key exponents, for example, Kim Stanley Robinson in the United States, Jean-Marc Ligny in France, Dirk C. Fleck in Germany, both self-identify as SF writers and are identified as such by the wider SF community. Robinson has won two Hugo Awards for Best SF Novel, Ligny has won a series of French SF awards, including the Prix Bob

Morane, the Prix Rosny Aîné, the Prix Une autre terre and the Prix Julia Verlanger, Fleck has twice won the Deutscher Science Fiction Preis. Moreover, cli-fi writers inclined to refuse the generic label, such as Margaret Atwood in Canada and Jeanette Winterson in England, often do so on the grounds that their work is 'literary' rather than 'genre' fiction. Second, both climate fiction's texts and its practitioners articulate a structure of feeling that accords centrality to science and technology, in this case, normally climate science. As Robinson says in his introduction to the omnibus edition of the *Science in the Capital* trilogy: 'science itself is the genius AI that we fear to create; it's already up and running. Attend to it and act on what you learn. It's the science fiction way' (Robinson, 2015b: xiv–xv). Neither of these conditions – those established by the selective tradition and those by the structure of feeling – are set in stone. It is, of course, possible that cli-fi will, at some time in the future, evolve into a comparatively autonomous genre, with its own selective tradition and its own structure of feeling; but this has not occurred as yet.

Between the pre-history of climate fiction outlined in the previous chapter and the contemporary sub-genre Bloom terms cli-fi, the crucial shift has been the development of a near consensus among scientists about the potentially disastrous effects of global warming. Modern SF has always enjoyed a close, if sometimes fraught, relationship with science. In 1818, Mary – or, perhaps, Percy – Shelley famously insisted, in the opening line of the preface to *Frankenstein*, that: 'The event on which this fiction is founded has been supposed, by Dr. Darwin, and some of the physiological writers of Germany, as not of impossible occurrence' (Shelley, 1980: 13). Verne and Wells quarrelled over the scientific adequacy of each other's lunar adventures: Verne observing that 'I make use of physics. He invents ... show me this metal. Let him produce it' (Verne, 1997: 101–102); Wells that 'Verne never landed on the moon because he never knew of radio and the possibility of sending back a message' (Wells, 1933: ix). In 1926, Gernsback's opening editorial in *Amazing Stories* described the genre as a blend of 'romance intermingled with scientific fact and prophetic vision' (Gernsback, 1926: 3). In 1979, Suvin, still today the generally acknowledged founding father of academic SF studies, distinguished SF from fantasy on the basis precisely of its dependence on 'cognitive logic', by which he clearly meant its scientificity (Suvin, 1979: 63).

There are counter-arguments, most obviously perhaps Aldiss's that: 'Science fiction is no more written for scientists than ghost stories are written for ghosts' (Aldiss, 1973: 1); or, more extremely, China Miéville's that SF is based not on 'some abstract/ideal "science"', but rather on

‘capitalist science’s bullshit about itself’ (Miéville, 2009: 240). There are, of course, many different versions of the genre’s vocation, almost as many, in fact, as there are of its definition, and we have no desire to privilege Suvin’s and Robinson’s over Miéville’s or, say, Atwood’s (Atwood, 2011). But it seems to us nonetheless that, in so far as some SF does indeed define itself in relation to science, then that kind of SF finds itself obliged to produce fictional responses to problems actually generated by contemporary scientific research. As Paolo Bacigalupi, co-winner with Miéville of the 2010 Hugo Award for best SF novel, observes of his 2015 novel *The Water Knife*:

[T]he roots of this devastated future drew sustenance from the dedicated research and reporting of ... science and environment journalists ... If we want to know what the future will look like, it’s worth following the people who report the details and trends that are rapidly defining our world. (Bacigalupi, 2015: 371)

On this view, SF ideally functions as an adjunct to ‘futurology’. As George Turner, author of one of the earliest of contemporary climate fictions, once argued:

We badly need a literature of considered ideas. Humanity is on a collision course with over-population, ecological disaster and meteorological catastrophe on the grand scale ... Science fiction could be a useful tool for serious consideration, on the level of the non-specialist reader, of a future rushing on us at unstoppable speed. (Turner, 1990: 209)

Moreover, in so far as SF is indeed written in response to such genuinely scientific concerns, then it will not normally be ‘apocalyptic’ in the strict sense of deriving from the *Book of Revelation*, or *Apokalypsis*. This last book of the Christian Bible is a richly complex text, which has been subject to multiple interpretations even among believers. It is clear, however, that the revelation in Books XX and XXI has the double meaning of a divinely ordered destruction of a real world that is irreparably wicked (XX: 11–15), which, for first century Christians, must have meant the Roman Empire, and a divinely ordered establishment of a new earthly heaven in its place (XXI: 1–8). Catastrophic SF typically reproduces none of these tropes: its catastrophes are normally either natural or man-made, but rarely divinely ordained; its real worlds are often merely damaged rather than destroyed; and are more likely to be represented as foolish than as wicked; and, finally, there is typically

no subsequent compensatory resolution akin to the idea of a heaven on earth. Those who stress the continuity between such religious (specifically, Christo-Islamic) and subsequent secular 'apocalypticisms' tend thereby to downplay both the textual specifics of *Apokalypsis* itself and the historical novelty of modern SF as a genre defined primarily in relation to modern science and technology. No doubt, SF makes use of tropes and topoi borrowed from other genres, not only the apocalypse, but also eutopia, dystopia, fabulous voyages, and so on, but it does so in ways that are distinctively compatible with modern scientific rationalism. The fact that real science can provide detailed and realistic models of the likely effects of nuclear war or anthropogenic climate change makes their treatment by SF amenable to analysis in such rationalist, and distinctly non-mystical, terms. Our aim here will be to test the extent to which SF has in practice been able to live up to Turner's hopes and expectations, with special reference to this problem of 'ecological disaster and meteorological catastrophe'.

2. Ecocriticism, Anthropocentrism and the Anthropocene

The last 15 years have witnessed the emergence of a substantial body of ecocritical writing on literature and climate change, much of it ably summarised by Kate Rigby (Rigby, 2014). More recent examples include Adam Trexler's *Anthropocene Fictions* (2015), Ghosh's *The Great Derangement* (2016), Chris Pak's *Terraforming* (2016), Antonia Mehnert's *Climate Change Fictions* (2016) and the 29 original essays collected together in Axel Goodbody and Adeline Johns-Putra's *Cli-Fi: A Companion* (2018). But ecocriticism is in general predicated upon a version of traditional literary-critical 'close reading' aimed at judging texts aesthetically in some updated version of Matthew Arnold's understanding of culture as the 'best which has been thought and said in the world' (Arnold, 2006: 5). Literary criticism of this kind typically aims at the identification of some kind of literary 'canon'. Historically, the term canon denoted a set of officially recognised 'sacred' books. In Christian theology it referred to the books of the *Bible* acknowledged by the Church as genuine and divinely inspired, and therefore 'true', as distinct from the *apocrypha*, the texts claimed by some to be divinely inspired, but nonetheless rejected by the Church. The final shape of the Catholic canon was determined by the Council of Rome in 382 CE, under the authority of both Pope Damasus I and Emperor Theodosius I. The Council was thus very clearly an institution for the authoritative allocation of value, empowered by both religious and secular authorities. Analogous institutions for the

authoritative allocation of aesthetic value existed under both medieval feudalism and early-modern absolutism, where they were typically located in the church or the court. But capitalism threatened to undermine all such institutions. As Marx and Engels famously observed in *The Communist Manifesto*: 'The bourgeoisie ... has converted the physician, the lawyer, the priest, the poet, the man of science, into its paid wage-labourers' (Marx and Engels, 1967: 82). Their judgement was, however, premature. For, the nineteenth century witnessed the emergence of a cluster of European and South American nation states, which used tax revenues to sustain a series of non-market institutions, the church, the monarchy, the aristocracy, the military, the universities and, in the twentieth century, the public broadcasters. These institutions were all essentially conservative, in the sense that they sustained both the newly dominant bourgeois culture and also substantial elements of residually feudal culture. And so they continued until the transition to what Jameson, following Theodor Adorno, calls late capitalism, 'the purest form of capital yet to have emerged, a prodigious expansion of capital into hitherto uncommodified areas' (Jameson, 1991: 36), in which 'aesthetic production ... has become integrated into commodity production generally' (Jameson, 1991: 4). Ours has thus become a culture with no institutions for the authoritative allocation of aesthetic value, which therefore requires no canon. Of course, ecocriticism is perfectly free to announce a canon for itself, indeed anyone and everyone can announce a canon for themselves. But these are not really canons since they are unable to exercise any authoritative institutional power.

Academic literary criticism was a product of the national institutional complex outlined above. It should be no surprise, then, that its primary subject matter was the national literary canon, simultaneously endorsed by and endorsing the imagined and imaginary community of the nation state. These national universities, churches and public broadcasters were thus institutions for the authoritative allocation of national value articulated in the dominant national language. Literary criticism's canons were thereby invariably national in character, 'English' in England (and its empire), 'French' in France (and its empire). While the more general cultures of late capitalism have subsequently become increasingly globalised, literary criticism has continued to be residually 'national' in its uses of language. Hence, our second objection to ecocriticism, that it is, to a quite remarkable degree, Anglophonocentric. This is true even of Ghosh and Pak, but in Trexler and Mehnert Anglophonocentrism is pushed to extremes, so that both books are concerned, not simply with Anglophone texts, but overwhelmingly with US American texts, Mehnert exclusively so.

Let us note, finally, that ecocriticism has often also been deeply complicit with the kinds of theoretical anti-humanism and epistemological relativism more conventionally associated with post-structuralism and postmodernism. As Serpil Oppermann rightly observes, contemporary ecocriticism increasingly participates in a ‘shared intellectual attitude ... namely postmodernism’ (Oppermann, 2011: 17). This might not, however, be the unmixed blessing Oppermann imagines it to be. One key aspect of the developing theoretical confluence between ecocriticism and postmodernism is that between longstanding structuralist and post-structuralist critiques of humanism and more recent ecological critiques of ‘anthropocentrism’. For Foucault, ‘man’ was famously ‘only a recent invention, a figure not yet two centuries old, a wrinkle in our knowledge’, who ‘will disappear again as soon as that knowledge has discovered a new form’ (Foucault, 1970: xxiii); for the pioneering ecocritic, Lawrence Buell, ‘the “I” has no greater claims to being the main subject than the chickens, the chopped corn, the mice, the snakes, and the phoebes – who are somehow also interwoven with me’ (Buell, 1995: 179). But the anthropocene raises peculiarly thorny questions for ecocriticism, given that Crutzen and Stoermer’s argument was quite determinedly anthropocentric, in so far as it insisted that we have entered a geological era in which the planet’s destiny, measured in terms of global warming, species extinction, and so on, is now, as a matter of fact, actually shaped by human technologies. It did so, moreover, on explicitly environmentalist grounds, that is in order to argue for activist intervention against the effects of anthropogenic climate change. Hence, Luke Hortle’s observation, in a commentary on David Mitchell’s *Cloud Atlas*, that ‘the Anthropocene signals the covert apotheosis of a resurgent humanism through its privileging of the human species’ destructive homogeneity’ (Hortle, 2016: 264), a criticism that deliberately echoes recent post-structuralist philosophical concerns about the humanism implicit in theories of posthumanism (Colebrook, 2015).

This is all rather complicated, we know, but let us attempt to unpack the argument by way of a brief return to the debate among Earth scientists with which we concluded the previous chapter. Eugene Stoermer, who coined the term Anthropocene, was Professor of Biology at the University of Michigan and an expert on microalgae; Paul Crutzen was Research Professor of Atmospheric Chemistry at the University of Stockholm and winner of the 1995 Nobel Prize for Chemistry; the body to which they formally proposed the term in 2000, the International Geosphere-Biosphere Programme, or IGBP, had been established by the International Council of Scientific Unions in 1987 to study changes in the total Earth system; it oversaw an enormous body of sustained

research between then and 2015, when it was succeeded by the Future Earth project. The geological time scale (GTS) conventionally used by Earth scientists distinguishes between eons, eras, periods and epochs. Measured thus, the last 11,700 years, the period in which human civilisations have existed, comprises the Holocene epoch of the Quaternary period of the Cenozoic era of the Phanerozoic eon. The epoch which immediately preceded it, the Pleistocene, lasted from roughly 2,588,000 to 11,700 years ago and was much colder than the Holocene. The epoch that in turn preceded it, the Pliocene, lasted from about 5,333,000 years ago, and was significantly warmer than now, but progressively cooled, leading to the glaciations of the Pleistocene. The GTS classificatory system is based on the evidence of geological residue and thus tends to register the effects of geology on life, but not those of life on geology. The theoretical novelty of Stoermer and Crutzen's proposal was precisely to assert the obverse, that human life is now significantly transforming the geology of the planet. This met with some initial scepticism, much of which has subsequently dissipated. The Working Group on the Anthropocene of the International Geological Congress formally recommended adoption of the term to the 2016 Congress in Cape Town, giving as its preferred date for the beginning of the new epoch, not the Industrial Revolution as it had been for Stoermer, but rather 1950. This later dating arises from the empirical observation that the lead indicators of anthropogenic disturbance to the Earth System – not simply atmospheric CO₂, but also ozone depletion, species extinction, deforestation, and so on – all increased very sharply from the middle of the twentieth century. As Crutzen observed in 2003, in an article co-authored with Will Steffen, then executive director of the IGBP, 'the Earth System has recently moved well outside the range of natural variability exhibited over at least the last half million years. The ... changes now occurring ... are unprecedented and unsustainable' (Crutzen and Steffen, 2003: 253).

For postmodern post-structuralists, this science is merely all so much culture, 'Anthropocene discourse' as Foucault might have put it. So Colebrook writes that 'man's effect on the planet will supposedly be discernible as a geological strata readable well after man ceases to be, even if there are no geologists who will be present to undertake this imagined future reading' (Colebrook, 2014: 10); and Hortle that we 'are asked to imagine a world after our extinction in which an impossible future reader (a rational scientist, no less) could interpret our indelible trace in the earth's bedrock' (Hortle, 2016: 267). This is, however, precisely *not* what Earth Science proposes. The Anthropocene is not in fact a 'thought experiment' as to what some hypothetical future

geologist might record, but rather a description of what contemporary Earth scientists actually observe to be happening *now*. So Crutzen and Steffen list 12 indicators of human activity and 12 indicators of resultant changes in the Earth System for the period between 1750 and 2000 (Crutzen and Steffen, 2003: 254–255). How can we explain this radical misreading of the science by scholars who have been trained precisely in reading? Commenting on a parallel misreading in the debate over the ‘Capitalocene’ – to which we turn very shortly – Ian Angus observes, first, that the academic left still suffers from the mutual incomprehension between the humanities and sciences that C.P. Snow once diagnosed in terms of the ‘Two Cultures’ (Snow, 1959); and, second, that this ‘became much worse in the late twentieth century under the influence of the open hostility toward natural science that characterized postmodernism’ (Angus, 2017: 82). Regrettably, much of that hostility still bleeds into contemporary ecocriticism.

The Capitalocene is to academic Marxism as ‘Anthropocene discourse’ is to academic postmodernism. The term was coined by Jason Moore in his 2015 *Capitalism in the Web of Life*, in many respects the most impressive attempt to date to build on the foundations of ‘ecomarxism’ established by writers like James O’Connor, John Bellamy Foster and Paul Burkett (O’Connor, 1997; Foster, 2000; Burkett, 2006).¹ Like them, Moore sees the contradiction between capital and nature as equally significant to that between capital and labour; like them, he also sees the capital–nature relation as riven by its own internal contradictions. Capitalism, he writes, is ‘cohered’ by a “law of Cheap Nature”, the ‘relentlessly innovative quest to turn the work/energy of the biosphere into capital’ (Moore, 2015: 14). This law can be understood in terms of the ‘Four Cheaps’, of labour-power, food, energy and raw materials (Moore, 2015: 17). But whereas nature is finite, capital is premised on the infinite: ‘The great secret and great accomplishment of capitalist civilization has been to *not* pay its bills’; but the end of cheap nature will bring ‘with it, the end of capitalism’s free ride’ (Moore, 2015: 87). There is thus a tendency of the ecological surplus to fall, occasioned by entropy, by capitalisation itself, which increases the money cost of the Four Cheaps, by disproportionality between the reproduction times of capital and nature, and by the fact that accumulation of capital becomes more wasteful over time, to the extent ultimately of activating ‘negative-value’. The language is that of

¹ Kohei Saito’s award-winning *Karl Marx’s Ecosocialism* (2017) is differently impressive. It works with Marx’s own previously unpublished and untranslated scientific notebooks to show that Marx himself had actually been an ecomarxist *avant la lettre*.

economics, but the substantive issue is that of ecology: negative value is 'expressed starkly in contemporary climate change' (Moore, 2015: 98).

This, then, is the Capitalocene, 'the historical era shaped by relations privileging the endless accumulation of capital' (Moore, 2015: 173). And it dates not from the mid eighteenth century as Stoermer originally understood the Anthropocene, nor from the mid twentieth century as the Working Group on the Anthropocene has, but rather from the origins of capitalism in the fifteenth century. This leads to a model of capitalist development as proceeding through three successive 'world hegemonies', each understood as 'socio-ecological projects', the Dutch based on timber, the British based on coal, and the American based on oil (Moore, 2015: 163). As a long history of capitalism this is very persuasive, but it nonetheless speaks over, rather than to, the concerns that prompted Crutzen and Stoermer's interventions into the Earth sciences. For, although capitalism might date from the fifteenth century, the key indicators of environmental despoliation clearly date from the nineteenth century. This is precisely the point of Andreas Malm's *Fossil Capital*, a text that also uses the term Capitalocene, but that identifies the crucial eco-historical shift as occurring around the British cotton industry's transition from water power to steam power – that is coal power – during the late eighteenth and early nineteenth centuries (Malm, 2016). Detached from the question of historical periodisation, which is crucial for Moore, but not for Malm, the Anthropocene/Capitalocene distinction becomes merely one of terminology. And, of course, here Moore and Malm are indeed formally correct: it was capitalism as a particular mode of production, rather than humankind in general, that produced what we are now calling anthropogenic – or capitalogenic? – climate change. But whatever these Marxist political economists might prefer, the term chosen by the more 'radical' scientists – meaning those whose work was the most disruptive of the pre-existing scientific consensus – is the Anthropocene. And this is where Angus's point holds: 'leftist academics are resisting efforts to bridge the two cultures gap', he writes: 'This is an academic equivalent of the *political sectarianism* that has long plagued the left' (Angus, 2017: 83). Indeed, it is, even if Angus's treatment of Moore often betrays its own similarly sectarian bent.

We might add that Capitalocene is very obviously an oddly ungainly neologism, and thus likely to be far less rhetorically effective than Anthropocene, even if very much more effective than Donna Haraway's proposed 'Chthulucene'. '*Chthulucene* is a simple word', she explains, 'a compound of two Greek roots (*khthôn* and *kainos*) that together name a kind of timeplace for learning to stay with the trouble of living and dying in response-ability on a damaged earth'. 'Chthonic ones', she

continues, 'are beings of the earth, both ancient and up-to-the-minute ... replete with tentacles, feelers, digits, cords, whiptails, spider legs, and very unruly hair' (Haraway, 2016: 2). Haraway is gracious enough to concede that 'we will continue to need the term *Anthropocene*' (Haraway, 2016: 47). But the stories of the Anthropocene and the Capitalocene are 'Too Big', she writes: 'Unlike the dominant dramas of Anthropocene and Capitalocene discourse, human beings are not the only important actors in the Chthulucene, with all other beings able simply to react. The order is reknitted: human beings are with and of the earth' (Haraway, 2016: 55). The Chthulucene is the past, present and possible future age of understanding our kinship with the natural world, especially the other animals, of which we are part. Hence, her preferred slogan: 'Make Kin Not Babies!' (Haraway, 2016: 102).

Trained in the sciences, Haraway was, of course, the author of the *Cyborg Manifesto*, which famously signalled our 'joint kinship with animals' even as it also signalled that 'with machines' (Haraway, 1991: 154). In her subsequent *Companion Species Manifesto*, animals clearly took priority over machines (Haraway, 2003). But in her imaginings of the Chthulucene, Haraway's zoocentrism comes close to misanthropy. A '9 billion increase of human beings over 150 years, to a level of 11 billion by 2100 if we are lucky, is not just a number', she begins by warning us, 'it cannot be explained away by blaming Capitalism or any other word starting with a capital letter' (Haraway, 2016: 6–7). She concludes by anticipating the possibility that: 'Over a couple hundred years from now, ... the human people of this planet can again be numbered 2 or 3 billion or so, while all along the way being part of increasing well-being for diverse human beings and other critters as means and not just ends' (Haraway, 2016: 103). How on earth could the human population possibly be reduced within two centuries from 11 billion to 2 or 3 billion? The answer would have to be something quite close to genocide. We have both enjoyed the company of pets and other domestic animals, cats, dogs, guinea pigs, hens, but we were perhaps less attached to them than is Haraway to her dog, the late Cayenne Pepper. Nonetheless, no amount of attachment would reconcile us to the near genocide of our own species. This, we fear, is ecocriticism at its most perverse.

Our substantive interests clearly overlap with those of ecocriticism, ecomarxism and even with parts of Haraway's 'Chthulucene argument', but our theoretical and methodological framework will be very different. Following on from the argument developed by Andrew Milner in *Locating Science Fiction* (Milner, 2012), we will seek to develop an empirically grounded view of SF as an amalgam of texts, practices and

artefacts, best understood by way of a combination of Williams's cultural materialism, Pierre Bourdieu's sociology of culture and Franco Moretti's application of world systems theory to literary studies. Each of these approaches is, in some very significant sense, essentially 'sociological' rather than 'literary-critical' in character. As such, they seem to us theoretically and methodologically more adequate to a subject matter as quantitatively extensive as contemporary 'cli-fi'.

3. Cli-fi and the Sociology of Literature

We have described our conceptual framework as a combination of ideas deriving from Williams, Bourdieu and Moretti. From Williams, of course, we take the specific notions of 'structure of feeling' and 'selective tradition', but also the more general notion of 'cultural materialism', by which he meant 'a theory of culture as a (social and material) productive process and of specific practices, of "arts", as social uses of material means of production' (Williams, 1980: 243). On this view, literature is a distinctive subset of socially specific, materially determinate, forms and practices. It is only a subset because the category 'literature' denotes only a particular, socially valorised selection from the whole body of socially available writing, and writing in turn only one among many forms of cultural practice. Williams was no doubt well aware of the institutional grounding of structures of feeling and selective traditions. Nonetheless, these are almost certainly better theorised through Bourdieu's notion of the 'cultural field'. For Bourdieu, even disinterested and gratuitous practices can be treated as directed towards the maximisation of some kind of profit. Applied to the arts, this approach produces a model of 'the field of cultural production' as structured externally in relation to the 'field of power' and internally in relation to two 'principles of hierarchization', or ways of allocating value (Bourdieu, 1993: 37–38, 40–41). The modern literary and artistic field is thus for Bourdieu a site of contestation between the 'heteronomous' principle, which subordinates art to economy, and the 'autonomous', which resists such subordination in the name of 'art for art's sake' (Bourdieu 1993: 40). Bourdieu's map of the late nineteenth century French literary field is depicted in Figure 2.1 below.

Here, the principle of autonomy, or '*consécration spécifique*', governs the left of the field, that of heteronomy, or '*profits économiques*', the right, so that the least economically profitable genres are to the left, the most economically profitable genres to the right. Each genre is also governed by the social hierarchy of its audiences, so that higher

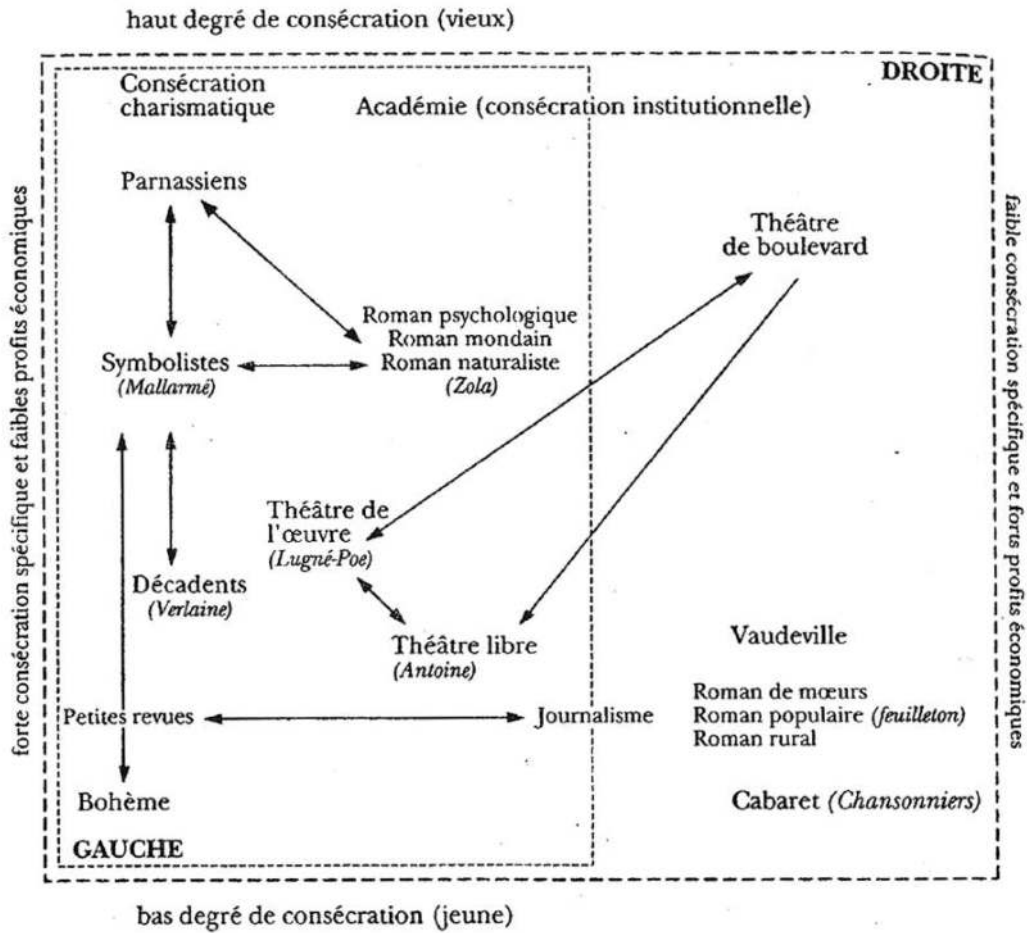


Figure 2.1: Bourdieu's Map of the Late Nineteenth-century French Literary Field

Source: Bourdieu, 1992: 176

status audiences (the academy, the old) govern the upper end of the field, lower status audiences (the bohemians, the young) the lower. Finally, the field is also traversed diagonally by the left–right political spectrum. Conventional wisdom often tends to treat SF as a necessarily low status and economically profitable genre, located somewhere near Bourdieu's 'roman populaire', the *feuilleton*. But if we factor in such variants as academic SF criticism, the 'literary' SF novel, the various SF 'new waves', 'art house' and 'underground' SF cinema, as Milner has done, then it becomes clear that the SF subfield is actually structurally homologous to the whole of the general cultural field rather than to any particular part therein. Milner's model is illustrated in Figure 2.2 below.

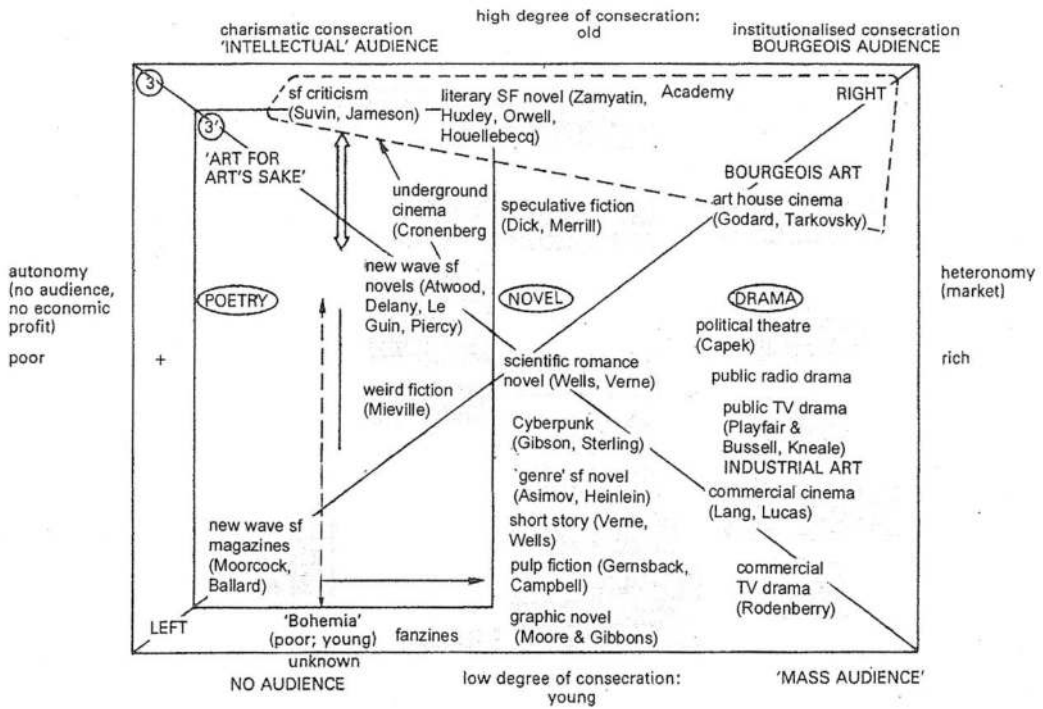


Figure 2.2: Milner’s Model of the Global SF Field in the Early
 Twenty-first Century
 Source: Milner, 2012: 45

There are two especially significant differences between Bourdieu’s map of the nineteenth century field and this application to twenty-first century SF. First, Milner’s model is global rather than national in its geographical range, which reflects the increasingly globalised character of contemporary cultural production. Second, it is apparently diachronic rather than synchronic in its historical range, which covers Verne and Wells, Yevgeny Zamyatin and Karel Čapek, as well as Atwood and Ursula K. Le Guin, Miéville and Michel Houellebecq. The diachrony is only apparent, however, for what Milner’s map actually records is not so much development over time as a record of how ‘the contemporary global field processes the legacies of its various cultural pasts’ (Milner, 2012: 45). In short, it acknowledges the way texts by Verne and Wells – and by Mary Shelley too, we might add – are still actively productive within the genre, most obviously so in adaptations for cinema and television. Another way to express this would be that one of the SF field’s central social functions is to produce and reproduce what is, in Williams’s terms, the genre’s selective tradition.

Our cultural materialism differs crucially from Williams's own in respect, not so much of our debt to Bourdieu as that to Moretti's appropriation of world systems theory. The latter is an approach to modern economic history developed by Immanuel Wallerstein, the enduring concern of which has been with how modern capitalism functions as a world system, comprising a 'core', 'periphery' and 'semi-periphery', defined in relation to three main variables, the degree of profitability, the degree of monopolisation and the degree of state patronage. Core-like processes tend to constitute the bulk of production in comparatively few states, peripheral in a much larger number, semi-peripheral in an intermediate zone containing a near even mix of core-like and peripheral production (Wallerstein, 2004: 28).

This is the model Moretti applies to Comparative Literature. He argues that the study of what Goethe termed *Weltliteratur* can no longer be conceived simply as national literature writ large, 'literature, bigger', but should be reorganised around entirely different categories and conceptual problems. It 'is not an object', he continues, 'it's a *problem*, and a problem that asks for a new critical method'. The model he proposes, directly adapted from Wallerstein, is that of a world literary system, simultaneously '*one*, and *unequal*: with a core, and a periphery (and a semi-periphery) that are bound together in a relationship of growing inequality' (Moretti, 2013: 46). If this is how the system functions, then the appropriate mode of analysis becomes 'distant reading', where distance 'is a condition of knowledge', permitting the analyst 'to focus on units ... much smaller or much larger than the text: devices, themes, tropes – or genres and systems' (Moretti, 2013: 48–49). The result is a history of the modern novel understood as a 'system of *variations*', in which during the nineteenth and early twentieth century pressure from the Anglo-French core tended towards uniformity, while variable local realities in the periphery and semi-periphery tended towards difference. Tendency and counter-tendency thus produced a series of localised structural 'compromises', between foreign plot, local characters and local narrative voice, in which the 'one-and-unequal literary system' became embedded in the form itself (Moretti, 2013: 57–59).

In *Distant Reading*, Moretti does not so much apply world systems theory as invoke it. For there is no equivalent here to Wallerstein's own detailed account of the interconnections between profitability, monopolisation and patronage, only the borrowed vocabulary of core, semi-periphery and periphery. The nearest Moretti came to such detail was in the earlier *Atlas of the European Novel 1800–1900*, where he used the number of titles published and the volume of translations recorded in national bibliographies as key empirical indicators. There he shows

how more than half of all nineteenth century European novels were originally published in either London or Paris. French novelists were more successful in translation in the Catholic South and British in the Protestant North, but the whole continent nonetheless read Walter Scott, Edward Bulwer-Lytton, Charles Dickens, Alexandre Dumas, Eugene Sue and Victor Hugo (Moretti, 1998: 186, 178–179). The number of titles and volume of translations need not necessarily correlate with profitability, monopolisation and state patronage, but in the long run they are very likely to do so, and in the case of British and French publishing almost certainly did.

The Warwick Research Collective has astutely observed that Moretti's understanding of the world literary system echoes Leon Trotsky's notion of capitalist development as a process of 'combined and uneven development', necessarily entailing the combination of archaic and contemporary forms. This, they argue, is 'a central – perhaps *the* central – arc or trajectory of modern(ist) production in literature and the other arts' (Deckard et al., 2015: 6). Hence, their insistence that 'world literature' is '*the literature of the world-system* – of the modern capitalist world-system' (Deckard et al., 2015: 8). Capitalism, they continue, is 'the substrate of world-literature' and 'modernity is both what world-literature indexes or is "about" and what gives world-literature its distinguishing formal characteristics' (Deckard et al., 2015: 15). Although Wallerstein himself traced the origins of the modern world system back to the sixteenth century, both Moretti and the Warwick Collective focus on the much shorter period since the late eighteenth century. As the latter explain, 'it is only in the "long nineteenth century", and then as the direct result of British and European colonialism, that we can speak both of the *capitalisation* of the world and of the full *worlding* of capital' (Deckard et al., 2015: 15). This is also, on our reading, the historical occasion for the emergence of modern SF.

Neither Moretti nor the Warwick Collective have applied distant reading to SF, but both Milner in Australia and Jerry Määttä in Sweden have begun to do so (Milner, 2014; Deckard, 2015). Määttä's primary focus is on 'canonical' SF texts, and on disaster narratives in general rather than climate fictions in particular, which is thus both simultaneously a narrower and broader field than ours, but his general conclusions nonetheless remain pertinent to this study. Catastrophe stories, he writes, seem to function 'as pressure valves during periods of build-up to expected conflicts or crises ... perhaps as a way of mentally preparing for an even bleaker reality which ... will soon be imminent' (Määttä, 2015: 429). It is surely very likely that the threat of an imminent even bleaker reality is one of the key drivers behind the development of contemporary climate fiction.

Our method here will be similar to Moretti's, not so much an application of Wallerstein as an invocation, centred on the core-periphery model. However, the methodological problems entailed by an attempt to identify specifically science-fictional sub-sets of Moretti's aggregate figures are considerable, not least those posed by changes over time in definition and nomenclature, and by the institutionalised effects of policing the boundaries between 'genre fiction' and the 'literary canon'. We therefore intend to take our base data from: first, a combination of aggregate book publishing and translation data, drawn from UNESCO's annual *Statistical Yearbook*, its *Index Translationum* and the invaluable *Internet Speculative Fiction Database*; and second, a distant reading of the history of the genre, derived in part from earlier close readings, in part from secondary accounts, especially those provided by the online third edition of *The Encyclopedia of Science Fiction* (Clute et al., 2011). The latter is, as Jameson observed of the hardcopy second edition, a 'superb' resource (Jameson, 2005: 1n). Measured in these terms, we can identify an initial Anglo-French core, which is later supplemented by new American and Japanese cores, while Russia, Germany, Poland and Czechoslovakia function as longstanding semi-peripheries, Latin America and China as newly emergent semi-peripheries. The structure of this system will be explored in detail in Chapter 3 below.

4. Towards an Ideal Typology of Climate Fictions

The range of imaginative responses to global warming appears to run from the gloomiest dystopia to the brightest eutopia by way of many kinds of intervening ambiguity. We use eutopia here as the antonym of dystopia, since, as More's 1516 Greek pun in Latin makes clear, utopia is neither a better nor worse place, but rather a no place:

Utopia priscis dicta ob infrequentiam,
Nunc civitatis aemula Platonicae, ...
Eutopia merito sum vocanda nomine.

['No-Place' was once my name, I lay so far;
But now with Plato's state I can compare, ...
'The Good Place' they should call me, with good cause.]
(More, 1995: 18–19)

Dystopia, which means bad place, is a more recent coinage, variously ascribed to Henry Lewis Younger in 1747, Noel Turner in 1782 and John

Stuart Mill in 1868 (Sargent, 2006, 15; Budakov, 2010; Köster, 1983; Mill, 1868). In Lyman Tower Sargent's definition, a 'utopia (eutopia, dystopia, or utopian satire)' is 'a species of prose fiction that describes in some detail a non-existent society located in time and space' (Sargent, 1976: 275). Academic utopian studies has thus formulated the increasingly conventional set of distinctions between: utopia, referring to the general form and its general conventions (the traveller, the guide, the island, etc.); eutopia, meaning its positive variant; and dystopia meaning its negative (Sargent, 1994: 7–10).

Thus defined, eutopias are normally understood as simply good or better places, dystopias as simply bad or worse places. But, as Tom Moylan's analyses of the 'critical utopia' and 'critical dystopia' serve to remind us, eutopias can be significantly dystopian in content, dystopias significantly eutopian (Moylan, 1986; Moylan, 2000; Moylan, 2014). Moylan argued that the new American eutopias of the 1970s – Ernest Callenbach's *Ecotopia* (1975), Sally Gearhart's *The Wanderground* (1979), Suzy McKee Charnas's *Motherlines* (1979), Dorothy Bryant's *The Kin of Ata are Waiting for You* (1971), Joanna Russ's *The Female Man* (1975), Le Guin's *The Dispossessed* (1974), Marge Piercy's *Woman on the Edge of Time* (1976) and Samuel R. Delany's *Triton* (1976) – were critical in the double sense of Enlightenment critique and of the 'critical mass' required to produce an explosion (Moylan, 1986: 10). They were distinctive, he argued, in so far as they rejected eutopia 'as a blueprint', while nonetheless preserving it 'as a dream'. They therefore focussed both on the conflict between eutopia and their 'originary world' and on 'the continuing presence of difference and imperfection' within eutopia itself. The result was a more plausible, because recognisable and dynamic, set of alternative possibilities (Moylan, 1986: 10–11). 'In resisting the flattening out of utopian writing in modern society,' he concluded, 'the critical utopia has destroyed, preserved, and transformed that writing and marks the first important output of utopian discourse since the 1890s' (Moylan, 1986: 43).

In his subsequent account of 'the dystopian turn' in late twentieth century American SF, Moylan argued that the new critical dystopias 'burrow within the dystopian tradition', but only 'in order to bring utopian and dystopian tendencies to bear on their exposé of the present moment'. They are thus 'stubbornly' eutopian, in the sense that they do not move easily toward their own better worlds: 'Rather, they linger in the terrors of the present even as they exemplify what is needed to transform it' (Moylan, 2000: 198–199). He also insisted that this was an essentially 'recent development', a 'distinctive new intervention', specific to the late 1980s and early 1990s (Moylan, 2000: 188). And he carefully distinguished the 'classical dystopia' and 'critical dystopia', on

the one hand, both of which are socially critical, from the 'anti-utopia', 'pseudo-dystopia' and 'anti-critical dystopia', on the other, none of which are (Moylan, 2000: 195). Determination to contextualise critical eutopia and dystopia in relation to very specific historical moments, those respectively of the rise of the American New Left in the 1960s and 1970s and of the triumph of Anglo-American neo-liberalism in the 1980s and 1990s, seems to us to lead Moylan into what is arguably an unnecessarily elaborate theoretical taxonomy. This is not to suggest that historical context is irrelevant, only that it might be unwise to posit too close a connection between formal and historical levels of analysis.

In the fully revised second edition of *Demand the Impossible*, Moylan observes that 'critical' can be used as 'either a periodizing or an interpretive protocol, and dialectically as both'. He is wary of the second of these three options, he explains, because it can easily 'aestheticize' the concept into a purely formal category and thus suppress its 'deep political motivation and intention' (Moylan, 2014: xxivn). Indeed, it can do so, but surely need not. Our view is that the historical preconditions for such criticality can be identified and explained in terms that will necessarily be socio-political, but that they are nonetheless also multiple and various and cannot therefore be tied definitively to any one time and place. Historically different but nonetheless analogous political conjunctures can produce similarly critical texts, which might thus be able to speak to each other over the decades or even over the centuries. And such similarities can be addressed in terms as strongly political as those Moylan applied to the specifics of the United States in the 1970s and 1990s.

If Moylan's position is historically over-specific, then that advanced by Atwood in her 'Dire Cartographies' essay is equally over-generalising. She argues that: 'Dystopias are usually described as the opposite of utopias ... But scratch the surface a little, and ... you see ... within each utopia, a concealed dystopia; within each dystopia, a hidden utopia' (Atwood, 2011: 85). We doubt this is strictly true and, even if it were, utopias can nonetheless be more or less critical, just as Moylan observes. But Atwood is certainly right to resist, at least by implication, Moylan's sense of criticality as a peculiar prerogative of American New Wave SF. Rather, these options are formally available and actually deployed, albeit discontinuously, throughout the history of the genre. As so often in utopian studies, the last word might well be left to Sargent:

the critical utopia has a history in the genre, but, and the buts are crucial, if the term is used narrowly ... there are fairly few of them, and the period that Tom [Moylan – AM and JRB] identified

and the authors he discussed ... are very unusual in that what emerged was in fact something that reflected the specific times in which they were written. (Sargent, 2014: 243)

We should add, however, that some of the recent climate change eutopias and dystopias are in fact critical in precisely Moylan's and Sargent's sense of the term.

This question of eutopia and dystopia, classical and critical, provides us with the first level of the framework for an ideal typology of contemporary climate fictions. We use the term ideal type here in Max Weber's sense of:

a one-sided *accentuation* of one or more points of view and by the synthesis of a great many diffuse, discrete, more or less present and occasionally absent *concrete individual* phenomena which are engaged according to those one-sidedly emphasized viewpoints into a unified *analytical* construct (*Gedankenbild*). (Weber, 1949: 90)

But in climate fiction the range of points of view is not simply a matter of eutopia or dystopia, but also of different responses to climate change. Here, the range runs roughly parallel to options available in various kinds of real-world discourse. Sociologists have identified a number of distinct 'climate change interpretive communities', six in the United States (Maibach, Roser-Renouf and Leiserowitz, 2009) and India (Leiserowitz et al., 2013), five in Australia (Hine et al., 2013) and Germany (Metag, Fuchslin and Schäfer, 2017). But in each case the communities are identified primarily by their degree of belief in the reality or otherwise of climate change. So, in Maibach, Roser-Renouf and Leiserowitz's pioneering study, the six main communities were identified as the Alarmed (18% of the population), the Concerned (33%), the Cautious (19%), the Disengaged (12%), the Doubtful (11%) and the Dismissive (7%). Only the two extreme communities, the Alarmed and the Dismissive, are 'actively engaged in the issue, but on the opposite end of the spectrum' (Maibach, Roser-Renouf and Leiserowitz, 2009: 3–5). Given that writing a novel or directing a film requires a comparatively high level of commitment, we would expect climate fictions to be overwhelmingly either Alarmed or Dismissive.

Alarmed might, however, be too broad a category for our purposes and can usefully be further refined by reference to relevant policy debates. Climate policy distinguishes between mitigation and adaptation strategies and between negative and positive variants of adaptation, the latter seeking possible advantages to be seized upon, the former

disadvantages to be minimised. Mitigation strategies in the strict sense are simply strategies to reduce emissions, but these are very rarely the stuff of SF narrative. In so far as climate fiction does contemplate mitigating the effects of global warming, it typically does so by way of the kind of technological fix implicated in climate engineering. For our purposes, then, mitigation and climate engineering can be considered more or less the same trope. To these three responses we can add as a fourth option the kind of deep ecological anti-humanism sometimes associated with Lovelock's 'Gaia hypothesis' (Lovelock, 1979); and, as a fifth, the kind of pessimistic fatalism that acknowledges the reality of climate change but sees it as more or less inevitable. Finally, in fiction as in reality we encounter the Dismissive, or what we will here term denial. Instances of all six kinds of response – denial, mitigation, negative adaptation, positive adaptation, deep ecology, fatalism – can be observed in climate fiction. Good examples of denial include Michael Crichton's *State of Fear* (2004), Liu Cixin's 三体 trilogy (2008–10) and Nele Neuhaus's *Wer Wind sät* (2011); of the special kind of denial that calls into question the scientists rather than the science, Ian McEwan's *Solar* (2010) and Sven Böttcher's *Prophezeiung* (2011); of mitigation, Herzog's *Heat* (1977), Fleck's *MAEVA!* trilogy (2008–15) and Robinson's *2312* (2012) and *Aurora* (2015); of negative adaptation, Turner's *The Sea and Summer* (1987), Michel Houellebecq's *La Possibilité d'une île* (2005), Ligny's *Aqua*TM (2006), Bacigalupi's *The Windup Girl* (2009), Barbara Kingsolver's *Flight Behavior* (2012), Robinson's *New York 2140* (2017) and Amitav Ghosh's *Gun Island* (2019); of positive adaptation, Robinson's *Science in the Capital* trilogy (2004–7) and its 2015 omnibus edition as *Green Earth*, Atwood's *Oryx and Crake* (2004) and *MaddAddam* (2013), Bernard Besson's *Groenland* (2011) and Bacigalupi's *The Water Knife* (2015); of deep ecology, Aldiss's *Helliconia* trilogy (1982–5), Frank Schätzing's *Der Schwarm* (2004), Ligny's *Exodes* (2012a) and *Semences* (2015); of fatalism, Wolfgang Jeschke's *Das Cusanus-Spiel* (2005), Winterson's *The Stone Gods* (2007), Umoya Lister's *Planetquake* (2010), Alexis Wright's *The Swan Book* (2013) and James Bradley's *Clade* (2015). These lists are by no means exhaustive, but are rather intended as examples. We should also bear in mind Weber's own cautionary reminder that in 'its conceptual purity', an ideal type 'cannot be found empirically anywhere in reality' (Weber 1949: 90).

Our preliminary research concentrated on novels and novellas, but it soon became clear that other media also engaged in fictional and non-fictional representations of various kinds of extreme climate change. Examples of graphic novels and comics include: Rochette and Lob's *Le Transperceneige* (1984); Hayao Miyazaki's 風の谷のナウシカ/*Kaze no Tani no Naushika* (1982–94); Josh Neufeld's *A.D.: New Orleans after the Deluge*

(2010); Grant Calof and Eric Eisner's *H2O* (2011); John Hicklenton's *100 Months* (2012); and Brian Wood's *The Massive* (2012–14). Examples from film and animation include: Miyazaki's adaptation of 風の谷のナウシカ/*Kaze no Tani no Naushika* for anime (1984); Kevin Reynolds's *Waterworld* (1995); Steven Spielberg's *A.I. Artificial Intelligence* (2001); Emmerich's *The Day After Tomorrow* (2004); Andrew Stanton's *Wall-E* (2008); Ivan Engler and Raph Etter's *Cargo* (2009); Neill Blomkamp's *Elysium* (2013); Bong Joon-Ho's 설국열차/*Seolgunnyeolcha* (2013); Darren Aronofsky's *Noah* (2014), Christopher Nolan's *Interstellar* (2014), Dean Devlin's *Geostorm* (2017), Frant Gwo's 流浪地球/*Liúlàng Dìqiú* (2019) and Seth Larney's *2067* (2019). These and other media will be discussed in greater detail in Chapter 8. There is also a large and growing body of young adult climate fiction, the most influential example of which is probably the Scottish writer Julie Bertagna's *Exodus* trilogy (2002–11). We might also, however, mention the two volumes of English writer Saci Lloyd's *The Carbon Diaries* (2008 and 2010), the Norwegian Jostein Gaarder's *Anna. En fabel om klodens klima og miljø* (2013) and the American J.L. Morin's *Nature's Confession* (2015).

Diagrammatically, we can represent our ideal typology as arranged around five measures of formal utopianism on the one hand and six measures of substantive response to climate change on the other. The six variants of climate response are those outlined immediately above. The five formal variants of utopian fiction are: the classical, or simple, eutopia; the critical eutopia; the classical, or simple, dystopia; the critical dystopia; and the fiction set in a reality that is neither significantly better nor significantly worse than our own, the non-utopia, which we might term the base reality text. This leaves us with the grid of 30 logically possible types of climate fiction included in Figure 2.3 below. In Chapters 4, 5, 6 and 7 below, we will attempt to measure the empirical incidence and efficacy of these 30 types. Each of those chapters is organised primarily around a different formal category (eutopia, dystopia, base reality text, etc.) and secondarily around specific responses to climate change (denial, mitigation, adaptation, etc.). So, the chapter titles indicate the primary organisation and the subtitles the secondary organisation.

This ideal typology will be confined to science fictions, loosely defined, and will thus deliberately exclude texts conventionally regarded as instances of fantasy. The relationship between SF and fantasy has been almost as fraught as that between SF and science. The writers cited at the beginning of this chapter, who stressed the continuity between science and SF, also typically stressed the parallel discontinuity between SF and fantasy. There is thus a long tradition insisting on a radical distinction between the two genres, which reaches back to Gernsback,

	Form (Type of Utopia)				
Content (Response to Climate Change)	Classical Dystopia	Critical Dystopia	Base Reality Text	Critical Eutopia	Classical Eutopia
Denial	三体/ <i>Three-Body</i>	<i>Solar</i>	<i>State of Fear</i>		
Mitigation	<i>Heat</i>	<i>Aurora</i>		<i>MAEVA!</i> trilogy	
Negative Adaptation	<i>La Possibilité d'une île</i>	<i>Aqua™</i>	<i>Flight Behavior</i>	<i>New York 2140</i>	
Positive Adaptation	<i>The Water Knife</i>	<i>Oryx and Crake</i>	<i>Green Earth</i>	<i>MaddAddam</i>	
Deep Ecology	<i>Exodes and Semences</i>	<i>Der Schwarm</i>			<i>Helliconia Winter</i>
Fatalism	<i>The Stone Gods</i>	<i>The Swan Book</i>	<i>Planetquake</i>		

Figure 2.3: An Ideal Typology of Contemporary Climate Fiction

Wells, Verne and Shelley. This argument is very forcefully restated in Suvin's insistence that the necessary and sufficient conditions for SF are 'the presence and interaction of estrangement and cognition' (Suvin, 1979: 7–8). The prescriptive intent here was clearly to exclude myth, folktale and fantasy from the genre (Suvin, 1979: 7–9, 20). This emphasis on the cognitive functions of SF is accompanied in Suvin by a profound aversion to fantasy as a 'proto-Fascist revulsion against modern civilization ... organized around an ideology unchecked by any cognition ... its narrative logic ... simply overt ideology plus Freudian erotic patterns' (Suvin, 1979: 69). Jameson echoes Suvin when he warns that SF will add to, while fantasy only subtracts from, utopia's epistemological gravity (Jameson, 2005: 57) and when he judges fantasy as 'technically reactionary' (Jameson, 2005: 60). The 'invocation of magic by modern fantasy', Jameson concludes, 'is condemned by its form to retrace the history of magic's decay and fall, its disappearance from ... the disenchanting world of prose, of capitalism and modern times' (Jameson, 2005: 71).

Yet, much of the canon of contemporary fantasy might plausibly be claimed for climate fiction: J.R.R. Tolkien's *The Hobbit* (1937) and *The Lord of the Rings* trilogy (1954–5); their film adaptations by Peter Jackson

(2001–3; 2012–14); C.S. Lewis's *The Chronicles of Narnia* (1950–6) and their film adaptations by Walden Media (Adamson, 2005–8; Apted, 2010); Philip Pullman's *His Dark Materials* trilogy (1995–2000); George R.R. Martin's still unfinished *A Song of Ice and Fire* (1996–2011) and its television adaptation by HBO as *Game of Thrones* (Benioff, Weiss et al., 2011–19). Indeed, both Tolkien and Lewis have already been so claimed (Dickerson and Evans, 2006; Dickerson and O'Hara, 2009). Martin has, however, explicitly rejected the proposition that *A Song of Ice and Fire*, *Game of Thrones* and, by extension, *The Lord of the Rings*, are actually about climate change: 'Like Tolkien I do not write allegory, at least not intentionally ... if I really wanted to write about climate change in the twenty-first century I'd write a novel about climate change in the twenty-first century' (Hughes, 2013).² The theological subtext in Tolkien and Lewis is, of course, Christian, in the latter case quite explicitly so; that in Pullman equally explicitly anti-Christian, but nonetheless obsessed with religion and religiosity; while Martin has described himself as a 'lapsed Catholic' fascinated by 'religion and spirituality' (Hibberd, 2011). This correlation between religiosity, spirituality and fantasy is unsurprising, in so far as both religion and fantasy tend towards forms of magical thinking. And, while there are versions of religiosity that certainly resist magic – Jesuit Catholicism as opposed to peasant Catholicism, for example, or Calvinism as opposed to Pentecostalism – fantasy fiction is nonetheless invariably magical.

Miéville is himself the author of the kind of 'weird fiction' that blends SF and fantasy and his *Railsea* (2012) could arguably be claimed for climate fiction. And, as we have seen, he has vigorously rejected the necessary connectedness of SF and science. Rather than counterpose SF to fantasy, he argues that SF is best considered 'a subset of a broader fantastic mode' (Miéville, 2002: 43). The near universalisation of commodity fetishism in contemporary capitalism, he writes, means that 'real' life itself 'is a fantasy' and conventional 'realism' therefore merely the realistic depiction of 'an absurdity which is true' (Miéville, 2002: 41–42). Acknowledging the difference between 'not-yet-possible' estrangement effects in SF and 'never possible' effects in fantasy, he nonetheless insists that, if the predicates for a fantasy 'are treated systematically and coherently within the fantastic work', then its cognition effects will be precisely those 'normally associated with sf' (Miéville,

² In a more recent interview with *The New York Times* Martin has conceded that 'in a very broad sense – there's a certain parallel there', but it is clear that he sees the parallelism as working by retrospective analogy rather than intentional allegory (Martin, 2018: A2).

2002: 45). Hence, his eventual conclusion that ‘we need fantasy to think the world, and to change it’ (Miéville, 2002: 48). There is much to be said for the inclusivity of Miéville’s position, not so much an argument against SF as an argument for fantasy in addition to and alongside it: ‘*Red Planets* we have. We should not neglect red dragons’ (Miéville, 2009: 245). And yet there is a specific problem in relation to climate fiction. For if all fantasy and much religion are instances of magical thought, and if in reality magic simply does not work, as it clearly does not, then fantasy and religion will be of little use in responding to real-world climate changes. This is not an argument against enjoying the pleasures of fantasy, but only against taking fantasy seriously as climate fiction. In fantasy magic can always save the day; in real life it never does. For that, we have only science and politics. And SF.

5. Narrative Strategies and Tactics

An important issue relevant across media is that of how central a position climate change actually occupies within any particular narrative. We have already referred *in passim* to Suvin’s definition of SF as a genre ‘distinguished by the narrative dominance or hegemony of a fictional “novum” (novelty, innovation) validated by cognitive logic’ (Suvin, 1979: 63). In some SF, climate change functions essentially only as a setting for another more central novum, whereas in others it is itself the novum. In addition, we might note the presence of ‘hybrid’ texts, where climate change is the primary science-fictional novum, but where a non-SF component, such as romance or crime, is nonetheless actually dominant. Texts where climate change functions primarily as ‘mise en scène’, to borrow a term from theatre and film studies, include: Atwood’s *MaddAddam* trilogy (2003–13), where genetic engineering is the primary novum; Houellebecq’s *La Possibilité d’une île* (2005), where it is cloning; Jeschke’s *Das Cusanus-Spiel* (2005), where it is time travel; Chang-Rae Lee’s *On Such a Full Sea* (2014), where it is future agriculture and pharmaceuticals; and David Mitchell’s *The Bone Clocks* (2014), where it is the struggle for immortality. Texts where anthropogenic climate change provides the primary novum clearly include: Herzog’s *Heat* (1977), Turner’s *The Sea and Summer* (1987), Maggie Gee’s *The Ice People* (1998) and *The Flood* (2004), T.C. Boyle’s *A Friend of the Earth* (2000), Robinson’s *Science in the Capital* trilogy, Schätzing’s *Der Schwarm* (2004), Ligny’s climate change trilogy (2006–15), Jeanette Winterson’s *The Stone Gods* (2007), Fleck’s *MAEVA!* trilogy (2008–15), Ilija Trojanow’s *Eis Tau* (2011), Barbara Kingsolver’s *Flight Behavior* (2012), Nathaniel Rich’s *Odds*

Against Tomorrow (2013), Alexis Wright's *The Swan Book* (2013) and Craig Russell's *Fragment* (2016). Examples of 'hybrid' texts would include Jordi de Manuel's *L'olor de la pluja* (2006) and Antti Tuomainen's *Parantaja* (2010), both of which are primarily crime novels. The key question here is not so much classification per se, but rather that of rhetorical efficacy.

A second issue relevant across media is that of the relative efficacy of different cultural forms. The panel on 'Climate Change Narratives' held at the 2014 72nd World Science Fiction Convention debated the difficulties of telling human stories concerning 'the distinctly larger-than-human problem of climate change' (Sieber et al., 2014). This does not seem to us as serious a problem as it might at first appear. All realist fiction tended to set human stories in larger-than-human contexts and there is no obvious reason why climate fiction should not have the capacity to do likewise. If there is a problem it is that, by comparison with plague or nuclear war, climate change is a relatively slow process. But so too was the decline of Scottish clan society depicted in Scott's Waverley novels, or the rise of bourgeois Paris depicted in Balzac's *La Comédie humaine*. There might be a specific problem for SF cinema, however, in so far as it finds itself obliged to work within much shorter time frames than those available to either the novel or the television mini-series. This could explain why Emmerich's *The Day After Tomorrow*, for example, was so obviously scientifically implausible: climate change just will not happen quite that quickly. One alternative approach is to set the film well after the catastrophe, as in the 2009 Swiss SF film *Cargo* or the 2013 South African film *Elysium*. Jameson identifies a further alternative, however, in Nolan's *Inception* (2010), Mitchell's novel *Cloud Atlas* (2004), and its 2012 film adaptation by Lana Wachowski, Tom Tykwer and Andy Wachowski. In these texts, Jameson argues, the artwork functions as 'an immense elevator that moves us up and down in time'; and it does so precisely because 'historicity today ... demands a temporal span far exceeding that of the biological limits of the individual human organism' (Jameson, 2013: 302). Interestingly, this is exactly the strategy subsequently pursued by Mitchell in his 2014 climate change novel *The Bone Clocks* and by Nolan in *Interstellar*.

This leads us into yet another cross-media issue, that of whether art can ever expect to change reality. Creative artists and humanities academics are no doubt inclined to overestimate the likely effects of the arts, corporate CEOs and economists to underestimate them. The issue was canvassed directly in respect of climate change in a *New York Times* opinion piece in July 2014. J.P. Telotte, Professor of Film and Media Studies at the Georgia Institute of Technology, argued that SF represents pressing cultural anxieties rather than real problems; George Marshall,

founder of the Climate Outreach Information Network, that it merely reinforces people's existing prejudices; Sheree Renée Thomas, editor of the *Dark Matter* anthology series, that what is imagined can sometimes come true; and Daniel Bloom, predictably enough, that "'Cli-fi" movies and novels have the power to change minds. That's their mission' (nytimes, 2014). If this opinion piece is any guide, the issue clearly remains an open question.

One of the members of the 2014 'Climate Change Narratives' panel, Euan G. Nisbet, Professor of Earth Sciences at Royal Holloway, University of London, volunteered the opinion that what climate science now most needs from SF is a contemporary equivalent to Nevil Shute's nuclear doomsday novel *On the Beach* (Shute, 1957). Much the same view has been expressed previously (Christoff, 2008). A novel from Australia, in the outer periphery of the world literary system, might seem an unlikely candidate as the template for contemporary climate fiction. And yet, as Moretti himself observed, peripheral literatures can in fact be sustained by historical backwardness (Moretti, 1998: 195–197). Shute's novel was published in hardback in Australia, Britain, Canada and the United States, went through several reprintings, became a critical and commercial success, was very quickly republished in paperback, translated into at least 25 other languages, adapted for film by Stanley Kramer in 1959, later still for television and radio, and, last but not least, almost certainly changed the realities of the nuclear arms race of the 1950s and 1960s. The great and not-so-great powers retained their nuclear weapons, of course, but Shute's novel and Kramer's film exercised an enormous influence, not only on the early mass campaigns for nuclear disarmament, but also on elite opinion in the United States, the Soviet Union and the United Kingdom; so much so as to contribute significantly to the climate of opinion that enabled the 1963 Test Ban Treaty between those three states (Baker, 2012: 158–159). Obviously, we cannot predict the nature of the novel, film or other artwork likely to have what we might call a 'Shute effect' on climate politics. But we can use *On the Beach* as a template by which to assess likely candidates. This will be part of our brief in the book's concluding eighth and ninth chapters. In the meantime, however, we return in Chapter 4 to Arthur Herzog's *Heat* and George Turner's *The Sea and Summer*, to a model of the world SF system, and to an account of the role of climate fiction therein.

Chapter 3

Climate Fiction and the World Literary System

We concluded Chapter 1 with a brief discussion of developments in climate science during the 1970s and 1980s, a passing mention of two very early global warming fictions, Arthur Herzog's *Heat* and George Turner's *The Sea and Summer*, and a promise to revisit these texts once our theoretical and methodological premises had been established. We now deliver on that promise.

1. *Heat* and *The Sea and Summer*

It would be rash to claim that *Heat*, published in 1977, and *The Sea and Summer*, published ten years later, are the very first instances of contemporary cli-fi – how could we possibly be sure? – but they are certainly unusually early examples. Both Herzog and Turner were professional writers and journalists with a relatively well-established career in SF: Herzog had worked for the *New York Times Magazine* and had previously published two SF novels, *The Swarm* (1974) and *Earthsound* (1975); Turner had worked for *The Age* in Melbourne and had published the SF *Ethical Culture* trilogy, comprising *Beloved Son* (1978), *Vaneglory* (1981) and *Yesterday's Men* (1983). Both had served in their country's armed forces and both were politically 'liberal' in the American sense of the term: Herzog's non-fiction included *The Church Trap* (1968), an attack on organised religion, and *The War Peace Establishment* (1969), a critique of the nuclear arms race; Turner's *Ethical Culture* trilogy was also preoccupied with the dangers of nuclear war. Both Herzog and Turner seem to have understood SF as a version of scientifically well-informed, futurological, literary realism. And both seem to have been drawn to the global warming topos as a continuation of and extension from their earlier SF, occasioned by awareness of and interest in current scientific concerns. In other words, they were drawn to it primarily by way of their respective vocations as SF writers.

If we locate their careers in relation to the Bourdieu–Milner model of the cultural field outlined in the previous chapter, however, an important difference becomes apparent: Herzog’s fiction was very much more directly aimed at market profit, Turner’s at literary prestige. *Heat* was first published in hardback by Simon and Schuster in New York, one of the largest American commercial publishers, and in paperback the following year in New York under the New American Library’s Signet imprint and in London by Pan Books, both highly successful commercial publishers. And, although *Heat* itself was never adapted for film or television, at the time of its release Irwin Allen’s blockbuster adaptation of Herzog’s *The Swarm* (1978) was already in production.¹ By contrast, *The Sea and Summer* was first published by Faber and Faber, the largest British ‘independent’ literary publisher, in London and Boston. *Heat* was very profitable, but won no awards; *The Sea and Summer* substantially less profitable, but nonetheless critically acclaimed: it won the 1988 Commonwealth Writers’ Prize Best Book Award, for the South East Asia and South Pacific Region, and the 1988 Arthur C. Clarke Award for best SF novel published in Britain, and was shortlisted for the Nebula Award for best SF novel published in the United States. We might also add that, whereas Herzog made his living entirely as a professional commercial writer, Turner had been in receipt of state patronage, through a writer’s fellowship from the Australia Council’s Literature Board.

Heat’s central protagonist is Dr Larry Pick, a brilliant, dedicated engineer, former full professor at MIT, now deputy director of CRISES, the Center for Research Investigation and Systems Evaluation Service, a government-funded centre for disaster research. In short, Pick is the latest incarnation in a long tradition of pulp SF scientist-heroes. The novelty here, however, lies in the fact that he is an environmental scientist as well as an engineer; and that his computer modellings point to the increasing likelihood of a runaway greenhouse effect. But, as so often in the pulp tradition, Pick’s efforts are impeded by colleagues with bureaucratic rather than scientific ambitions: the director, Rufus Edmunston; Pick’s successor as deputy director, Hal Anderson; and White House apparatchik, Joseph Banner. But the developing climate crisis confirms Pick’s analyses. He assembles a team to pursue the problem – including his eventual lover, the disaster sociologist Rita Havu – all of whom work in a state-of-the-art underground laboratory, The Hole, using a state-of-the-art computer, ILLIAC. These are, of course, reworkings of familiar SF tropes. But the scientific detail and moral seriousness of the cautionary tale is less familiar. As the junior climatologist, Benjamin

¹ As it happened, the film was a commercial failure.

Blake explains, 'a runaway greenhouse effect is just about the only conceivable way the world *could* end' (Herzog, 2003: 42). And as Pick himself says to Edmunston. 'I wonder how they'll feel a hundred years from now when they find out that people in the twentieth century knew what was coming and kept their mouths shut. They'll be a little bitter' (Herzog, 2003: 58).

As the greenhouse effect does indeed begin to run away, the US Government enforces conventional mitigation policies so as to reduce emissions. There are bans on the production and use of power tools, lawnmowers, electric blankets, electric toothbrushes, electric tin openers, garbage disposal units and microwave ovens, a ban on all unnecessary driving and other 'frivolous consumption of energy' (Herzog, 2003: 239). But these are only short-term measures. The eventual solution and the novel's denouement lie in what we have been calling mitigation as engineering, in Pick's design and testing of an artificial 'earth-sun', a system of mirrors placed in orbit around the Earth that will focus the sun's rays on to terrestrial receiving stations, which then transmit their heat back into space. This kind of technofix is yet another classic pulp SF trope, as is the essentially optimistic conclusion in which the scientist-hero both gets the girl and saves the world: 'Mankind would have to survive a few terrible years, but then the heat would abate and, when the power satellites went up, the crisis would be over. The earth could become paradise, just as the Bible believed it had begun' (Herzog, 2003: 250).

The Sea and Summer is by comparison a more sophisticated, more formally complex novel. Set mainly in and around Melbourne in Australia, it is organised into a core narrative comprising two parts set in the mid twenty-first century, and a frame narrative comprising three shorter parts set a thousand years later, among 'the Autumn People' of the 'New City' in the Dandenong Ranges, to the east of the present site of Melbourne (Turner, 1987: 3–16, 87–100, 315–316). The latter depicts a eutopian future society, in a slowly cooling world, which uses submarine archaeology to explore the sunken remains of the 'Old City'. The novel opens by introducing the frame narrative's three main characters: Marin, a part-time student and enthusiastic Christian, who pilots the powercraft used to explore the drowned city; Professor Lenna Wilson, an expert on the collapse of the 'Greenhouse Culture' in Australia, who teaches history at the university; and Andra Andrasson, a visiting actor-playwright, researching the twenty-first century as possible material for a play (Turner, 1987: 3–6). They explore the remains of the submerged city and debate their meaning both on-site and at the university. The core narrative is a novel within a novel, also entitled

The Sea and Summer, written by Lenna as an ‘Historical Reconstruction’ of the thirty-first century’s real past (Turner, 1987: 15). It traces the development of the Greenhouse Culture through a set of memoirs and diary extracts written by five key protagonists, Alison Conway, Francis Conway, Teddy Conway, Nola Parkes and Captain Nikopoulos, during the years 2044–61. Thus, where the narrative voice in Herzog is that of the omniscient author, Turner’s text is deliberately polyphonic. And where Herzog’s narrative proceeds by simple chronology, Turner’s core narrative is counter-chronological, beginning and ending in 2061, but moving through the 2040s and 2050s as it develops. This makes it an interestingly early example of Jameson’s future-historical novel as elevator.

At the opening of the core narrative, the poor ‘Swill’ live in high-rise tower blocks, the lower floors of which are progressively submerged by rising sea levels; the wealthier ‘Sweet’ in suburbia on higher ground. In 2033 a third of Australia has been set aside for Asian population relocation, by 2041 the global population has reached ten billion and the cost of iceberg tows and desalinisation projects has brought the economy close to bankruptcy (Turner, 1987: 29–30). On his sixth birthday in 2041, Francis Conway and his nine-year-old brother, Teddy, are taken by their parents, Alison and Fred, to see the sea. What they find is a concrete wall ‘stretching out of sight in both directions’. Francis’s mother surprises him by explaining that:

This is Elwood and there was a beach here once. I used to paddle here. Then the water came up and there were the storm years and the pollution, and the water became too filthy ... It must be terrible over there in Newport when the river floods ... A high tide covers the ground levels of the tenements. (Turner, 1987: 23–24)

The beach gives the novel its title: in 2061, Alison will recall her delight in it, observing that the ‘ageing woman has what the child desired – the sea and eternal summer’ (Turner, 1987: 20). In the interim, Fred Conway has been laid off and commits suicide in 2044, leaving her and her boys to move to Newport (Turner, 1987: 30–34). There they meet Billy Kovacs, the Tower Boss, who becomes Alison’s lover, Francis’s mentor and the reader’s guide to the social geography of an Australian dystopia.

There is, of course, one other important difference between the two novels: *Heat* was produced in the United States, at what we have already identified as the core of the world literary system, *The Sea and Summer* in Australia, at its periphery. And both texts bear the clear impress of their point of production. In *Heat*, warming occurs first and foremost in

America itself as the Atlantic heats up. As Hal Anderson explains: ‘Partly it’s a matter of geographical proximity combined with the prevailing weather patterns. More important, America’s enormous energy use and resulting heat output ... aggravate the problem, making already unstable atmospheric conditions worse’ (Herzog, 2003: 119). This is nonsense as science, but perfectly plausible as literary geo-politics. *The Sea and Summer* is similarly inflected geo-politically. Here, the state takes over the administration of the Australian economy when the world financial system collapses during the 2040s (Turner, 1987: 71). At this point, even Australian readers are left wondering what exactly has happened to the international parent companies of Australian subsidiaries, to the World Bank, the International Monetary Fund, the General Agreement on Tariffs and Trade, the United States Federal Reserve Bank, the European Central Bank, the People’s Bank of China, and so on. And for non-Australian readers, the question becomes more pressing and more general: what exactly has happened to the rest of the world?

The fact that both novels are more or less oblivious to the wider world beyond their respective national frontiers might explain why neither has been translated into any of the other major SF languages, French and German, Russian, Polish and Czech, Japanese and Chinese.² Nor has either been subsequently adapted for film or television. In the case of *Heat*, this is especially surprising, given its location at the core of the world literary system and the fact that two of Herzog’s other novels were in fact made into films. We are unsure as to how to explain this, but it does seem likely that the very earliness of these early climate fictions impeded both their translation and adaptation. In short, the markets simply were not ready. This discussion has, however, allowed us to broach the main subject matter of this chapter, that is the place of climate fiction in relation to the world literary system.

2. Science Fiction and the World Literary System

In the previous chapter, we sketched out a model of the global SF field, loosely derived from Moretti’s theory of distant reading, which identified an Anglo-French core, supplemented by more recent American and Japanese cores, older Russian, German, Polish and Czech semi-peripheries, supplemented by more recent Latin American and Chinese semi-peripheries, and a periphery comprising the rest of the

² *The Sea and Summer* has, however, been translated into Spanish.

world. This model is built around three main vectors: the size of national book publishing industries; the volume of translations between different languages; and the global history of SF as registered in comparatively authoritative sources, especially the online *Encyclopedia of Science Fiction*. Only the last is specific to the genre, for the others we assume some indirect, but nonetheless real, correlation between factors relevant to aggregate publishing and those relevant to genre-specific publishing.

The six largest national book trades for most of the twentieth century were the British and American, French and German, Russian and Chinese. By the 1960s only these six possessed national industries producing over 20,000 titles per annum (Laurenson and Swingewood, 1972: 140). By the mid 1990s, the UK annual output of books had reached 107,263 titles, China 100,951 titles, Germany 75,515, the US 68,175, Russia 36,237, France 34,766 (UNESCO, 1999: IV-82–89; IV-83–86–88).³ Other things being equal, then, we would expect these six national literary economies to contribute disproportionately to SF book publishing, and thence to SF film and television production.

Translation rates obviously differ from total publication rates, but there is nonetheless a considerable correlation between the two. Excluding Latin and Ancient Greek, which are highly unlikely to include much SF, UNESCO's *Index Translationum* calculates that, over the period 1979–2018, the top 12 source languages for translation were, in rank order, English, French, German, Russian, Italian, Spanish, Swedish, Japanese, Danish, Dutch, Czech and Polish. English, French and German were by far the largest source languages, English with 1,266,110 titles, French 226,123 titles and German 208,240 titles; all other source languages produced well under 200,000 titles (UNESCO, 2019). We should note that Spanish translations were more likely to be Latin American than European; and that translations from English were more likely to be British in the earlier period, more likely to be US American in the later, but that both were major national publishers throughout. This means that, of our six largest national publishers, all but China were in the top 12 producers of source translations. And Chinese, the fourteenth largest modern source language (the thirteenth was Norwegian), was itself still quantitatively significant. Other things being equal, we would expect SF world texts – that is, those that acquired a significant audience beyond their immediate national context – to be exported disproportionately from these 12 language zones.

Quite apart from these aggregate statistics, something needs to be said about the relative significance of different languages within the global

³ The *UNESCO Statistical Yearbook* ceased publication in 2000.

cultural economy. Alexander Beecroft distinguishes between two ‘global languages’, English and French, a number of ‘regional world languages’, such as Spanish, Portuguese and Arabic, ‘major national languages’, such as German, Polish and Japanese, ‘minor national languages’, such as Norwegian and Cambodian, and ‘minority languages’, such as Pomeranian and Maori (Beecroft, 2015: 259–277). Other things being equal – which they very often manifestly are not – one would expect SF world texts to be exported disproportionately from the first three kinds of languages. Beecroft’s reasons for treating French as a global language are interesting:

One of the features making French a genuinely global language is the large number of second-language speakers (perhaps 200 million ...) ... Further, it is an official language in twenty-nine nations ... on every continent except Asia ... It is one of the six official languages of the United Nations, one of the three working languages of the European Union, and ... a working language of nearly every international organization in the world. (Beecroft, 2015: 264–265)

So, although there are more German than French first-language speakers (90 million as opposed to 70 million), French is a world literature, a *littérature-monde*, in a way German is not. This might explain why France is more significant than Germany as a source of translations, despite having a smaller total publishing industry. We should, then, expect both French and English to contribute disproportionately to the world SF field.

Before leaving the question of language and publishing, more needs to be said about Germany, Russia and China. German might not be a world language, but Germany is nonetheless the home of the third largest book trade in the world. Perhaps the most unusual feature of German publishing is that, unlike its British, American and French counterparts, it is a massive net importer of translations. According to the *Index Translationum*, English was the source language for 1,266,110 titles during the period 1979–2018, but the target language for only 164,509 titles, a net surplus of 1,101,601 titles; by contrast, German was the source language for 208,240 titles, but the target language for 301,935 titles, a net deficit of 93,695 titles. Other things being equal, we should expect to find Germany much more responsive to Anglo-French SF than vice versa. Something similar can be observed of China, where the net deficit was 49,052 titles. Russian, by contrast, was a net exporter of translations, albeit with only a very small surplus of 2,818 titles. Other things being equal, we should expect these different translation

rates to affect the relative locations of these national literatures within the world SF system.

This leads us to the question of the qualitative significance of the various national SF cultures. We might begin by noting that SF world conventions, which attest to the presence of a sizeable local fan base, have been hosted by cities in the United States, Canada, the United Kingdom (both England and Scotland), Germany, Australia, the Netherlands, Japan, Finland, Ireland and New Zealand (scheduled for 2020). We can also note that Hugo Award winning novelists have been drawn from the United States, the United Kingdom, Canada and China; and Hugo winning film and television directors from the United States, the United Kingdom, Australia, China, New Zealand, Mexico and Canada (World Science Fiction Society, 2019). There is an obvious bias towards Anglophone and North or Central American SF producers here, but this is unsurprising given that the World Science Fiction Society is based in the United States, despite its misleadingly universalising title. A few less obvious observations are in order, however. First, the presence of the Netherlands and Finland among world convention host nations reminds us that, although Dutch and Finnish are relatively minor languages, spoken by only about 17 million and 5.5 million people respectively, they are each significant modern source languages for published translations (tenth and twentieth respectively, according to UNESCO), which suggests the possibility that both might contribute more than peripherally to world SF. Second, the presence of Canada, Australia, Ireland and New Zealand among host nations, of Canada in both lists of Hugo Award winners, and of Australia and New Zealand in the second list, suggests that peripheral Anglophone nations have more ready access to the world SF system, by way of British and US American intermediaries, than do minor non-Anglophone nations. Third, the presence of China in both lists of Hugo Award winners – during the twenty-first century, but not in the twentieth – suggests the possibility that Chinese SF might be an emergent force within the genre.

Turning to the history of the genre, it is clear that it was conceived in England and France, at the core of the nineteenth century world literary system (Mary Shelley and, above all, Jules Verne and H.G. Wells) and continued in both countries throughout the twentieth century and into the twenty-first (through Aldous Huxley, George Orwell, C.S. Lewis, John Wyndham, Fred Hoyle, Arthur C. Clarke, Michael Moorcock, J.G. Ballard, Iain M. Banks, Ken Macleod and China Miéville in Britain, J.-H. Rosny aîné, Anatole France, Maurice Renard, Jacques Spitz, Pierre Boulle, Robert Merle, Daniel Walther, Serge Brussolo, G.-J. Arnaud, Maurice Dantec, Jean-Marc Ligny, Alain Damasio and

Michel Houellebecq in France). Verne and Wells are clearly crucial. In 1990, the last year in which the *UNESCO Statistical Yearbook* published figures for the most frequently translated authors, Verne was the fourth most translated author in the world, Wells the sixty-eighth (UNESCO, 1999: 7–110, 7–111). In 2019, the *Index Translationum* had Verne in second place, with 4,751 new translations recorded between 1979 and 2018. The University of Illinois holds translations of Wells's work in 19 different European languages, including 53 titles in French, 47 in Spanish and 32 in German (Parrinder, 2005: 2). First published in England in 1895, *The Time Machine* was translated into French and Brazilian Portuguese as early as 1899, into Hungarian in 1900, Russian in 1901, Italian in 1902, German in 1904 and Czech in 1905; *War of the Worlds*, published in England in 1898, was translated into Dutch, Hungarian and Norwegian in 1899, into French in 1900, German and Italian in 1901, Spanish in 1902 and Czech in 1903 (Parrinder and Barnaby, 2005: xxiii–xxv).

For Moretti, the distinction between periphery and semi-periphery is essentially that between simple cultural reception and imitation on the one hand, and creative cultural innovation on the other. The semi-peripheral SF societies are therefore those that can be seen, retrospectively, as having substantially contributed to the global SF field and to the evolving global SF selective tradition. Measured in these terms, the most significant semi-peripheral SF cultures are almost certainly: Germany, during the Weimar Republic (Otto Willi Gail, Thea von Harbou, Fritz Lang, Otfried von Hanstein) and, again, in the post-Cold War Federal Republic (Wolfgang Jeschke, Frank Schätzing, Dirk C. Fleck); Russia, during the early Soviet period (Alexander Belyaev, Alexander Bogdanov, Mikhail Bulgakov, Vladimir Mayakovsky, Andrei Platonov, Alexei Tolstoy, Yevgeny Zamyatin), the late Communist period (Genrikh Altov, Dmitri Bilenkin, Kir Bulychev, Mikhail Emtsev, Eremey Parnov, Arkady and Boris Strugatsky, Alexei Tarkovsky) and in the post-Cold War Russian Federation (Vladimir Sorokin, Dimitri Glukhovsky); inter-war Czechoslovakia (Karel Čapek, J.M. Troska); Communist Poland (Konrad Fialkowski, Stanisław Lem, Adam Wisniewski-Snerg); inter-war North America; and post-Second World War Japan. Each of these clearly generated work that became influential on the Franco-British core and, through it, on the more general world system.

The periphery, by contrast, included both late nineteenth century Japan and early twentieth century Poland. Verne's *Le Tour du monde en 80 jours* was translated into Japanese as early as 1879, six more of his *Voyages extraordinaires* in the early 1880s. These prompted a series of Japanese

imitations, the best known of which is probably Oshikawa Shunrō's 海島冒険奇譚 海底軍艦/ *Kaitō Bōken Kidan: Kaitei gunkan*, a reworking of *Vingt mille lieues sous les mers*. Wells's *The Time Machine* and *The War of the Worlds* were translated into Polish in 1899, prompting a series of Polish imitations, so that the earliest 'Polish writers of science fiction ... worked more or less consciously under Wells's spell' (Juszczak, 2005: 126). Good examples include Jerzy Żulawski's lunar trilogy (1901–10), Antoni Słonimski's sole SF novel, *Torpeda Czasu* (1924) and Bruno Winawer's *Doktor Przybram* (1924). None of these acquired any lasting international significance, however, that is they did not enter into the global SF selective tradition. These are unusually interesting cases precisely because both subsequently emerged from peripheral into semi-peripheral status (and Japan eventually into near core status). But the periphery also included a whole range of other national cultures similarly prone to import, but not significantly export, SF texts, for example China, South Korea, Argentina, Brazil, Italy, the Netherlands, Finland, Norway, Hungary, Canada, Australia and New Zealand.

Two of the semi-peripheral SF cultures, the United States and arguably also Japan, eventually emerged as new cores of the system. The so-called 'Golden Age' of American SF, which many US Americans mistakenly identify with the origin of the genre itself, was the product of a moment when the United States still remained an essentially semi-peripheral literary economy. But between the 1930s and the 1950s the United States very rapidly became near hegemonic within the genre (Hugo Gernsback, John W. Campbell, Isaac Asimov, Robert Heinlein), a situation that continued through the New Wave (Philip K. Dick, Harlan Ellison, Norman Spinrad, James Tiptree Jr, Roger Zelazny), feminism (Usula K. Le Guin, Joanna Russ, Marge Piercy), Afrofuturism (Samuel R. Delany, Octavia Butler), cyberpunk (William Gibson, Bruce Sterling) and the new humanisms of writers like Kim Stanley Robinson and Paolo Bacigalupi. Moreover, North American hegemony extended from print to film (James Whale, Stanley Kubrick, George Lucas, Stephen Spielberg, Ridley Scott, James Cameron, Tim Burton and Paul Verhoeven all worked in Hollywood, even though some were of European extraction) and television (Gene Roddenberry, J. Michael Straczynski, Chris Carter and Joss Whedon).

This Americanised SF was exported into Japan during the immediate post-Second World War period, in part as a result of the American military occupation. The genre's new Japanese semi-periphery responded to its new (Anglo-) American core much as the United States had responded to European SF, by productively reworking inherited forms in ways that register local peculiarities. The key Japanese SF writers (Kōbō

Abe, Shinichi Hoshi, Sakyo Komatsu, Haruki Murakami) all achieved this kind of effect. But the decisive breakthrough came in the way Japanese writers, directors and animators appropriated the products of the American audio-visual media to produce contemporary manga and anime SF (Osamu Tezuka, Katsuhiro Otomo, Mamoru Oshii, Hideaki Anno). Japanese SF has, then, moved from the genre's periphery to its semi-periphery and, in some respects, threatens to rival American SF at the core.

We have described in detail here the model of the world SF system sketched in brief in Chapter 2 above. Finally, however, let us note three significant amendments to that model: first, the problematic status of Italy and Latin America; second, the anomalous status of Anglophone Canada; and, third, the comparatively recent rise of China to something close to semi-peripheral status. Italian, Brazilian Portuguese and Latin American Spanish are major language communities, housing large publishing industries, which produce very significant bodies of translation. All three were also early importers of SF texts from the Franco-British core. And, no doubt, there is a good case to be made on formal grounds that Primo Levi, Italo Calvino, Jorge Luis Borges and, indeed, the Latin American 'magical realists' more generally were in fact SF writers. But the international reputations of all of these rest on claims to 'literariness' quite distinct from those conventionally associated with SF as a genre.

Canada is, by most standards, a peripheral or, at best, semi-peripheral literary economy, but it also enjoys peculiarly close relationships with the United States, which has been the primary core of the post-Second World War SF system. For better or for worse – and sometimes both – US Americans often treat Anglophone Canada as if it were part of the United States. And this is perhaps especially true of the SF subculture. So, the first SF world convention to be held outside the United States was in Toronto in 1948. So, American SF magazines, comics, graphic novels and paperbacks are readily on sale in Canada and, conversely, Canadians readily contribute to them. So, leading Canadian SF writers, such as A.E. van Vogt and Margaret Atwood, and film and television directors, such as David Cronenberg and John Fawcett, have enjoyed unusually easy access to American audiences and honours. American SF writers, like Judith Merril and William Gibson, have also at times moved to live in Canada, thus further cementing the relationship. The part of Captain James T. Kirk in the original *Star Trek* series was played by the Canadian actor William Shatner; and most of Chris Carter's *The X-Files* were filmed in and around Vancouver. *Science Fiction Studies*, the leading international academic journal in the field, has largely been

a joint American–Canadian co-production; one of its longer standing editors, Darko Suvin himself, although Yugoslav Croatian by upbringing and education, was based in Comparative Literature at McGill University in Montréal. Related scholarly enterprises, such as the Science Fiction Research Association and the Society for Utopian Studies, are also substantially American–Canadian affairs. This is not to suggest that Canada is in itself a core SF culture, but rather that its status is genuinely anomalous, oscillating between core and peripheral characteristics, to the extent that the wider core oscillates between constructing itself as US American or as North American.

China is an altogether different matter. Chinese is the world's most widely read language, it is home to one of the world's six largest publishing industries and it is both an important source and target language for translations. And yet it was not even peripheral to the world SF system until the late 1970s. There had been: a brief flourishing of utopian fictions during the first years of the twentieth century, many involving quasi-science fictional flying machines, some also distinctly futuristic gender relations (Chen, 2016); one isolated Chinese translation of the Japanese translation of Verne's *De la terre à la lune* in 1902; a plethora of didactic children's SF stories, on the official Russian model, during the brief alliance between the Soviet Union and the infant People's Republic; and virtually nothing at all during the Cultural Revolution. The genre only emerged as reading for adults, and then often only fitfully, after 1978 (Liu, 2016a: 363–364). Thereafter, it has been continuously associated with the magazine 科幻世界 *Kehuan Shijie* / *Science Fiction World* founded in 1979, which reached a peak circulation of 400,000 in 1999 and still claims a regular circulation of about 300,000. This is, no doubt, negligible by Chinese standards, but nonetheless very significant by the standards of SF magazines elsewhere. The three leading contemporary Chinese SF writers, Liu Cixin, Wang Jinkang and Han Sung, are all veterans of 科幻世界 *Kehuan Shijie* and all have been multiple winners of the 银河奖 / Yinhe / Galaxy prize for best Chinese SF, which it administers. All three have been translated into English and, famously, Liu won the 2015 Hugo Award for best SF novel, with the English translation of 三体 *Santi* / *Three-Body*. This does not yet make China a new core, but it very probably does mean that it has finally entered into the semi-periphery of the system.

3. Climate Fiction and the World Literary System

If cli-fi is a sub-genre of SF, as we believe it to be, then, other things being equal, one would expect its geo-political literary economy to run roughly parallel to that of the genre as a whole. And to some extent this is indeed the case. However, we also need to distinguish between structural and conjunctural determinants of the evolution of the sub-genre. The main structural determinant, we hypothesise, will indeed be the world SF system. But its effects may be either countered or reinforced by one or more of three main conjunctural factors: the degree of perceived vulnerability to extreme climate change of any particular national political economy; the salience of Green politics within any particular national polity; and the salience of climate change within broader environmentalist discussions in any particular national culture. All three of these pertain in part to the cultural sphere, even the first, for if the actual degree of climate vulnerability can be measured with some degree of objective accuracy – it is clear, for example, that poorer countries are generally more vulnerable than wealthier – the extent to which this is collectively perceived and understood remains culturally constructed. Media representations of the threat of climate change, especially commentary by climate scientists, economists and ecologists, are likely to be central here. At the strictly political level, the local visibility of Green politics will depend on such factors as the electoral system and the availability or non-availability of public funding for minor parties. But it will also depend on the local balance between old and new media, the extent to which advertising revenues are dependent on carbon polluters, and so on. Our three conjunctural determinants can thus be understood as different aspects of the ‘greening’ of the public sphere. They are not ‘merely’ cultural, however, not even the third, since the contours of local environmentalist debates will themselves be shaped in response to wider political and economic developments. The local incidence of cli-fi, we can provisionally hypothesise, will be determined by the interaction between the world SF system and the (loosely defined) local green public sphere.

The effects of the world SF system itself are most clearly apparent in three of the four core SF cultures, the United States, Britain and France, all of which have been productive of an extensive body of climate fiction. Instances of American cli-fi include: in written literature, David Brin’s *Earth* (1990), Bruce Sterling’s *Heavy Weather* (1994) and *The Caryatids* (2009), T.C. Boyle’s *A Friend of the Earth* (2000), Michael Crichton’s *State of Fear* (2004), Robinson’s *Science in the Capital* trilogy (2004–7), *Aurora* (2015) *Green Earth* (2015) and *New York 2140* (2017), Cormac McCarthy’s *The Road*

(2006), Bacigalupi's *The Windup Girl* (2009) and *The Water Knife* (2015), Barbara Kingsolver's *Flight Behavior* (2012), Nathaniel Rich's *Odds Against Tomorrow* (2013), William Gibson's *The Peripheral* (2014), Chang-Rae Lee's *On Such a Full Sea* (2014), Ben Lerner's *10:04* (2014), Edan Lepucki's *California* (2014), Claire Vaye Watkins's *Gold Fame Citrus* (2015), Meg Little Reilly's *We Are Unprepared* (2016), John Feffer's *Splinterlands* (2016), Louise Erdrich's *Future Home of the Living God* (2017), David H. Spielberg's self-published *On Vestige Way* (2017) and Richard Powers's *The Overstory* (2018); in the graphic novel, Josh Neufeld's *A.D.: New Orleans after the Deluge* (2010), Grant Calof and Eric Eisner's *H2O* (2011) and Brian Wood's *The Massive* (2012–14); in film, Kevin Reynolds's *Waterworld* (1995), Steven Spielberg's *A.I. Artificial Intelligence* (2001), Roland Emmerich's *The Day After Tomorrow* (2004), Andrew Stanton's *Wall-E* (2008), Jeff Nicholls's *Take Shelter* (2011), Jake Paltrow's *Young Ones* (2014), Darren Aronofsky's *Noah* (2014), Christopher Nolan's *Interstellar* (2014) and Dean Devlin's *Geostorm* (2017); and in television, some episodes of Bruce Miller and Reed Morano's *The Handmaid's Tale* (2017–19).

Well-known instances of British cli-fi include: in written literature, Maggie Gee's *Where are the Snows* (1991), *The Ice People* (1998) and *The Flood* (2004), Will Self's *The Book of Dave* (2006), Ian McDonald's *River of Gods* (2006), Jeanette Winterson's *The Stone Gods* (2007), Liz Jensen's *The Rapture* (2009), Hamish MacDonald's *Finitude* (2009), Marcel Theroux's *Far North* (2010), Ian McEwan's *Solar* (2010), J.M. Ledgard's *Submergence* (2011), David Mitchell's *Cloud Atlas* (2004) and *The Bone Clocks* (2014), Ben Elton's *Time and Time Again* (2014), Michel Faber's *The Book of Strange New Things* (2014), Laurie Penny's *Everything Belongs to the Future* (2016), Megan Hunter's *The End We Start From* (2017), Paul McAuley's *Austral* (2017), Chris Beckett's *America City* (2017) and John Lanchester's *The Wall* (2019); in the graphic novel, John Hicklenton's *100 Months* (2012); in film, Franny Armstrong's *The Age of Stupid* (2009) and Matthew Vaughn's *Kingsman: The Secret Service* (2015); in television, Russell T. Davies's *Years and Years* (2019); of French cli-fi, in written literature, Houellebecq's *La Possibilité d'une île* (2005) and arguably also his *La Carte et le territoire* (2010), Yann Quéro's *Le Procès de l'Homme Blanc* (2005) and *L'Avenir ne sera plus ce qu'il était* (2010) and also his edited collection *Le Réchauffement climatique et après ...* (2014), Ligny's *Aqua*TM (2006), *Exodes* (2012) and *Semences* (2015a), Pierre-Yves Touzot's *Terre lointaine* (2008) and Bernard Besson's *Groenland* (2011); and in the graphic novel, Jean-Marc Rochette, Benjamin Legrand and Olivier Bocquet's three sequels to *Le Transperceneige* (1999–2015). The best-known Japanese examples are Hayao Miyazaki's graphic novel 風の谷のナウシカ/*Kaze no Tani no Naushika* (1982–1994), its 1984 adaptation for anime, and his 1997

anime もののけ姫/*Mononoke-hime*, but these are not so much cli-fi as 'cli-fantasy'. The comparative underproduction of Japanese cli-fi texts seems to be an effect of the low salience of anthropogenic climate change within environmentalist discussions in Japan, where nuclear radiation has been a much more central issue, at least since the 2011 Fukushima disaster and arguably ever since the long-term effects became apparent of the 1945 American nuclear attacks.

In specifically genre terms, as distinct from the more generally 'literary', Robinson is almost certainly by far the most important of the core cli-fi writers. He was already a successful, well-established SF writer when he wrote the *Science in the Capital* novels. He had won the John W. Campbell Memorial Award for Best SF Novel for *Pacific Edge* in 1991, Hugo Awards for *Green Mars* and *Blue Mars* in 1994 and 1997 respectively, and a Nebula Award for *Red Mars* in 1993. His work thus enjoyed professional, fan and academic legitimacy: the Nebula Awards are made by a professional writers association, the Science Fiction and Fantasy Writers of America; the Hugo Awards by a fan organisation, the World Science Fiction Society; and the Campbell Memorial Award by a panel of experts appointed by the Center for the Study of Science Fiction at the University of Kansas. Interestingly, Fredric Jameson, the doyen of American academic SF critics, has dedicated two books to Robinson (Jameson, 2005: v; Jameson, 2013: v). In 2008 Robinson was even named a 'Hero of the Environment' by *Time* magazine (Morton, 2008). His work has also been translated into at least 23 other languages, although the complete *Science in the Capital* trilogy only into French and Dutch. Nonetheless, and perhaps surprisingly, none of Robinson's work has ever been adapted into other media. For these particular novels, this might be in part an effect of their sheer length, 1,632 pages in total in the first edition. But there are reasons pertaining to content as well as to form.

Robinson's work is often described as 'hard SF' and is justly famous for the quality of its scientific research. But in *The Science in the Capital* trilogy, where the subject matter appears closest to its author's deepest concerns, the reader is almost overwhelmed by the details, not only of the science, but also of the internal mechanisms of scientific policy-making. Indeed, remarkably little actually happens in the first volume, *Forty Signs of Rain*, until the spectacular flooding of Washington DC at its conclusion (Robinson, 2004: 326–356). *Fifty Degrees Below*, which deals with the stalling of the Gulf Stream, and *Sixty Days and Counting*, which recounts the opening stages of the presidency of the environmentally activist, former Californian senator, Phil Chase, are more fast-moving, but still often overburdened with scientific and technical detail. Moreover, the whole trilogy suffers from a preoccupation with

American internal politics that might not excite much international interest, even were the United States still the only global superpower. The trilogy's central protagonist, Frank Vanderwal, is a Californian biomathematician and rock climber, whose initial cynicism about science policy is eventually superseded by active enthusiasm for a Chase administration. Chase himself, a character Robinson takes over from an earlier novel (Robinson, 1997), is an idealised amalgam of an Al Gore who managed to get elected and a Barack Obama who managed to get things done.

It is easy to see why American readers might find both Vanderwal and Chase plausible and attractive, but Europeans neither. This is surmise, of course, but nonetheless only the first volume has as yet been translated into Spanish, none into German, Italian, Czech, Polish or Russian (or, for that matter, Japanese or Chinese). In *Green Earth*, the 2015 omnibus edition, the text is reduced by about 300 pages (Robinson, 2015b: xiii) and much of the political and scientific policy detail cut back. In his author's introduction, Robinson explains that he had intended to write a realist novel as if it were SF, 'describing Washington D.C. as if it were orbiting Aldebaran', but concedes that 'afterward it seemed possible that occasionally I might have gone too far' (Robinson, 2015b: xii). It is still too early to judge whether the rewrite has overcome the weaknesses of the original trilogy in the only terms that matter sociologically, that is, those of reader (and translator) response. We shall see.

The single most striking feature of the semi-periphery is the sheer volume of German eco-fiction. Important examples include: Anton-Andreas Guha's *Der Planet schlägt zurück* (1993), Fleck's *GO! Die Ökodiktatur* (1993), *Das Tahiti-Projekt* (2008), *MAEVA!* (2011) and *Feuer am Fuss* (2015), Karl-Heinz Tuschel's *Der Mann von IDEA* (1995), Till Bastian's *Tödliches Klima* (2000), Sybil Berg's *Ende gut* (2004), Schätzing's *Der Schwarm* (2004), Jeschke's *Das Cusanus-Spiel* (2005), Liane Dirks's *Falsche Himmel* (2006), Manfred Boeckl's *Die Einöder* (2007), Ulrich Hefner's *Die dritte Ebene* (2008), Dieter Oesterwind's *Steinerne Glut* (2008), Klaus Peter Lehner's *Natürlich grausam* (2008), Juli Zeh's *Corpus Delicti* (2009), Nele Neuhaus's *Wer Wind sät* (2011), Sven Böttcher's *Prophezeiung* (2011), Ilija Trojanow's *Eis Tau* (2011) and Margret Boysen's *Alice, der Klimawandel und die Katze Zeta* (2016). Fleck, Schätzing and Jeschke are all winners of the Deutscher Science Fiction Preis for best novel, Fleck twice for *GO! Die Ökodiktatur* and *Das Tahiti-Projekt*, Schätzing for *Der Schwarm*, Jeschke twice, including one for *Das Cusanus-Spiel*. Schätzing and Jeschke have been translated into English and French, Fleck into Spanish, Turkish and Vietnamese, but not into either English or French.

Schätzing's *Der Schwarm* has been to date by far the most commercially successful of German cli-fi novels. First published in hardback in

Germany and Austria, it was the bestselling German novel for eight successive months during 2004, was adapted for Hörspiel, or audio-play, in the same year, republished in paperback in 2005, and subsequently translated into at least 20 other languages. It was also critically well received, not least for the quality of its background scientific research, and in 2005 won both the Bauer Group's Goldene Feder media award and the Deutscher Science Fiction Preis. A German–Italian film adaptation was announced in 2007, although this has still to appear, and was presumably delayed by the death in 2010 of Dino De Laurentis, one of the film's prospective producers. Climate change is not self-evidently the novel's primary novum: an obvious alternative candidate would be the eponymous Swarm, 'die Yrr', 'Der sich seiner selbst bewusst gewordene Ozean' ['the ocean become conscious of itself'] (Schätzing, 2005: 965; Schätzing, 2007: 858).⁴ But the Yrr play an essentially reactive role in the novel, merely responding to the anthropogenic environmental crisis that actually drives the narrative. The primary novum is thus 'der globalen Klimaerwärmung' ['global warming'], compounded by 'Ströme von Schadstoffen, Überfischung, die rücksichtslose Erschließung der Küsten' ['chemical dumping, overfishing, the reckless overdevelopment of coastal regions']⁵ and other human offences against the integrity of the seas (Schätzing, 2005: 234; Schätzing, 2007: 194). Moreover, the ultimate source of this crisis, it is clear, is the 'Mineralölkonzerne' ['petroleum industry'] with its 'Interessengeflecht' ['web of vested interests'] that has 'den Planeten überzogen' ['the planet in such a stranglehold'] (Schätzing, 2005: 366; Schätzing, 2007: 307). Hence, the most spectacular of the Yrr's counter-attacks, a tsunami that destroys the North Sea oil wells (Schätzing, 2005: 402–404; Schätzing, 2007: 337–339).

The novel's success in Germany can be explained in part as the obverse of George Turner's in the Anglosphere, that is, by the fact that it was marketed as 'Roman', or novel, rather than 'Science Fiction'. German literary culture, from the book trade through to the academy, tends to make sharp distinctions between 'Literatur' and 'Trivilliteratur', firmly consigning to the latter 'Science Fiction', written thus in English. That *Der Schwarm* was a novel, rather than mere SF, thus almost certainly enhanced its sales. Moreover, its status as an ecofiction must have had special appeal to the sizeable part of the German electorate that votes Green: Die Grünen were the world's first organised Green Party and

⁴ Sally-Ann Spencer translates this as the 'conscious ocean', but our 'the ocean become conscious of itself' is truer to the German.

⁵ Spencer's translation has 'urbanisation' rather than 'reckless overdevelopment', but this is too bland.

are still among the most electorally successful, holding 63 seats in the present Bundestag. The novel's ecopolitics are almost Lovelockian in character, in so far as the Yrr are in effect Gaia surrogates. *Der Schwarm* is a very long novel, 987 pages in the German original, 881 in the English translation, but has a comparatively simple narrative structure, moving chronologically forward from 14 January to 15 August of a year in the near future, followed by a very brief 'Epilog' set exactly one year later. This too may have enhanced its commercial appeal.

Der Schwarm has an interestingly ambivalent attitude towards the United States. At one level, it is structured around a binary political opposition between European and Canadian scientists on the one hand, and the American political, military and intelligence elite on the other. But at another, it remains deeply indebted to American SF film and TV: Schätzing's scientists do not themselves appear to read many novels, but they do repeatedly draw deliberate analogies between their own actions and those of characters from Hollywood cinema. Moreover, some of the novel's central sequences are clearly very well suited to American 'blockbuster' treatment, for example that where Sigur Johanson, the urbane Norwegian marine biologist, arrives by helicopter at the Shetland Islands in the nick of time to rescue Karen Weaver, a British scientific journalist, from the imminent impact of the North Sea tsunami (Schätzing, 2005: 410–417; Schätzing, 2007: 344–349). But Schätzing's treatment of the main US characters nonetheless sometimes borders on quite explicit anti-Americanism. So, for example, the US president is represented as a Christian fundamentalist believer in the literal truth of *Genesis*, in effect a kind of dumbed-down George W. Bush (Schätzing, 2005: 591; Schätzing, 2007: 511). Worse still, Judith Li, the commander of the *USS Independence*, a state-of-the-art helicopter carrier used to transport the international scientific taskforce to the Greenland Sea, turns out to be a murderous psychopath, who would rather kill the scientists than treat with the Yrr. In a climactic confrontation with Johanson, which culminates in her shooting him, Li insists that: 'Schon eine Koexistenz wäre das Eingeständnis unserer Niederlage, des Glaubens an Gott, des Vertrauens in unsere Vorherrschaft' ['Even agreeing to coexist would be an admission of failure – a sign of our defeat, the defeat of humanity, of our faith in God and the world's faith in American supremacy'] (Schätzing, 2005: 939; Schätzing, 2007: 831). This anti-Americanism might have strengthened the novel's appeal in Europe, but it could also explain why the English translation underperformed in the United States. And the United States is still at the core, not only of the world economy but also of the world literary system.

By contrast with Germany, there is comparatively little mention of climate change in SF from the Eastern European semi-periphery. The politics of de-Stalinisation, including the cultural politics of state-produced environmental pollution, seem to figure much more largely. Interestingly, there is a passing reference to Western misconceptions about climate change in Sorokin's *Den' oprichnika*: 'Аж целых минуе 32. Вот вам и глобальное потепление, о котором чужеземцы таллычат' ['It's a good 32 below. Now here's that global warming foreigners are always blathering about'] (Sorokin, 2006: 129–130; Sorokin, 2010: 110). Sorokin's oprichnik, Andrei Danilovich Komiaga, is no doubt an unreliable narrator, but his Russian readers are nonetheless no doubt familiar with this particular sentiment. Sorokin's joke is on his readers, but it seems significant nevertheless that the joke actually works.

This comparative indifference to climate fiction recurs in China. Chinese SF has been concerned with environmental issues such as pollution, and with the negative possibilities of terraforming on other planets (Li, 2018), but global warming itself does not appear to figure at all prominently. Indeed, Liu Cixin specifically warns his American readers that, whereas 'climate change and ecological disasters ... have ... built-in adjustment periods', 'contact between humankind and aliens can occur at any time'. Hence, his in our view improbable insistence that 'extraterrestrial intelligence will be the greatest source of uncertainty for humanity's future' (Liu, 2014: 394). An obvious reply to Liu is that, whereas climate change is clearly already happening, there is no reason at all to believe that extraterrestrial intelligences will ever contact the Earth. As Robinson has his dying Euan observe in *Aurora*:

[T]hat's why we've never heard a peep from anywhere. It's not just that the universe is too big. Which it is ... But then also, life is a planetary thing ... it develops to live where it is. So it can only live there, because it evolved to live there ... by the time life gets smart enough to leave its planet, it's too smart to want to go. Because it knows it won't work. (Robinson, 2015a: 179)⁶

There is a further irony here in that Liu's 三体 *Santi*, literally *Three-Body*, in English translation *The Three-Body Problem*, is itself predicated on the absolute priority of climate change, if not on Earth, then on Trisolaris. The eponymous three-body problem is, of course, an apparently insoluble problem in classical mechanics. But in the novel it is also both an apparently insoluble virtual reality game of alien origin and, more

⁶ We might add that Robinson is on record as admiring Liu's 三体 *Santi* trilogy.

fundamentally, the relation of the planet Trisolaris to its three-sun system in Alpha Centauri. The effects of this trisolar interaction have been to subject the planet to extremes of heat and cold, which radically impede the development of Trisolaran culture and ultimately threaten to destroy the planet. Hence, the invasion fleet's 450-year journey towards Earth. Hence, too, the computer game and the ETO, the Earth–Trisolaris Movement, both of which are alien-inspired and designed to slow down Earth's own technological development. Mike Evans, one of the co-founders of the ETO, is unsurprisingly a radical environmentalist. Wonderfully complex and intellectually stimulating though the novel undoubtedly is, it is also a thinly disguised polemic against environmentalism, which ironically performs that which it aims to refute. It is difficult to avoid the conclusion that Liu's novel mirrors a wider Chinese indifference to global warming registered in the People's Republic Government's lack of commitment to the 1997 Kyoto Protocol. *三体Santi* was first serialised in *科幻世界Kehuan Shijie* during 2006, that is well before China's apparent change of position in the 2015 Paris Agreement. This is not to suggest that Liu is simply a mouthpiece for Chinese policy, but rather that both the policy and the fiction articulated then widespread Chinese attitudes towards climate change.

Almost as striking as the differences between the German, Russian and Chinese semiperipheries is the substantial number of cli-fi texts emanating from the periphery proper. The obvious starting point here is Canada, which for reasons already noted is only in part periphery, but in part also core. Examples of Canadian cli-fi include Élisabeth Vonarburg's *Chroniques du Pays des Mères* (1992), Atwood's *MaddAddam* trilogy (2003–13), Jean-Louis Trudel's *Les Marées à venir* (2009), Craig Russell's *Fragment* (2016) and Omar El Akkad's *American War* (2017). Interestingly, all five of the Anglophone texts are simultaneously North American and Canadian. Of these, by far the most important are those in the *MaddAddam* trilogy. While the novelists focussed on thus far in this chapter – Herzog, Turner, Robinson, Schätzing, Sorokin and Liu – have all been essentially genre writers, even Schätzing despite his publisher's efforts to suggest the contrary, Atwood is reluctant to apply the category of SF to her own work. She is a towering figure on the Canadian and international literary scene, a Companion of the Order of Canada and Order of Ontario, a Fellow of the Royal Society of Canada, the American Humanist Association's 1987 'Humanist of the Year', a Chevalier in the French Ordre des Arts et des Lettres, winner of the British Booker Prize for 2000 and 2019. And the vast majority of her fiction is in no sense science-fictional. But she is nonetheless the author of six novels that, at the very least, closely resemble SF, *The Handmaid's*

Tale (1985), its long-awaited sequel *The Testaments* (2019), the *MaddAddam* trilogy and *The Heart Goes Last* (2015). Moreover, *The Blind Assassin* (2000), the novel for which she won the Booker in 2000, is arguably a work of what might be termed 'meta-science fiction': Alex Thomas, one of its central characters, is a Canadian communist pulp SF writer whose own '*The Blind Assassin*' is a novel within the novel.

The trilogy comprises *Oryx and Crake* (2003), *The Year of the Flood* (2009) and *MaddAddam* itself (2013). In so far as there is a primary novum in the trilogy, it is the genetic engineering that allows OrganInc Farms to design the 'pigoons' and Crake the 'Crakers', the two of which come together in the third volume to establish a possible posthuman eutopian future. Global warming is nonetheless strongly present as *mise en scène* right from the beginning of *Oryx and Crake*: 'as time went on ... coastal aquifers turned salty and the northern permafrost melted and the vast tundra bubbled with methane, and the drought in the midcontinental plains regions went on and on, and the Asian steppes turned to sand dunes' (Atwood, 2004: 27). And, as becomes apparent in *MaddAddam*, the fusion of oil and Christian religion, represented by the Church of Petroleum and its leader, the 'Rev', is a key driver towards system collapse. Its slogans, as caricatured by the Rev's son, Zeb, run all the way from 'Solar Panels Are Satan's Work' to 'Serial Killers Believe in Global Warming' (Atwood, 2013: 117).

The *MaddAddam* trilogy has been translated into French, German and Italian, and its first two volumes into Spanish and Portuguese, Polish and Czech. Atwood's own highly successful promotional tour for the second volume included live performances of the God's Gardeners hymns featured in the novel. A TV adaptation of the entire trilogy, to be directed by Darren Aronofsky, was taken up by HBO, but subsequently shelved, and is now under consideration by Netflix and others. In short, the trilogy has all the hallmarks of a core rather than peripheral literary product. In an early review of *The Year of the Flood*, Jameson made two interesting observations: first, that 'Atwood can now be considered to be a science-fiction writer ... and this is not meant to disparage';⁷

⁷ Atwood herself remains to be persuaded. In a much-cited exchange with Le Guin, she insisted that her *Oryx and Crake* and *The Year of the Flood* were 'speculative fiction', but not 'science fiction': 'what Le Guin means by "science fiction" is what I mean by "speculative fiction," and what she means by "fantasy" would include some of what I mean by "science fiction"' (Atwood, 2011: 7). Our understanding of the SF selective tradition will incorporate any definition of the genre widely subscribed to by actors within the SF field and, in those terms, Le Guin's definition is clearly more representative than Atwood's.

second, that ‘she is a Canadian, and no little of her imaginative power comes from her privileged position above the border of the lower 48’ (Jameson, 2009: 7–8). The second point requires a little elaboration. Much of Atwood’s literary fiction, including *The Blind Assassin*, is set in her native Canada, but all five of her SF novels are set in the United States or in what was once the United States. In other words, her SF is quite deliberately North American rather than Canadian. Moreover, as Jameson also observes, ‘at least 300 million English-speakers generally need to be reminded’ that she is Canadian. Her fiction thus performs exactly that oscillation between core and periphery we found to be characteristic of Anglophone Canada.

Other significant, more fully peripheral instances of climate fiction include: from Australia, Steven Amsterdam’s *Things We Didn’t See Coming* (2009), Alexis Wright’s *The Swan Book* (2013), Peter Carey’s *Amnesia* (2014), Jane Rawson’s *A Wrong Turn at the Office of Unmade Lists* (2014), Ellen van Neerven’s *Heat and Light* (2014), Alice Robinson’s *Anchor Point* (2015), James Bradley’s *Clade* (2015), George Miller’s *Mad Max: Fury Road* (2015), Jane Abbott’s *Watershed* (2016), Briohny Doyle’s *The Island Will Sink* (2016), Sally Abbott’s *Closing Down* (2017), Cat Sparks’s *Lotus Blue* (2017), Jennifer Mills’s *Dyschronia* (2018), Tom Faunce’s *Split by Sun* (2018); Rohan Wilson’s *Daughter of Bad Times* (2019) and Shelley Birse’s *The Commons* (2019); from Sweden, Jesper Weithz’s *Det som inte växer är döende* (2012); from Norway, Jostein Gaarder’s *Anna. En fabel om klodens klima og miljø* (2013) and Jo Nesbø and Erik Skjoldbjærg’s *Okkupert* (2015–17); from Finland, Risto Isomäki’s *Sarasvatin hiekka* (2005), Antti Tuomainen’s *Parantaja* (2010) and Emmi Itäranta’s *Teemestarin kirja* (2013); from Spain, Jordi de Manuel’s *L’olor de la pluja* (2006); from Latin America, Homero Aridjis’s *Le leyenda de lose soles* (1993) and *¿En quién piensas cuando haces el amor?* (1996) and Gioconda Belli’s *Waslala* (1996); from South Africa, Alastair Bruce’s *Wall of Days* (2010), Umoya Lister’s *Planetquake* (2010) and Neill Blomkamp’s *Elysium* (2013); from Switzerland, Ivan Engler and Ralph Etter’s *Cargo* (2009); and from Korea, Bong Joon-Ho’s *설국열차/Seolgunnyeolcha* (2013). We will return to many of these texts in the chapters that follow. For now, however, let us note that the comparatively large number of Australian cli-fi texts might owe something to George Turner’s legacy,⁸ something to the country’s extreme vulnerability to the likely effects of global warming, and something to the, by Anglophone standards, comparatively large Green presence in Australian (and New Zealand)

⁸ This is certainly the view of Bruce Gillespie, Turner’s literary executor (Gillespie, 2016: 158).

parliamentary politics.⁹ Let us note also that the comparatively large number of Finnish texts must owe something to the growing strength of SF in Finland, as evident in Helsinki's successful bid to host the 2017 SF world convention. Let us note, finally, that the extraordinary critical and commercial success of Blomkamp's *District 9* (2009) seems to have prompted 'an unprecedented boom in local science fiction' (Steenkamp, 2014: 143) in post-apartheid South Africa, which has had, as a side effect, the further development of local cli-fi.

Tuomainen's *Parantaja* is clearly one of the more successful recent peripheral cli-fi novels. It won the 2011 Johtolanka-palkinnon voittaja for Best Finnish Crime Novel and has to date been translated into more than 20 languages, including English, French, German, Polish, Czech, Russian, Chinese and Spanish. At the beginning of the narrative, anthropogenic climate change seems merely to be the novel's *mise en scène*: 'Arvio ilmastopakolaisten määrästä maapallolla: 650–800 miljoonaa ihmistä. Pandemiavaroitukset: H3N3, malaria, tuberkuloosi, ebola, rutto' ['Estimated number of climate refugees planet-wide: 650–800 million people. Pandemic warnings: H3N3, malaria, tuberculosis, Ebola, plague'] (Tuomainen, 2013a: 10; Tuomainen, 2013b: 4). Ultimately, however, it is transformed into a primary *novum*, once it becomes clear that the ecoterrorist Pasi Tarkiainen, the novel's eponymous *Parantaja*, or Healer, has been prompted to the serial murder of business executives and politicians precisely by the rapidly deteriorating climate situation. As Pasi explains to the protagonist-narrator, the poet Tapani Lehtinen: 'Keitä sä luulet, että ne murhatut oli? ... Senkin jälkeen, kun ne tiesivät tekevänsä tuhoa, ne jatkoivat sitä. Ne jatkoivat murhaamista – valehtelemalla' ['Who do you think those murdered people were? ... Even after they knew about the destruction they were causing, they kept doing it. They kept murdering – by lying'] (Tuomainen, 2013a: 213–214; Tuomainen, 2013b: 203). *Parantaja* has been marketed as Scandinavian or Nordic noir, but extreme climate change is nonetheless what actually drives its narrative, which makes the novel an unusually interesting kind of SF/crime hybrid.

We might conclude this chapter by asking why it is that so many cli-fi texts appear to originate from the periphery of the global SF field. Thus far, we have advanced essentially *ad hoc* arguments concerning such matters. But we might also find more general answers available in earlier versions of Moretti's own theoretical framework. In his *Atlas*

⁹ In 2019 there were ten elected Green members in the Australian parliament (out of 227) and eight in the New Zealand (out of 120), as compared to none in the US Congress, one (out of 338) in the Canadian parliament, and one (out of 650) in the UK.

of the *European Novel*, Moretti argued that peripheral or semi-peripheral status can itself be conducive to new cultural possibilities. Citing Roberto Schwarz on Brazil (Schwarz, 1992: 29), he observed that 'peripheral' literatures can be 'sustained' by 'historical backwardness'. If this 'unlikely conjunction' occurs, he continued:

the horizon does indeed open up ... *the new model is the product of a new space*: the semi-periphery of Europe, the semi-periphery of the world-system ... A new space encourages paradigm shifts ... because it poses new questions – and so asks for new answers ... The outcome of a new geographical space, these forms then produce *a new fictional space* ... A new space that gives rise to a new form – that gives rise to a new space. Literary geography. (Moretti, 1998: 195–197)

This could explain why many of the truly innovative moments in the global history of SF – the emergence of the SF 'pulp' and the SF B feature movie in the United States or of SF manga and anime in Japan – are located, not in the system's core, but in its periphery becoming semi-periphery. The development of contemporary cli-fi might be a similar such moment, similarly located disproportionately in newly emergent semi-peripheral SF cultures.

Our conclusion, then, is that the cultural geography of climate fiction exhibits significant, albeit minor, variations from the more general structure of the global SF field. At the core, there appears to be a comparative underproduction of cli-fi in Japan; in the semi-periphery, a comparative over-production in Germany and under-production in Russia, Poland, the Czech Republic and China; in the periphery, an interestingly creative comparative overproduction in Canada, Finland, Australia and South Africa. The repeated eruption of new peripheral sources of literary creativity partly contradicts Moretti's claim that the world literary system is characterised by relations of growing inequality. But so too does his own stress on how new geographical spaces can produce new fictional spaces. As Moretti himself writes, such exceptions 'occur often enough to show a counter-force at work within the world literary system. The morphology of underdevelopment is not without its surprises' (Moretti, 2013: 105). We might conclude, then, that the tendency towards growing inequality within the world literary system is, like Marx's own law of the falling rate of profit, a law of tendency, which can be offset by countervailing tendencies such as that towards cultural creativity at the periphery.

Chapter 4

The Classical Dystopia in Climate Fiction

In Chapter 2 we sketched out an ideal typology of 30 logically possible types of climate fiction, 12 of which were eutopias, 12 dystopias, and six neither eutopian nor dystopian. As we noted, the concept, term and empirical instances of eutopia clearly precede those of dystopia: eutopia flourishes from the Renaissance through the Enlightenment and into the nineteenth century, dystopia only during the twentieth and twenty-first centuries. It is therefore common for discussion of utopian genres to proceed chronologically from eutopia to dystopia. But it is apparent from even the most cursory overview that contemporary cli-fi is much more likely to be dystopian than eutopian. We will therefore reverse the procedure and begin with dystopian cli-fi, reserving discussion of its eutopian counterpart to Chapter 7.

At this point, we need to say a little more about Moylan's distinction between classical and critical dystopias. The obvious antonym of eutopia is the anti-utopia, that is the kind of text that deliberately aims to confound eutopian hope and aspiration. But neither classical nor critical dystopias are strictly anti-utopian in this sense. As a form, the classical dystopia, Moylan observes, 'is an exercise in a politically charged form of hybrid textuality', hybrid, that is, between eutopia and anti-utopia, so that some dystopian texts 'maintain a horizon of hope', others 'foreclose(s) all transformative possibility', yet others 'negotiate a ... strategically ambiguous position'. The narrative structure of the dystopia, that of the alienated protagonist's resistance to a nightmarish socio-political reality, he continues, 'creates the possibility for social critique and utopian anticipation in the dystopian text' (Moylan, 2000: 147). This possibility may or may not be fully realised, but when it is, then we encounter the 'critical dystopia', that is the dystopia that 'includes at least one eutopian enclave or holds out hope that the dystopia can be overcome and replaced with a eutopia' (Sargent, 2001: 222).

Sargent coined the term 'critical dystopia' to describe the new dystopian American SF of the early 1990s, especially Marge Piercy's *He, She and It* (1991); it was picked up by Raffaella Baccolini in her reading of feminist dystopias and applied retrospectively to Katharine Burdekin's *Swastika Night* (1937) and Atwood's *The Handmaid's Tale* (1986); Moylan then gave it extensive theoretical elaboration in his account of the dystopian turn in late twentieth century American SF (Sargent, 1994: 9; Baccolini, 2000; Moylan, 2000, 183–199). Moylan's own key instances are provided by Robinson's *The Gold Coast* (1988), Octavia Butler's *The Parable of the Sower* (1993) and *The Parable of the Talents* (1998), and, again, Piercy's *He, She and It*. These texts are critical in a double sense both of critiquing contemporary society and of being critically aware of their own textuality:

[A]ll three dystopias reflect upon their formal relations with sociopolitical realities by way of their internal accounts of textual interventions. Thus, they teach their readers not only about the world around them but also about the open-ended ways in which such texts as the ones in front of their eyes can both elucidate that world and help to develop the critical capacity ... to know, challenge, and change. (Moylan, 2000: 199)

Unlike Baccolini, Moylan regarded the critical dystopia as a distinctive new intervention, specific to the United States in the late 1980s and early 1990s. So, neither *Swastika Night* nor *The Handmaid's Tale* could count as such (Moylan, 2000, 188). Indeed, he quite explicitly insists that the latter is 'a classical not a critical dystopia' (Moylan, 2000: 196). Nonetheless, Baccolini and Moylan are agreed on the crucial difference between classical and critical dystopias:

[D]ystopias maintain utopian hope *outside* their pages ... for it is only if we consider dystopia as a warning that ... readers can hope to escape its pessimistic future ... the new critical dystopias allow both readers and protagonists to hope by resisting closure: the ambiguous, open endings of these novels maintain the utopian impulse *within* the work. (Baccolini and Moylan, 2003: 7)

This distinction will be crucial for our purposes: we will treat as classical those cli-fi dystopias that maintain social hope only outside the text, and as critical those where social hope actually exists within the text. For each, we will try to identify representative instances of our

six ideal-typical responses to climate change, denial, mitigation, negative adaptation, positive adaptation, Gaian, and fatalist.

In Chapter 2, we occasionally referred to the classical dystopia as 'simple', thereby tacitly echoing Suvin's distinction between the 'simple dystopia', the anti-utopia, and the 'fallible dystopia' (Suvin, 2010: 395). And what Suvin means by the simple dystopia is indeed roughly commensurate with what Sargent, Baccolini and Moylan mean by the classical dystopia. Nonetheless, we need to be wary of the assumption that classical dystopias are necessarily either any less complex or any less rhetorically effective than critical dystopias. Much secondary commentary in utopian studies seems to work on the assumption that the most persuasive dystopian texts will always 'maintain a utopian impulse' (Baccolini and Moylan, 2003: 7). But we doubt this is necessarily the case. A text might well be more persuasive as an extra-textual warning the more completely it eliminates resistance within itself. And, as we shall see from our opening discussion of the Liu Cixin trilogy, classical dystopias can in fact be richly complex. That said, the analytical distinction between classical and critical dystopias still stands.

1. Denial

The first of our six ideal-typical responses to climate change was denial. The best-known instance of denial in cli-fi is almost certainly Michael Crichton's *State of Fear*, but it is neither a eutopia nor a dystopia, rather what we have been calling a 'base reality' text. For a more properly dystopian instance, we turn to Liu Cixin's 地球往事/*Remembrance of Earth's Past* trilogy, comprising 三体, literally *Three-Body*, but in published translation *The Three-Body Problem*, 黑暗森林/*The Dark Forest* and 死神永生/*Death's End*, first published in book form between 2008 and 2010 (although, as we noted in Chapter 3, the first volume had appeared in magazine serialisation in 2006). The trilogy's primary novum is the encounter with alien intelligences, initially the Trisolarans, later a whole galaxy of actually or potentially hostile civilisations. But extreme climate change is what brings Trisolaris to the point of launching an invasion of Earth. Trisolaris, we eventually learn, is the sole remaining planet out of 12 in Alpha Centauri, the nearest 'star' to our own, actually a three-sun system. As a result of the interaction of the three suns, the planet experiences extremes of cold and heat sufficient both to destroy whole civilisations on a regular basis and to slow the development of Trisolaran culture as a whole, so extreme in

fact that they now threaten to destroy the planet itself. Here, climate change is neither anthropogenic nor geogenic, or whatever might be their Trisolaran equivalents, but rather, as it were, *asterogenic*, an effect of the stars themselves.

Ye Wenjie (叶文洁), an astrophysicist working on the Chinese equivalent of SETI at the secret Red Coast Base, deliberately transmits a message exposing the Earth's location to the Trisolarans. Her motives are interestingly anti-humanist but also radically eutopian: she has witnessed the murder of her father, the physicist Ye Zhetai (叶哲泰), by Red Guards during a Cultural Revolution struggle session; and she has herself suffered persecution for her interest in a banned book, Rachel Carson's *Silent Spring*. Here, Maoism is not the eutopian alternative it might once have been, but rather a viciously chaotic form of institutionalised anti-intellectualism. Radical environmentalism, by contrast, does indeed initially appear eutopian. At the point of first contact, the Trisolarans are far more technologically advanced than humanity, but they realise that, during the 450 years it will take for their invasion fleet to travel from Alpha Centauri to the Solar System, Earth's uninterrupted technological development could render it the more advanced. The Trisolarans therefore set out to disrupt the development of Terran science, partly through encouragement of the Earth-Trisolaris Movement (ETO), partly through the development of the *Three Body* virtual reality game directed at Terran scientists and intellectuals, partly through the development and transmission to Earth of 'Sophons', supercomputers the size of a proton, which impose a 'lockdown' on Terran scientific development. The two key figures in the ETO are Ye Wenjie herself, who becomes its spiritual leader, and Mike Evans (麦克·伊文斯), the radical environmentalist son of an American oil millionaire, who is its main source of funding. Evans is as disillusioned with American corporate capitalism as Ye with Maoism and even more committed to environmentalist eutopianism. Ye and Evans thus combine environmentalism with a deep anti-humanism that leads them and the ETO to welcome the prospect of a Trisolaran conquest of Earth. The ETO – and by extension real-world environmentalists – are clearly represented as traitors to the human species, and the destruction of their ship *Judgement Day*, with Evans aboard, toward the end of the *The Three-Body Problem* clearly invites the reader's approbation. That Trisolaran intentions are thoroughly hostile is made absolutely clear when the Sophons announce to the human race that: '虫子' ['You're bugs!']¹ (Liu, 2008a: 292; Liu, 2014: 383). The only eutopian enclave

¹ 'Insects' might be a better translation than 'bugs'.

within the novel is thus both destroyed and discredited in a move that takes the novel very close to the anti-utopian end of Moylan's range of dystopian options.

The second volume in the trilogy, *The Dark Forest*, opens with a conversation between Ye Wenjie and Luo Ji (罗辑), an astronomer turned sociologist, to whom she suggests the two basic axioms of a possible cosmic sociology: '第一, 生存是文明的第一需要; 第二, 文明不断增长和扩张, 但宇宙中的物质总量保持不变' ['First: Survival is the primary need of civilization, Second: Civilization continuously grows and expands, but the total matter in the universe remains constant'] (Liu, 2008b: 5; Liu, 2015: 6). The implication, by no means immediately apparent either to Luo or to the reader, is the deeply anti-eutopian 'dark forest theory' of the universe, that the cosmos teems with intelligent life forms, all of whom relate to each other like hunters in a dark forest, never sure of each other's intentions and therefore rationally committed to the logical necessity for pre-emptively genocidal strikes. For reasons initially obscure to himself, Luo is appointed by the United Nations as one of four 'Wallfacers', tasked with developing deliberately deceitful strategies for resistance to the coming Trisolaran invasion (the Trisolarans have completely transparent minds and therefore cannot lie). After the near destruction of the Earth Space Fleet by a single Trisolaran probe, the so-called 'droplet', and after centuries long periods of hibernation, Luo realises that the only effective stratagem against Trisolaris is to threaten to reveal its location, and of necessity thereby also that of Earth, to other hostile civilisations elsewhere in the galaxy. Luo's brutal realism is directly counterposed to the eutopianism of those who refuse to admit the necessarily hostile nature of Trisolaran intentions, for example the UN's 'Project Sunshine', which proposes to share the Solar System with Trisolaris once it has been defeated, or the widespread human belief that, since the droplet is an object of profound aesthetic beauty, it must therefore be '三体世界发往人类世界的一个信物' ['a token of goodwill from Trisolaris to humanity'] (Liu, 2008b: 367; Liu, 2015: 431). Thus, the novel functions as an explicitly anti-eutopian retort to notions like Le Guin's Ekumen or *Star Trek's* United Federation of Planets, in which advanced alien intelligences are imagined as necessarily benign. We might note in passing that Terran anthropogenic climate change does not receive a mention in *The Dark Forest*, but not as the result of the kind of processes of capital accumulation and technological development that actually drove the process during the twentieth and twenty-first centuries. Rather, it arises from the demoralisation humanity suffers when confronted by the apparent inevitability of the Trisolaran invasion:

当时的环保法令倒还都有,但那正是悲观时期,人们普遍都有一个想法:环保有屁用?就算把地球保成一个花园儿,还不是留给三体人?

[The environmental laws were there, but ... the general attitude was, 'What the hell is environmental protection for? Even if Earth turns into a garden, isn't it all going to the Trisolarans anyway?'] (Liu, 2008b: 333; Liu, 2015: 391–392).

In Liu's third and final volume, *Death's End*, Luo Ji has been promoted from Wallfacer to 'Swordholder', a single human individual charged with responsibility for 'dark forest deterrence', that is for revealing the location of both Trisolaris and Earth in the event of any Trisolaran attack on Earth. After 54 years, Luo is succeeded by Cheng Xin (诚信), the novel's main protagonist, an aerospace engineer who has lived through a series of hibernations, and who is actually incapable of launching the broadcast that would destroy the two planets. The Trisolarans predicted this and have launched an invasion fleet in anticipation of her election. On Earth, a Trisolaran occupation, presided over by a robot incarnation of the Sophon, concentrates the entire remaining human population into Australia, to near genocidal effect. But one Terran ship, *Blue Space*, escapes the attack and successfully broadcasts Trisolaris's coordinates to the universe. As a result, first Trisolaris and then eventually the Earth and the entire Solar System are casually destroyed in dark forest attacks by casually observed third parties about whom we learn next to nothing. Cheng Xin survives, however, to live out her life alongside the robot Sophon and Guan Yifan in 'Universe 647', a mini-universe outside of time, where they await the heat death of the great universe. Clearly, we have now moved a long way from climate change, whether on Earth or Trisolaris, and from any realistically plausible futurology, in the direction of the kind of transcendental cosmic history once associated with the likes of Olaf Stapledon, a transcendental SF that is not exactly religious, but might as well be. The underlying continuity between 三体 and 死神永生, we might well conclude, nonetheless, lies in its persistent anti-eutopianism. As Liu himself observes: 'I wrote about the worst of all possible universes in *Three-Body*' (Liu, 2016a: 367).

2. Mitigation

Our second type of cli-fi dystopia was focussed on mitigation, but, as we noted in Chapter 2, mitigation in the strict sense is rarely the stuff

of SF narrative. In fact, mitigation in all senses, including the technofix of climate engineering, seems to figure prominently mainly in the early stages of the sub-genre. As the scientific consensus abandoned mitigation in favour of adaptation so too did SF. Nonetheless, Herzog's *Heat* is, as we have seen, an interestingly early example of a mitigation dystopia. Despite its cli-fi subject matter, the novel is at its core the kind of late-classical rather than strictly critical dystopia Moylan sees as characteristic of post-war American popular SF:

Immersed in modernity's own mass culture, the new maps of hell did not look forward to a better time ... At work in the belly of the beast, they focused ... on experiences of everyday life in societies increasingly shaped by a refined imbrication of economy and culture ... the sf dystopias ... tend to be less driven by extremes of celebration or despair, more open to complexities and ambiguities, and more encouraging of new riffs of personal and political maneuvers. (Moylan, 2000: 182)

Many of the tropes and topoi Moylan deems distinctive to these 'new maps of hell' (a phrase he borrows from the title of Kingsley Amis's pioneering account of the genre) – cynicism, pessimism, the critique of progress, exploitation and technology, the upbeat ending, the critique of corporate capitalism, advertising and consumerism (Moylan, 2000: 167–168) – are all present in Herzog's novel.

Herzog is both pessimistic and cynical, both about technological 'progress' in general and about American consumer capitalism in particular. 'For the first time in history', he writes, 'humanity had the power – through technological advances ... – to change the climate in which we live' (Herzog, 2003: 68). 'We've been so proud of our standard of living', observes his Hal Anderson: 'We don't know the price yet' (Herzog, 2003: 119). Faced with crisis, Herzog explains, Floridians, 'like most Americans', lack 'disaster sense'. A combination of hyper-optimism, hubristic belief in their own power and a 'preoccupation with success and instant sensory gratification' misleads them into the belief that nature cannot be dangerous (Herzog, 2003: 81). But nature is not so easily dismissed. The greenhouse effect takes hold and the country is disrupted 'by massive hurricanes, tornadoes, droughts, floods and fogs, ... which materialized without warning, so that the weather seemed to change day by day' (Herzog, 2003: 236). And, as the heat rises, American society fractures into the shape of its own socio-pathologies: 'Doomsday cults' announce the imminent end of the world 'at God's hands'; UFO enthusiasts claim the climate is 'really under attack from

space'; right-wing fanatics that Russia is waging "weather war" on the US' (Herzog, 2003: 179).

This relentlessly dystopian register is countered by the CRISES renegades, Larry Pick and Rita Havu. Pick, the male engineer, insists the problem is 'how to reduce or eliminate the thermal burden caused by man', especially the use of fossil fuels, and seeks the solution, not in simple mitigation, but in the technofix of energy generation 'somewhere else ... in space'. Terrestrial alternative energy sources, he argues, are bound to fail, even 'exotic means, like solar' (Herzog, 2003: 131). Havu, the female sociologist, is more proto-ecological in sentiment: observing a model of the Earth spinning in The Hole, she reflects that, for contemporary Americans, home is 'an apartment, a house, a piece of land'. 'Humanity was still in its infancy', she continues: 'When it got older, humanity would see the *world* as its home and take better care of it' (Herzog, 2003: 204). But both see themselves and their specialist expertise as at risk of being overwhelmed by the wider society and both are uncertain of success. Only through 'the reeducation and indoctrination of the American people' will change ever be possible (Herzog, 2003: 238). As the novel builds towards its denouement, and New York withers in the awful heat, Rita predictably stripped to her bikini, neither can know the outcome of Pick's experimental design. And so, in lines that almost echo Ballard, he ponders the possible results of failure: 'Around the city would be a jungle inhabited by small bands of humans gradually reverting to savagery in suffocating heat that made civilized life impossible' (Herzog, 2003: 248). Then comes the move Moylan describes as the 'upbeat ending' designed to suit the market (Moylan, 2000: 167). Pick and Havu make love for what might well be the last time and prepare for suicide, but then, in the novel's closing lines, the 'earth-sun' is suddenly announced a success: 'The earth-sun flickered, died, reappeared, grew stronger. A new light, round, yellow and steady, gleamed in the heavens' (Herzog, 2003: 251).

3. Negative Adaptation

If mitigation is an increasingly rare motif in cli-fi, negative adaptation is correspondingly increasingly common and is now almost certainly the dominant variant among both classical and critical dystopias. Here, we consider two examples of the former, both taken from core SF cultures, Michel Houellebecq's *La Possibilité d'une île* (2005) and Will Self's *The Book of Dave* (2006). Houellebecq is, of course, conventionally considered a literary rather than genre writer, the ageing enfant terrible

of French letters. But at least four of his novels are clearly future fictions, *Les Particules élémentaires* (1998), *La Possibilité d'une île* itself, *La Carte et le territoire* (2010) and *Soumission* (2015). The French SF studies journal *ReS Futurae* has recently devoted an entire issue to his work (Atallah, 2016). And Houellebecq himself betrays a familiarity with the genre that is almost fannish in character. At one point in *La Possibilité d'une île*, the clone Daniel25, looking back on the twenty-first century from the forty-first, reflects that 'certaines publications comme *Métal Hurlant* témoignent à cet égard d'une troublante prescience' ['certain publications such as *Métal Hurlant*² display a quite troubling prescience'] (Houellebecq, 2005a: 447; Houellebecq, 2005b: 318). *Métal Hurlant* was, in both its twentieth and twenty-first century incarnations, the leading French adult SF BD, so successful it was eventually published in a number of foreign-language editions, including an American version that excited the enthusiasm of William Gibson and Ridley Scott (Gibson and Wallace-Wells, 2011). For our purposes, then, *La Possibilité d'une île* will definitely count as SF.

Whether or not it is 'cli-fi' is a different matter, however. The novel's primary novum is cloning rather than climate change: its three main characters are Daniell, a twenty-first century successful comedian, bored and miserable despite his wealth, and his two cloned neohuman successors, Daniel24 and Daniel25, living 2,000 years later in what was once coastal Spain. Daniell has left behind extensive written testimony, to which Daniel24 and Daniel25 by turn add their commentaries. But climate change during the intervening millennia nonetheless provides the novel's determining *mise en scène*. In the forty-first century, Daniel24 comments wistfully that: 'La mer a disparu, et la mémoire des vagues' ['The sea has disappeared, and ... the memory of waves'] (Houellebecq, 2005a: 44; Houellebecq, 2005b: 27). As Daniel25 explains: 'Des transformations climatiques et géologiques de grande ampleur ont remodelé la physionomie de la région, comme celle de la plupart des régions du monde, au cours des deux derniers millénaires' ['Huge climatic and geological transformations have remodelled the physiognomy of this region, as they have most regions of the world, over the course of the two last millennia'] (Houellebecq, 2005a: 414; Houellebecq, 2005b: 296). The intervening history, he informs us, comprised: 'la fonte des glaces',

² Gavin Bowd actually translates *Métal Hurlant* as *Screaming Metal*, which suggests that he knows much less about SF than does Houellebecq. *Métal Hurlant* was so well-known internationally that most foreign-language editions simply retained the French title. The American edition, however, went under the title *Heavy Metal*.

or the melting of the ice, and 'la Première Diminution', or the First Reduction, in which the global population declined from 14 billion to 700 million; and then, later, 'le Grand Assèchement', or the Great Drying Up, and 'la Seconde Diminution' (Houellebecq, 2005a: 114). Nuclear war between the declining human civilisations had apparently also been a contributory factor to the developing catastrophe: thermonuclear bombs triggered the collapse of the Arctic and Antarctic icecaps, which caused 'l'immersion de l'ensemble du continent asiatique à l'exception du Tibet' ['the immersion of the entire Asian continent, with the exception of Tibet'] (Houellebecq, 2005a: 447; Houellebecq, 2005b: 318). But Daniel25 is clear, nonetheless, that climate change had preceded nuclear war: 'le début de l'effondrement des civilisations humaines fut marqué par des variations thermiques aussi soudaines qu'imprévisibles' ['the beginning of the collapse of the human civilisations was ... marked by variations in temperature that were as sudden as they were unpredictable'] (Houellebecq, 2005a: 447; Houellebecq, 2005b: 318).

La Possibilité d'une île is, then, a dystopia framed by negative adaptation to the most adverse variants of extreme climate change. The central adaptation is clearly the development of the neohumans themselves. Unreformed humans still exist in the forty-first century, but they have effectively devolved – losing the power of speech, for example – and have thus become reduced to life in 'savage' hunter-gatherer packs. By contrast, the neohuman clones – Daniel24 and Daniel25, but also Marie22, Marie23 and Esther31 – each live alone as hi-tech hermits, communicating only audio-visually. In a typically Houellebecqian gesture, we learn that they have no need for physical contact with each other, essentially because the 'RGS', or 'Rectification Génétique Standard', has ensured that they are 'autotrophe', or autotrophic, that is, they do not reproduce sexually and cannot therefore evolve or devolve biologically. As Daniel25 observes, 'la RGS, conçue au départ pour de simples raisons de convenance esthétique, est ce qui allait permettre aux néo-humains de survivre sans grande difficulté aux catastrophes climatiques' ['the SGR, conceived at the outset for reasons of purely aesthetic propriety, is what enabled the neohumans to survive, without any great difficulty, the climatic catastrophes'] (Houellebecq, 2005a: 375; Houellebecq, 2005b: 266). This neohuman autotrophic alternative is by no means a eutopian enclave within the novel, however, since it is by definition exclusive of community. And Daniel25 finally comes to realise this. Unusually and inexplicably for a clone, he abandons the life and home of his predecessors in order to search for '*La possibilité d'une île*' promised in the last line of Daniell's last poem (Houellebecq, 2005a: 433). But the novel's eventual conclusion is simply that no such possibility exists:

Le bonheur n'était pas un horizon possible. Le monde avait trahi. Mon corps m'appartenait pour un bref laps de temps; je n'atteindrais jamais l'objectif assigné. Le futur était vide; il était la montagne. Mes rêves étaient peuplés de présences émotives. J'étais, je n'étais plus. La vie était réelle.

[Happiness was not a possible horizon. The world had betrayed. My body belonged to me for only a brief lapse of time; I would never reach the goal I had been set. The future was empty; it was the mountain. My dreams were populated with emotional presences. I was, I was no longer. Life was real.] (Houellebecq, 2005a: 485; Houellebecq, 2005b: 345)

It is as bleak an ending as any in the entire history of dystopian fiction.

Like Houellebecq, Will Self enjoys a reputation as a literary rather than genre writer, albeit one who plays with science-fictional and fantasy motifs, most obviously perhaps in his 1994 short story collection *Grey Area*. Like *La Possibilité d'une île*, *The Book of Dave* is a classically dystopian future fiction, in which extreme climate change provides the *mise en scène*, but the primary *novum* nonetheless lies elsewhere, in this instance in the language and religion of Self's 'Hamster' future people. Their post-catastrophic religion provides the target for relatively unsubtle anti-religious satire that is almost certainly less effective than that in Walter M. Miller's *A Canticle for Leibowitz* (1960), their language for linguistic satire less persuasive than that in either Anthony Burgess's *A Clockwork Orange* (1962) or Russell Hoban's *Riddley Walker* (1980). The most interesting feature of the novel is, in fact, its *mise en scène* rather than either of its *nova*. Its 16 chapters alternate between the twentieth and twenty-first centuries, on the one hand, and the twenty-sixth century, by then known as the sixth century AD 'After Dave'. The Dave in question, Dave Rudman, is an angry, sometimes deranged, contemporary London cab driver, who writes and has printed on metal a book of misogynistic rantings, inspired in part by the belief that his ex-wife, Michelle Brodie, is keeping his son Carl away from him, in part by 'The Knowledge' in which professional taxi drivers are trained. Dave buries this book in the garden of Michelle's Hampstead house and, six centuries later, in post-diluvian London, in the year 523 AD, it has become the sacred text for the misogynistic religion of Dävinanity.

The first characters we meet are the Hamsters, living on the island of Ham, which we soon realise is the only remaining part above water of what was once the hilly suburb of Hampstead. For, rising sea levels have turned the island of Britain into the 'Ing Archipelago'. Much of

the future dialogue is written in 'Mokni', a dialect supposedly derived from taxi drivers' cockney. There is an Arpee-Mokni glossary of words and phrases (Self, 2006: 479–496) and also, on the inside back cover, a map of the Archipelago drawn by Martin Rowson, which shows 'Nott', 'Brum', 'Cov' and 'Cot' as islands or peninsulae. The Hamsters – and presumably also the inhabitants of other islands in the archipelago – engage in small-scale semi-feudal agriculture, their lives dominated by nature, on the one hand, and a harshly intolerant religion, on the other. They grow wheat, harvest gulls' eggs, and herd the intelligent, pig-like, genetically modified 'motos' and their young 'mopeds'. The men, or 'dads', and women, or 'mums', lead entirely separate lives, in different parts of the village, their children staying with the women for half the week, with the men for the other, as prescribed in *The Book of Dave*. The novel's twentieth century chapters are peppered with premonitions of flooding, from Dave's spirited defence of the Knowledge to an American 'fare': 'If all of this were swamped, taken out by a huge fucking flood, who'd be able to tell you what it was like? Not the fucking Mayor or the Prime Minister – that's for sure. But me, an "umble cabbie"' (Self, 2006: 33) – through to his own panicked response to an advertisement for mineral water in Piccadilly Circus – 'water began to flood between the buildings, a tidal bore that came surging along the rivers of light. Dave was shocked – what could this apocalyptic vision be selling?' (Self, 2006: 294). Dave is eventually restored to sanity by his affair with Phyllis Vance, and writes a second book repudiating the first, which is also then buried in the Hampstead garden. In the sixth century AD, a young Hamster named Symun Dévúsh, or 'the Geezer', finds this second book, enthusiastically proclaims its message, but is arrested as a heretic. When his follower, Antonë Böm, begins to realise the implications of the Geezer's teachings, he is drawn precisely to this Piccadilly Circus passage from *The Book of Dave*: 'if the Geezer spoke the truth ... Then – then, this ... this is Ham – Hampstead ... and that ... beyond the reef ... below the lagoon ... is ... is London. For did not Dave speak of a mighty flood, a great wave transforming the city's streets into raging rivers?' (Self, 2006: 312).

Unlike *La Possibilité d'une île*, *The Book of Dave* is written in deliberately comic rather than tragic register, much of its comedy predicated on a banal middle-class London prejudice about the supposedly reactionary nature of the city's taxi drivers. But, for all the cheap jokes, the novel is almost as bereft of hope as Houellebecq's. In the sixth century AD, Symun is cruelly tortured by the authorities in New London – broken on the wheel, his fingers cracked, forehead branded, tongue cut out – and exiled to desolate Nimar, where he eventually dies. Antonë and Symun's son Carl are themselves arrested and sentenced to death, they escape

and return to Ham, only to find the Guvnor, the Hack and the Driver, agents of the PeeSeeO, or Public Carriage Office, bullying the Hamsters into the wholesale slaughter of all the island's motos. Carl watches the 'whole deranged panorama' and is struck by a revelation: 'The Public Carriage Office has no need of motos – nor of the truth. They require only the Book and the Wheel, the Drivers and the Inspectors, the King and his servile lawyers!' (Self, 2006: 450). In the twenty-first century, Dave is killed by the Turks, loan sharks attempting to recover his bad debts, who disguise his murder as a suicide: 'No one – not even Phyllis Vance – seriously doubted that Dave Rudman had taken his own life ... Even so, Phyllis ... had enough canniness to introduce doubts into the mind of the local coroner, so ... that the death certificate laconically recorded the end of Dave's wayward journey through life with a further "misadventure"' (Self, 2006: 472). In the distant future, Antonë, Carl and the moto Lyttulmun make 'their way down to the manor and whatever fate awaited them'; in the recent past, Dave's son Carl decides to be a lawyer rather than a cabby, because 'there's gotta be more of a future in it' (Self, 2006: 451, 477). These are each disappointingly slight endings, both of which suggest that Self was not at all sure how exactly to end his novel. But, whatever may be said for or against them, neither contains the slightest shred of eutopian hope.

4. Positive Adaptation

We have been using the term positive adaptation to refer to climate fictions in which there are advantages to be had from climate change. These are hardly ever universally available, however – if they were the threat of anthropogenic warming would be much less serious than the IPCC envisages – but rather are normally acquired by the relatively rich and powerful in what is in effect a negative sum game. Once again, our two examples, Bernard Besson's *Groenland* (2011) and Paolo Bacigalupi's *The Water Knife* (2015), are taken from core SF cultures, respectively France and the United States. Besson is a retired French intelligence officer turned professional novelist. *Groenland* was his ninth novel, the first of two to date – the second is *Le Partage des terres* (2013) – to feature 'Fermatown', a private enterprise, strategic and criminal analysis company, which comprises John Spencer Larivière, a Franco-American former French intelligence officer, his Franco-Khmer lover Victoire Augagneur, also a former intelligence officer, and Luc Masseron, a bisexual computer expert. The novel's primary novum is very definitely climate change:

La dernière phase du réchauffement climatique commença ... Dans un craquement de fin du monde, la région du Lauge Koch Kyst quittait le Groenland pour rejoindre la baie de Baffin. Une monstrueuse crevasse, profonde de deux kilomètres, s'élargissait au milieu de l'île-continent.

[The last phase of global warming had begun ... With a sound as ominous as the crack of doom, the Lauge Kock Kyst had begun to tear away from Greenland and plummet into Baffin Bay in the North Atlantic Ocean. A colossal breach a mile and a half deep was opening up in the middle of the island continent.] (Besson, 2011: 9; Besson, 2013a: 1)

This great rift in the island generates a massive tsunami, which causes catastrophic flooding in Baffin Island, the Labrador coast, the St Lawrence River, Boston and New York (Besson, 2011: 28). But it also promises to free up the northern sea routes for the oil and gas companies and to open up for exploitation immense deposits of rare metals (Besson, 2011: 63). Two rival corporations, Nicolas Lanier's Franco-Danish 'Terre Noire' and Abraham Harper's Canadian-American 'North Land', are apparently hotly in pursuit of the commercial opportunities presented by the collapse of the Greenland ice cap.

Fermatown becomes involved when John is hired by Geraldine Harper to find her husband Abraham, whose last-known location was somewhere in 'La Grande Plaie du Chien errant' (The Great Wound of the Wild Dog) in north-western Greenland. While Victoire and Luc pursue their investigations in Paris and in regional France, John flies to Greenland and sets off in search of Abraham Harper, accompanied by Qaalasog, his North Land Inuit minder. In a parallel plot development, the Terre Noire ship, *Bouc-Bel-Air*, carrying ice core samples and company scientists, is disabled by the tsunami off the Greenland coast in Baffin Bay, and Nicolas Lanier arrives by helicopter to take charge of the ship. For reasons that are initially obscure, the Fermatown team is subject to a series of assassination attempts. Eventually, however, we discover that their handler at French security, Deputy Director François Guerot, is a double agent acting for the Russo-Norwegian alliance, trying to prevent a possible merger between Terre Noir and North Land. It also turns out that Abraham Harper is Nicolas Lanier's father and has long been aiming at a merger between the two companies. After much in the way of complicated manoeuvres, counter-manoevres, double-crosses and killing, in France and in Greenland, the Russo-Norwegians are eventually beaten, Terre Noir

and North Land merge to become Terre Humaine, the captain of the *Bouc-Bel-Air* is awarded the Legion of Honour at the Canadian Embassy in Paris, and Fermatown gets paid.

The intricacies of the plot need not concern us. What we should note, first, are the very detailed and often vivid descriptions of melting ice, cracking land, floods, and so on: ‘En mourant, le Groenland perçait la mer et le ciel de larmes de cristal comme le monde n’en avait jamais vu’ [‘As it died, Greenland was slicing into the sea and sky with blades of crystal such as the world had never seen before’] (Besson, 2011: 279; Besson, 2013a: 193). Second, we need note that, although the novel is unclear as to the precise degree to which historical global warming has been anthropogenic, it is nonetheless very clear that warming is indeed occurring and that human activities are accelerating the process. The wife of the *Bouc-Bel-Air*’s captain tells Luc: ‘[L]e permafrost et les fonds marins libèrent de plus en plus de méthane. Ce gaz va provoquer un effet de serre vingt fois plus puissant que le carbone et accélérer le changement climatique’ [‘[T]he permafrosts and seabeds are releasing more and more methane. That gas is going to produce a greenhouse effect twenty times more powerful than carbon and speed up climate change’] (Besson, 2011: 62; Besson, 2013a: 39). Third, the novel is also clear as to who will be the likely beneficiaries of these developments. As Sébastien Le Gall, a French intelligence analyst, explains to Victoire, ‘Lanier et les Harper ont la clé scientifique de toutes les spéculations des prochaines crises énergétiques et donc financières, immobilières et politiques’ [‘Lanier and the Harpers hold the key to all the transactions of the coming energy crisis ... and the related crises in finance, real estate, and politics’] (Besson, 2011: 305; Besson, 2013a: 211). Finally, it is equally clear as to who will be the likely losers. ‘On nous a chassés, on nous a atomisés, on nous a pollués, on nous a alcoolisés, on nous a drogués’ [‘We’ve been driven away. We’ve been radiated. We’ve been polluted. We’ve been turned into alcoholics, and we’ve been drugged’], Qaalasoq says to John, ‘maintenant on va nous spoiler’ [‘now we’re about to be looted’] (Besson, 2011: 233; Besson, 2013a: 162). The immediate crisis is resolved in favour of the economic and commercial interests of the French Government, the Harpers and Lanier, and indeed Fermatown. But nonetheless, six months later at the Canadian Embassy: ‘Dehors, l’orage grondait au-dessus de l’avenue Montaigne. La pluie s’était changée en grêle et la température venait de perdre 3C en moins d’une demi-heure’ [‘Outside, a storm raged over the Avenue Montaigne. The rain had turned to hail, and the temperature had dropped to freezing in just half an hour’] (Besson, 2011: 410; Besson, 2013a: 285).

Bacigalupi is a professional American SF writer, winner of Hugo, Nebula and John W. Campbell Awards for *The Windup Girl*, which also dealt with climate change, and a professed devotee of environmental science. As he explained in a 2009 interview: 'Environmental science is telling us a lot about our future ... The surfeit of bad trends pushes me to set my stories in worlds which are often diminished versions of our own present' (Bacigalupi, 2009b). *The Water Knife* takes place in a not-too-distant future, when rising sea levels have inundated coastal cities like New Orleans and desertification has overtaken the American Southwest. A 'State Independence and Sovereignty Act' allows states like Nevada and Arizona to 'defend' their borders against Texan climate refugees. California, however, is the dominant state in the region, with immense power and muscle. Climate change is here clearly the primary novum: the American Southwest is simply running out of water. The story revolves around three characters. Angel Velasquez is a Las Vegas 'water knife' that is, an enforcer, sent south to Phoenix by his boss, Catherine Case, 'the Queen of the Colorado', head of the Southern Nevada Water Authority (SNWA), to investigate stories of a game-changing claim to water rights on the Colorado River. Lucy Monroe is a Pulitzer Prize winning journalist and author, originally from New England, who has 'gone native' in Phoenix and is now trying to discover who brutally tortured and murdered her friend Jamie Sanderson, an Arizona water lawyer, who had boasted to her about these self-same water rights. Maria is an orphaned Texan refugee, now reduced to selling water – and eventually her body – in Phoenix, who lives with her hooker friend Sarah and works alongside her male friend Toomie. Maria merely wants to survive and escape north, but ends up carrying the water rights, disguised as a hard copy first edition of Mark Reisner's 1986 book *Cadillac Desert*. The rights are legally senior because older: they were originally granted to the Pima tribe of Native Americans, descendants of the original Hohokam, who had farmed Arizona in the thirteenth century; but were later legally transferred to the city of Phoenix in return for a cash settlement (Bacigalupi, 2015: 229–230).

In *The Water Knife*, as in *Groenland*, the plot centres on a series of complicated manoeuvres, counter-manoevres, double-crosses and killings, but here the latter are often extremely violent. In *The Water Knife*, as in *Groenland*, these are punctuated by detailed and vivid descriptions of the effects on the natural environment of extreme climate change. As Lucy observes, commenting on the inadequacy of the language of meteorology, 'maybe they were destined for a single continuous storm – a permanent blight of dust and wildfire smoke and drought, and the only records broken would be for days where anyone could even see the

sun' (Bacigalupi, 2015: 25). In *The Water Knife*, as in *Groenland*, the text is very clear that global warming is real and continues to be exacerbated by human activity. 'Nebraska, Kansas, Oklahoma, and Texas had thrown on the garments of fertility for a century', Angel reflects, 'pretending to greenery and growth as they mined glacial water from ten-thousand-year-old aquifers ... And then the water ran out' (Bacigalupi, 2015: 78). *The Water Knife*, like *Groenland*, is also clear from the very beginning that there will be both winners and losers in this developing negative sum game: 'The Queen of the Colorado had slaughtered the hell out of these neighborhoods; her first graveyards, created in seconds when she shut off the water in their pipes. "If they can't police their damn water mains, they can drink dust," Case had said. People still sent the lady death threats about that' (Bacigalupi, 2015: 8–9).

At the novel's conclusion Lucy and Angel, who have become lovers, and Maria and Toomie, who have not, escape to Las Vegas on SNWA choppers, all four of them badly hurt, but still carrying the water rights, which Case will, of course, discretely bury. The outcome will thus be as Lucy had predicted at the novel's outcome: 'Phoenix was Austin, but bigger and badder and more total. Collapse 2.0: Denial, Collapse, Acceptance, Refugees' (Bacigalupi, 2015: 24).

There are important differences between the two novels, not least the extraordinary amount of sexual and sexualised violence in *The Water Knife*, but, unlike the texts we have previously discussed, these focus on the struggles over scarce resources, and the battles between winners and losers, that are likely to become increasingly prominent in a climate-damaged world. This is why we have treated them as positive adaptation novels. But there is nonetheless no eutopian enclave or community, nor even any eutopian hope, in either novel: Fermatown survives and is still in business, but it is hardly a eutopian enterprise; Lucy, Angel, Maria and Toomie survive, but that is hardly a eutopian achievement. And this is why these are classical rather than critical dystopias, because what little hope they might offer necessarily lies outside the text in its power as warning. There is certainly precious little intratextual hope to be found in Lucy's musings on future history:

Maybe that's what archaeologists will call us. The Outdoors Period. For when people still lived outdoors.

Maybe in a thousand years everyone would be living underground or in arcologies, with only their greenhouses touching the surface, all their moisture carefully collected and held. Maybe in a thousand years humanity would become a burrowing species, safely tucked underground for survival. (Bacigalupi, 2015: 347)

5. Gaia

Our fifth type of classical dystopia is the Gaian, that is those where the Earth is represented as a self-regulating complex system, in which organic life and inorganic environment interact to maintain conditions for the continuation of life on the planet. Lovelock famously borrowed the term Gaia from his near neighbour, the SF author William Golding, so there is a certain poetic justice in its return to SF by way of cli-fi. We should be careful, however, to distinguish Lovelockian science and SF from the kind of 'New Age' neo-paganism that celebrates the idea of Gaia as Earth Mother. For, in truth, Gaia theory posits that the system functions to preserve life in general, but not human life in particular. The three novels we will use as examples here are drawn from the Anglo-French core, Maggie Gee's *The Ice People* (1998) and the second and third volumes in Jean-Marc Ligny's climate trilogy, *Exodes* (2012a) and *Semences* (2015a); the first volume *AquaTM* (2006) is better understood as a negative adaptation critical dystopia and will be discussed as such in Chapter 5.

Gee is English, a professor of Creative Writing at Bath Spa University, and a distinctly 'literary' writer: in 1983, she was one of six women included in the decennial Granta list of 20 Best Young British Novelists; she is a former chair of the Royal Society of Literature and a recipient of the OBE for services to literature. *The Ice People* is classically dystopian in so far as its ice age frame narrative, set after the events of the core narrative, necessarily forecloses any alternative eutopian possibilities. The reader can engage with hope only outside the text and beyond its narrative temporality. The novel opens with its British Ghanaian protagonist, Saul, an old man in the late twenty-first century, captured by a group of 'wild children', ice age outlaws (Gee, 2008: 13), who, it is clear, will kill him if and when they tire of his storytelling. His life story, as told to the outlaws, provides the novel with its core narrative. 'They want me to tell them about the future', he recalls: 'I used to do it all the time, obscenely self-confident, a tech teacher ... I told my pupils about global warming. I told them why we were so hot, why despite all our efforts it could only get hotter' (Gee, 2008: 14–15) And it had indeed got hotter. So, Saul describes how mid-late twenty-first century Britain succumbed to social collapse engendered by anthropogenic warming: 'There were three years of plague ...; blazing summers when viruses flourished and civil order couldn't stand the strain' (Gee, 2008: 22). But then the polar icecaps suddenly began to expand, ushering in a new ice age: 'Our overheated planet was at last cooling down, with everyone queuing up to claim the credit, virtuous

big business, responsible governments' (Gee, 2008: 85). The ice age is, however, in no sense anthropogenic but, rather, a long-run trend predicted by both environmental science and geology and long since exploited by SF, but here explicitly credited to a fictional Nobel Prize acceptance speech given by Lovelock (Gee, 2008: 60).

A key theme in the novel is the way climate shapes human personal life. So, Saul tells of how his marriage to Sarah had been good in warm times, but how as the climate began to cool so too did their relationship. More or less contemporaneously, the wider society has also become increasingly segregated along gender lines. Saul is involved in a men's club, the 'Gay Scientists', which bears some of the hallmarks of real-world men's rights movements, while Sarah joins 'Wicca World', a feminist-environmentalist organisation that eventually assumes government. A crucial point at issue between Sarah and Saul, feminism and anti-feminism, is the developing male preference for 'Doves', or domestic robots. At one point, Sarah catches Saul in bed with Dora, their Dove: 'They're – completely unnatural. They're wrong. They're perverted' (Gee, 2008: 131). Sarah leaves Saul, taking their son Luke with her, and turns to militant lesbian-separatist feminist political activism. But Saul kidnaps the boy, flees to continental Europe and tries to use his Ghanaian heritage to secure passage to the warmth of Africa. Traumatized by his mother's earlier attempts to chemically castrate him and by his father's attempts to culturally Africanize him, Luke escapes, leaving Saul to return to England, where he is in turn involved in the car crash from which the outlaws 'rescue' him.

The Ice People is critical of both the Gay Scientists and Wicca World: 'It was bullshit, all of it, looking back. No one gives a fig about politics now; we're all too frightened of freezing to death' (Gee, 2008: 122). The serious point here is that no politics can adequately conceive how ultimately unimportant humanity actually is. As Saul recalls:

We dreamed apocalyptic dreams. We fled our terror of the cold. We thought of the ice as waste, dead, a barren zone where life was extinguished ... I began to see the truth. *We were the exceptions to the rule.* The ice was bad for human beings, shattered our careful webs of control, killed our parasites, bugs and bedmates – and yet, the rest of life was flourishing.

Lovelock had said it decades ago. There were more species in ice ages, not fewer. (Gee, 2008: 273)

The new ice age is Gaia's way of restoring planetary equilibrium, a gift to life in general, but not to humanity in particular:

the beauty, the amazing beauty of the end of the day ... A great wheel of birds comes turning across it, thousands of them blown in from the sea. They're coming back slowly, the birds, the foxes, paws, clawmarks printing the ice. And there, wider, higher than the towers, is the radiance beyond the horizon. The ring of fire, then the ring of ice. And somewhere, across the snowfields, it's coming. (Gee, 2008: 318–319)

Gee's novel clearly rehearses tropes from the earlier new ice age fictions we traced in Chapter 1: the reversal of power relations between Africa and Britain, the speed with which the ice advances, its beneficial effects on non-human life. But these are combined with a distinctive emphasis on gender politics and with repeated references to Lovelock and Gaia. There is a necessary undertone of fatalism in the latter: 'What was ever the point of us, our struggling, quarrelling, suffering species, getting and spending, wasting, grieving?' (Gee, 2008: 218). But fatalism is even more developed in Gee's *The Flood*, a more recent climate novel we will discuss in Chapter 6. The key weakness in *The Ice People* itself is not so much its fatalism, however, as a failure to confront the possibility that anthropogenic warming might more than offset the planet's long-term cyclical tendency towards cooling; in short, that the Anthropocene might be real. Gee does not quite deny the relevance of anthropogenic factors, but in this particular novel she certainly renders them radically subordinate to the planet's own geogenic logics. This might make for literary originality, but it also makes for an arguably unhelpful contribution to real-world debates about climate change.

Where Gee is a 'literary' writer, Ligny is a professional 'genre' writer and the winner of a number of French SF-related prizes. In an interview in 2012, while discussing *Exodes*, he sketched out the implications for humanity of a rudimentary version of Gaia theory:

Quoi que l'on fasse, même si demain on stoppait toute émission de gaz à effet de serre, le climat va se réchauffer de toute manière. Les scientifiques les plus pessimistes ... prédisent un «emballement» climatique ... Cet emballement mènera nécessairement à une sixième extinction massive des espèces vivantes ... La Terre s'en remettra bien sûr, ce n'est pas la première fois que son climat est bouleversé, et pour elle l'humanité n'est qu'une péripétie.

[Whatever we do, even if we stop all gas emission tomorrow, the climate will still warm up. The most pessimistic scientists ... predict a 'runaway' climate change ... This acceleration will necessarily

lead to a sixth mass extinction of living species ... The Earth will recover, of course. It won't be the first time her climate has shifted, and for her humanity is just an accident.] (Ligny, 2012b)

This is the fundamental premise underlying both *Exodes* and *Semences*.

In all three of the climate trilogy, anthropogenic global warming provides the primary novum, but whereas *AquaTM* is set before the climate catastrophe, *Exodes* and *Semences* are set, respectively, during and after it, in the twenty-second and the twenty-fourth centuries. *Exodes* is essentially a doomsday novel – its last chapter is entitled ‘Exterminer, annihilier, détruire!’ (Ligny, 2012a: 503) – directly informed by a kind of anti-humanist Gaian deep ecology – Lovelock in French translation figures prominently in the bibliography (Ligny, 2012a: 540). The novel is set in 2100, at a time when human civilisation is already close to collapse and humanity seems doomed. The elites have withdrawn into domed enclaves, one of which is nicely located at Davos in Switzerland; the planet’s equatorial regions have become uninhabitable; there are immigration wars, roaming bands of cannibalistic ‘Mangemorts’, or Deatheaters, and incendiary ‘Boutefeux’, or Firebrands. Hence, the eponymous mass exodus, in which humans from all across Europe attempt to escape from conditions for which there is no escape. The novel is thus structured around doomed escape attempts by six main characters: Pradeesh Gorayan, an Indian geneticist working on life expectancy in the Davos dome; Mercedes Sanchez, a Spaniard who joins a religious cult that believes that angels will arrive by UFO to take them to the Garden of Eden; Mercedes’s son Fernando Sanchez, who leaves home on his eighteenth birthday to join les Boutefeux; Paula Rossi, an Italian concerned above all for the health of her young sons, Romano and Silvio, who trades her body for food, water and transport; Mélanie Lemoine, a French woman living alone with her dog in the Forez Mountains, who uses her last days to try to save the remaining animals; and Olaf Eriksson, a Norwegian fisherman, who flees from the Lofoten Islands, which have been overwhelmed by refugees, in search of something better further south. Ultimately, the characters converge near Davos, which is attacked by Fernando’s Firebrands, in an ironically dark denouement: Pradeesh suggests to Paula, Romano and Mercedes that they can still find ‘l’un des derniers havres de paix existant sur cette planète’ [‘one of the last havens of peace remaining on this planet’] in ‘Les îles Lofoten’ (Ligny, 2012a: 534).

The most sympathetic of the characters is almost certainly Mélanie, whose home in the Forez Mountains is close to Ligny’s own and whose escape to her fortified farm is metaphorical rather than literal and, in

any case, dedicated to the protection of the non-human. She is also the character whose close observations of the natural environment most anticipate developments between *Exodes* and *Semences*. Mélanie sees herself as living ‘en harmonie avec la nature – une nature certes revêche, avare et hostile, mais qui la nourrit encore’ [‘in harmony with nature – a rogue nature it had become, greedy and hostile, but it still nourished her’] (Ligny, 2012a: 62). When her neighbour Séverine asks to see the animals, Mélanie shows her around and eventually insists that the anthill takes pride of place over everything else. ‘En fait, c’est un ville en pleine expansion, qui grossit de jour en jour’ [‘In fact, it’s a city in full expansion, which gets bigger every day’]. She explains:

Ce que tu vois là, ce n’est que la partie émergée. En sous-sol, ça s’étend sur des dizaines de mètres, j’ai pu le vérifier : il y a des cités annexes, des sorties dérobées, des postes de garde avancés ... et un contrôle de l’immigration à l’entrée de la cité principale.

[What you see there, it’s only the exposed part. Underneath, it spreads out over dozens of meters, I’ve verified it. There are annex cities, hidden exits, advance guard posts ... and immigration control at the entrance to the main city.] (Ligny, 2012a: 68)

Séverine thinks this is merely a tall story, but Mélanie is insistent that it is actually reality:

J’ignore si c’est dû aux changements de l’atmosphère, aux UV ou à l’augmentation de la température, en tout cas les fourmis sont en train d’évoluer à vitesse grand V ... Peut-être que, tout simplement, elles ont senti – ou la nature leur a fait comprendre – que l’ère de l’homme était passée, que leur était venu de dominer le monde.

[I don’t know if it’s due to changes in the atmosphere, to UV rays or to the rise in temperatures, in any case the ants are evolving at lightning speed ... Perhaps, quite simply, they sense – or nature makes them understand – that the era of man has passed, that their turn has come to dominate the world.] (Ligny, 2012a: 70)

The full significance of this passage only becomes apparent in *Semences*, when we learn that, during the intervening 200 years, the ants have evolved into ‘les fourmites’, a linguistic and biological cross between ‘les fourmis’ and ‘les termites’, and have become capable of near telepathic communication, not only with each other, but also with humans.

Semences is, as Ligny himself cheerfully admits, a kind of ‘road-movie’ (Ligny, 2015b); it is also a novel of young adult sexual awakening. The two main characters, Denn and Nao, are members of a small, primitive, cave-dwelling tribe, who live in symbiotic relationship with fourmites. This couple come across a dying man, ‘Un démon des Âges Sombres’ [‘A demon from the Dark Ages’] (Ligny, 2015a: 76) of the twentieth and twenty-first centuries when human science and technology flourished, who bequeaths them a silk scarf depicting images of what seems to be an Earthly paradise of snow-capped peaks and fertile valleys. We know from the novel’s prologue that this man is Natsume and that the Greenland Inuit tribe he abandoned – also small, also primitive, also cave-dwelling, also in symbiotic relationship with fourmites, and also ignorant of the world beyond itself – was certainly not the ‘dernier paradis sur Terre’ [‘last paradise on Earth’] (Ligny, 2015a: 7). Carrying a micro-society of fourmites with them, Nao and Denn journey through the blasted landscapes of a ravaged planet, attempting to trace their way to the dead man’s home. In this burning world, where temperatures are about 100 C during the day, and where the few surviving humans live underground, the tropics are now completely uninhabitable, the old temperate zones have become tropical and the poles temperate, the oceans are swollen and acidified, biodiversity has collapsed into homogeneity through mass extinction – there are no birds – and the ruins of the old cities are irradiated. Yet, Denn and Nao do also discover new life, and, with it, new kinds of hope, wherever they travel. They also discover each other as their relationship, initially akin to that between brother and sister, acquires an increasingly sexual character.

By comparison with the sheer hopelessness of *Exodes*, *Semences* is, then, a cautiously optimistic text. But what hope it holds out is accorded either the two teenage lovers as individuals or the planet as a whole living system, that is, as Gaia. Human civilisation, by contrast, has not only auto-destructed, but has also been responsible for the destruction of 95 per cent of the species on land. As a result, the fourmites rather than humanity will become the planet’s dominant species. In the novel’s closing pages, Nao realises that the longstanding accords between humans and fourmites are now over:

C’est fini.

Finie la collaboration. Finie la symbiose. Finie les Accords ...

Pourquoi ? émet-elle.

Pourquoi ne pas continuer ensemble ? On pourrait tant s’apprendre ...

Les fourmites ne répondent pas, mais la réponse, évidente, s’étale devant ses yeux. Elles n’ont pas besoin des humains. Ceux-ci ne

servent que de moyen de transport, à l'occasion. Et de nourriture, à défaut. L'époque de la domination des humains sur la Terre est révolue, c'est désormais l'avènement des fourmites.

[It's finished.

The end of collaboration. The end of symbiosis. The end of the Accords ...

Why? she signalled.

Why not continue together? We could learn together ...

The fourmites don't respond, but the answer is evidently spread out before her eyes. They have no need of humans. They serve as a means of transport, on occasion. And as nourishment, failing all else. The epoch of human domination on Earth is over, it's now the rise of the fourmites.]

(Ligny, 2015a: 408–409)

Given the inevitably human subject position from which Ligny writes and his readers read, *Semences* has to be understood as, ultimately, an extension of the classically dystopian pessimism of *Exodes*: hope for humanity exists only outside the text in its capacity as warning and its author's as harbinger.

Our sixth substantive responsive to climate change was, of course, fatalism. But fatalism presents peculiar problems for the kinds of fiction overwhelmingly intended as warning. What, after all, is the point of warning against that which cannot be avoided? We will therefore postpone our discussion of fatalism in the classical dystopia until Chapter 6, where we will attempt to explore the more general problem of fatalism at some length.

Chapter 5

The Critical Dystopia in Climate Fiction

For Sargent, Moylan and Baccolini alike, the crucial distinguishing feature of the critical dystopia is that social hope exists within the text, typically in the form of some eutopian enclave or eutopian community. For Moylan in particular, however, and to some extent for Baccolini and Sargent too, the critical dystopia can also be contextualised in relation to a specific historical moment, that of the triumph of Anglo-American neo-liberalism in the 1980s and 1990s. Suvin's later taxonomy, which posits an analogous distinction between the 'simple dystopia' and the 'fallible dystopia' is similarly dependent on the supposed specificities of an immediately contemporary politico-social configuration: the fallible dystopia, he writes, is 'a new sub-genre of the US 1960s–1970s ... arising out of ... the shock of Post-Fordism and its imaginative mastering' (Suvin, 2010: 394–395). We doubt that the critical, or fallible, dystopia can be defined with such historical and geographical precision. For, on our reading cli-fi critical dystopias can be identified in many other geographical locations over the early twenty-first century. We will set aside Moylan's geo-historical criteria, then, and confine ourselves to the specifically formal question of the intratextual presence of eutopian alternatives.

1. Denial

Strictly speaking, denialist cli-fi is highly unlikely to be critical in this sense, since a non-existent problem requires no eutopian response. But those few texts that reject the scientists rather than the science can themselves occasionally be critical. The example we cite here is Ian McEwan's *Solar* (2010), although we might also have considered Sven Böttcher's *Prophezeiung* (2011). *Solar* is by far McEwan's funniest book and was awarded the 2010 Bollinger Everyman Wodehouse Prize for comic writing. At times – for example when its protagonist, Nobel

laureate Michael Beard, fears he has frozen off his penis (McEwan, 2010: 58–60) – it is almost reminiscent of Tom Sharpe’s *Wilt* books. McEwan is a famously ‘literary’ British writer, winner of the Man Booker Prize, Fellow of the Royal Society of Literature and the Royal Society of Arts, Fellow of the American Academy of Arts and Sciences. Moreover, this novel is set in the very recent past rather than in the future, and its climate science is more or less accurate, all of which might suggest it best be judged a realist novel. But the novel’s crucial scientific novum of artificial photosynthesis is nonetheless entirely fictional, which makes *Solar* SF, at least as judged by Suvin’s definitions. Beard himself is short, fat, gluttonous and an inveterate philanderer. When we first meet him, he is head of the chronically underfunded British National Centre for Renewable Energy, set up primarily to create the illusion that the then Blair Government is concerned about climate change. He is unfaithful to Patrice, his fifth wife, whom he learns has been having an affair with his younger colleague, Tom Aldous. The latter dies in a freak accident during a confrontation with Beard, who thus acquires Aldous’s artificial photosynthesis research, which he subsequently passes off as his own. Beard builds a reputation as a champion of solar energy on the basis of Aldous’s research, continues to over-indulge in food, drink and sex and, eventually, presides over the building of an artificial photosynthetic solar power plant in New Mexico. In the denouement, Beard’s theft of Aldous’s research is exposed by a patent lawyer, he is diagnosed with a cancerous melanoma, his business partner leaves him with multi-million-dollar debts, and the solar plant is sabotaged by the man he framed for Aldous’s murder. In the final scene, as all this comes to a head, Beard suffers an ‘unfamiliar, swelling sensation’ (McEwan, 2010: 279), which is very probably a heart attack.

Beard says all the right things about climate science, but his own propensity to self-indulgence nonetheless suggests why humanity might not be able to rise to the occasion, or, at least, how the problem has arisen. This is both the novel’s serious subtext and the occasion for much broad comedy. So, when Beard gives a speech at the Savoy to an audience of pension-fund managers, he explains that: ‘The science is relatively simple, one-sided and beyond doubt ... and is as incontestable as the basics of natural selection. We’ve observed and we know the mechanisms, we’ve measured and the numbers tell the story, the earth is warming and we know why. There is no scientific controversy, only this plain fact’ (McEwan, 2010: 152). He continues: ‘We’ll use light directly to make cheap hydrogen and oxygen out of water, and run our turbines night and day. Believe me, this will happen’ (McEwan, 2010: 154). All the while, however, Beard is feeling sicker and sicker because he has previously

over-indulged on smoked salmon (McEwan, 2010: 146–147), so much so that he eventually throws up (McEwan, 2010: 156). At times, Beard's – and presumably McEwan's – cynicism seems to know no bounds. For example, when his business partner, Toby Hammer, worries about climate sceptic claims that global warming has stopped, Beard replies: 'Here's the good news. The United Nations estimates that already a third of a million people a year are dying from climate change ... Two years ago we lost forty per cent of the Arctic summer ice. Now the eastern Antarctic is going. ... Toby, listen. It's a catastrophe. Relax!' (McEwan, 2010: 216–217). And yet, Beard and McEwan continue to insist on the truth value of the science. This, then, is the novel's eutopian enclave, not Beard as an individual, not even Aldous as an individual, not any individual scientist as a character, but rather the community of scientists as embodied in the science they produce.

2. Mitigation

Mitigation has now become almost as rare a motif in the critical dystopia as in the classical. It is worth noting, however, that it is an increasingly salient feature in Robinson's recent SF, for example in both *2312* (2012) and *Aurora* (2015a). In neither case is climate change the primary novum; in both, this is a combination of quantum computing and terraforming. As Chris Pak astutely observes (Pak, 2016: 168–203), terraforming has been a preoccupation in Robinson's work ever since the *Mars Trilogy* (1993–96), where the terraforming of Mars is linked to the possibility that Earth itself might need to be terraformed in response to environmental catastrophe. By the time in which *2312* and *Aurora* are set, Mars, Venus, Mercury, the Jovian and Saturnine moons, and many asteroids are all already inhabited by humans, and thereby subject to some degree of terraforming. *2312* is obviously set in the twenty-fourth century, *Aurora* between the twenty-sixth and thirtieth centuries. In both, Earth is depicted as ravaged by the negative consequences of anthropogenic extreme climate change and in both serious attempts are made to mitigate those consequences. These are at their most spectacular in *2312*, where the protagonists and eventual lovers, the Mercurian artist Swan Er Hong and the Titanian diplomat Fitz Wahram, help to return thousands of extinct or near extinct species to Earth from the 'asteroid terraria' – that is, artificial ecosystems built in the hollowed out interiors of asteroids – where they have been preserved. Robinson's description of the resultant landings is simultaneously inspirational, surreal and vaguely comic:

It looked like a dream, but ... it was real, and the same right now all over Earth: into the seas splashed dolphins and whales, tuna and sharks. Mammals, birds, fish, reptiles, amphibians: all the lost creatures were in the sky at once, in every country, in every watershed. Many of the creatures descending had been absent from Earth for two or three centuries. Now all back, all at once. (Robinson, 2012: 395)

Earth itself, ‘the planet of sadness’ (Robinson, 2012: 303), is still trapped in a system of predatory late capitalism – hence the scale of the environmental damage – but the rest of the solar system is run along socialistic lines, in a future version of the Mondragon system of workers cooperatives currently operating in Euskadi.

The mitigation efforts in *Aurora* are less spectacular, but perhaps more substantially realistic. The novel’s main storyline is the attempt to establish a human colony on Aurora, an Earth-like moon of Tau Ceti’s Planet E (Robinson, 2015a: 45–48). This is ultimately unsuccessful because, as a dying settler observes, ‘any new place is going to be either alive or dead. If it’s alive it’s going to be poisonous, if it’s dead you’re going to have to work it up from scratch’ (Robinson, 2015a: 178). The colony is abandoned and a minority of would-be settlers decide to return to Earth. They nearly starve en route, but are saved by the wonderfully intelligent ‘Ship’, a quantum computer AI which narrates most of the novel, and which puts them into hibernation and finally sacrifices itself in order to send 616 survivors back to Earth (Robinson, 2015a: 395). Their home planet, they have learnt, has been seriously damaged by global warming:

[O]n Earth the sea level was many meters higher than it had been when their ship had started its voyage, and the carbon dioxide level in Earth’s atmosphere was around 600 parts per million, having been brought down significantly from the time Ship had left ... That suggested carbon drawdown efforts. (Robinson, 2015a: 271)

The scale of the catastrophe only becomes fully apparent, however, after they have returned to Earth. The seas have risen by 24 metres during the twenty-second and twenty-third centuries, all Earth’s beaches are drowned, and, despite the attempts at carbon drawdown, sea levels have thus far barely fallen: ‘Yes, they are terraforming Earth ... they are calling it a five-thousand-year project ... It’ll be a bit of a race with the Martians’ (Robinson, 2015a: 436). *Aurora* is, no doubt, a highly intelligent piece of work, which subverts the conventions, not only of the generation starship subgenre, but also of almost all space travel and

first contact SF. But this very pessimistic estimate of how long it would take to terraform Earth or Mars also subverts, or at least runs contrary to, the original expectations of Robinson's *Mars Trilogy*. In the novel's denouement, Freya, the colonists' informal leader, leads the survivors into an alliance with the 'Earthfirsters', a group working on landscape restoration, specifically beach return, who are opposed to the deep space exploration still advocated by 'space cadets'. As one Earthfirster explains to Freya: 'We don't like the space cadets ... This idea of theirs that Earth is humanity's cradle is part of what trashed the Earth in the first place' (Robinson, 2015a: 439).

Desperately damaged though Earth undoubtedly is in Robinson's futures, the still dominant late-capitalist mode of production is subject to clear and effective challenges by eutopian enclaves and communities, the latter-day Mondragon cooperators in *2312*, the Earthfirsters in *Aurora*. And in both novels, the eutopians are firmly on the side of science and scientists (as, indeed, they were in the *Mars Trilogy*). This is clearly a much more positive representation of the scientist than that in McEwan, but it nonetheless echoes the latter's positive endorsement of science per se. Along with terraforming and eutopianism, this positive conception of science is a key organising principle in Robinson's work. As he himself recently explained, while reflecting on the origins of his *Science in the Capital* trilogy:

I had ... come to feel that many people, and especially many of my leftist colleagues, thought of science as merely the instrument of power – as the most active and effective wing of capitalism. This ... struck me as wrong. To me it seemed that we actually exist in a situation that can better be described as 'science versus capitalism': a world in which smaller progressive concepts such as environmentalism, environmental justice, social justice, democracy itself – all these were going to be defeated together, unless they were aligned with the one great power that might yet still successfully oppose a completely capitalist future, which was science. (Robinson, 2016: 6)

3. Negative Adaptation

As we have noted, negative adaptation seems to be the dominant form in both the classical and critical climate dystopia. In Chapter 3 we cited Cormac McCarthy's *The Road* (2006) as an example of US cli-fi. And, indeed, the novel is commonly treated as such: George Monbiot, the distinguished British environmental activist, described it in *The Guardian*

newspaper as ‘the most important environmental book ever written’ (Monbiot, 2007); ecocritics Astrid Bracke and Margu rite Corporaal even go so far as to argue that it ‘does not merely function as a warning, but also as an illustration of the role of responsibility, language and vision in the relationships humans have with nature’ (Bracke and Corporaal, 2010: 711). The novel is clearly a critical dystopia since it contains eutopian enclaves and communities, not only the central protagonists themselves, the man and the boy, father and son, but also the family of ‘good guys’ who come to the boy’s rescue in its closing pages (McCarthy, 2007: 302–306). And, in so far as these characters each attempt to minimise the harm done to their post-catastrophic world, it is also clearly an instance of negative adaptation. But the question immediately arises as to what exactly they are adapting. The world the man and the boy walk through is utterly bereft of natural life, but at no point does McCarthy ever suggest that this dead landscape is a consequence of climate change. To the contrary, both nuclear war and divine rapture appear far more likely causes of this particular literary apocalypse. As we have already observed, SF – and therefore climate fiction – does not sit easily with apocalypse at the formal level. And *The Road* quite clearly depicts an apocalypse, a cataclysm that occurs at a very specific moment: ‘The clocks stopped at 1:17. A long shear of light and then a series of low concussions’ (McCarthy, 2007: 54). This simply cannot be anthropogenic climate change. Bracke and Corporaal observe that McCarthy’s bleak landscapes are ‘indebted to images of nature, such as gardens and rivers, rooted in our cultural memory’ (Bracke and Corporaal, 2010: 711). Doubtless, this is so. But, wherever McCarthy addresses the natural world he does so in decidedly elegiac terms, which emphasise that which was lost, rather than the causes of the loss. This is no more apparent than in the closing paragraph:

Once there were brook trout in the streams in the mountains. You could see them standing in the amber current where the white edges of their fins wimpled softly in the flow. They smelled of moss in your hand. Polished and muscular and torsional. On their backs were vermiculate patterns that were maps of the world in its becoming. Maps and mazes. Of a thing which could not be put back. Not be made right again. In the deep glens where they lived all things were older than man and they hummed of mystery. (McCarthy, 2007: 306–307)

McCarthy’s determinedly ambiguous masterpiece operates in the mythological or biblical register rather than the scientific or rationalist.

While certainly amenable to ecocriticism, *The Road* is not in our view a cli-fi novel concerned with the possible consequences of twenty-first century climate change.

We will therefore use as our examples two more unambiguously cli-fi texts, Ligny's *Aqua*TM (2006) and the English David Mitchell's *The Bone Clocks* (2014). *Aqua*TM is the first and the most critically and commercially successful volume in Ligny's climate trilogy, set in 2030 at a time when drought and global warming have transformed drinking water into an extremely valuable commodity. It seems to have been conceived as a stand-alone novel and is written in a register closer to Ligny's earlier cyberpunk novels, *Cyberkiller* (1993), *Inner City* (1996) and *Les Chants des IA au fond des réseaux* (1999), than to the later volumes in the climate trilogy. Anthropogenic climate change is clearly its primary novum and, equally clearly, this process has been driven, and continues to be driven, by corporate capitalism: 'chez GeoWatch l'information ne se diffuse pas: elle se vend. Cher' ['at GeoWatch information isn't diffused: it is sold. Expensively'] (Ligny, 2006: 57). As the opening EuroSky weather forecast – 'la météo de *votre* region en temps réel!' ['the weather in *your* region real time!'] cheerfully tells us:

Les îles Britanniques font le gros sous l'ouragan de force 12 qui a abordé les côtes il y a un peu plus d'une heure, on compte déjà une trentaine de victimes ... Les Pays-Bas renforcent leurs digues et se préparent tant bien que mal à résister ... Treizième mois de sécheresse en Andalousie, les derniers orangers se meurent ... En Italie, des millions de méduses mutantes s'échouent en ce moment sur les côtes de l'Adriatique, leur venin peut être mortel ... Enfin, si vous circulez dans les Alpes, prenez garde aux glissements de terrain.

[The British Isles are bearing the brunt of the force 12 hurricane that hit the coast a little over an hour ago, there are already thirty victims ... The Low Countries are reinforcing dikes and preparing to resist as best as possible ... In the thirteenth month of drought in Andalusia, the last orange trees are dying ... In Italy, millions of mutated jellyfish are washing up at this moment on the Adriatic coast, their venom perhaps deadly ... Finally, if you are driving in the Alps, be on your guard for landslides.] (Ligny, 2006: 7)

The stark reality behind the glib media bites follows quickly, when the Aflsuidijk, which dams the Zuiderzee, is destroyed in a suicide attack by 'la Divine Légion', an American Christian-fundamentalist cult: 'Les

Pays-Bas plongent dans le chaos, près d'un quart du pays est submergé. Pardessus cet enfer, l'ouragan hurle, cogne et déferle, indifférent au sort des humains' ['The Low Countries plunge into chaos, a quarter of the country submerged. Over this hell, the hurricane screams, beats and spreads, indifferent to the fate of humans'] (Ligny, 2006: 15).

The novel's two main characters are Laurie Prigent, a French SaveOurSelves (SOS) activist, and Rudy Klaas, a former tulip grower, who lost his family in the Dutch floods. Laurie's hacker brother Yann pirates a satellite picture, showing that there is an extensive underground water layer beneath the surface of drought-stricken Burkina Faso, from a GeoWatch EcoSat. But Resourcing, the big American consortium which owns the satellite, claims possession of the newly discovered water layer. Laurie is sent by SOS to transport drilling equipment to Burkina Faso and Rudy is hired as her driver. SOS and the Burkina Faso president, Fatimata Konaté, are thus pitted against GeoWatch, Resourcing's CEO Anthony Fuller, and la Divine Légion, who believe that Fuller's cloned son, Tony Junior, is the new messiah. This opposition between an alliance of European NGO activists with non-Western subaltern peoples, on the one hand, and of American corporate capitalism with American Christian fundamentalism, on the other, allows the first to be constructed as eutopian enclaves within a wider globalised dystopia. So, there is more genuine hope in *Aqua*TM than in *Semences*, which is why we describe this novel, alone of the trilogy, as a critical dystopia. Indeed, in the novel's outcome the Burkinese successfully fend off an American-inspired coup, secure control of their water, commence drilling, and their crops and gardens begin to flourish. It is, in short, an extremely successful instance of negative adaptation. Moreover, both Laurie and Rudy achieve their own personal eutopias: she falls in love with Abou Konaté, Fatima's son, and becomes pregnant by him; he transforms the vengeful bitterness he has felt towards la Divine Légion into a kind of warrior virtue.

Both resolutions are decisively enabled by the protagonists' decisions to opt for non-Western rather than Western ways. For Rudy, this occurs when he joins in an attack by Shawnee Indians on the ranch belonging to Governor John Bournemouth of Kansas, a Resourcing and Divine Légion loyalist: 'les Shawnees vont fourrer leur butin dans le pick-up de Rudy, incendient le ranch, montent sur leurs chevaux nerveux et s'éloignent dans la grande prairie desséchée, en entonnant un très ancien chant de guerre' ['the Shawnees poked their booty into Rudy's pick-up, burnt the ranch, mounted their nervous horses and rode away into the vast parched prairie, singing a very ancient war song'] (Ligny, 2006: 719). For Laurie, it occurs when Hadé Konaté, Abou's grandmother, who leads a traditional West African 'bangré' circle, offers to use their magic to

save her and her unborn child from a life-threatening skin cancer. You have two choices, Hadé tells Laurie:

[S]oit vous retournez en Europe vous faire soigner par la chimiothérapie et la génétique. Ce sera long, coûteux, douloureux, pas certain de marcher, ça laissera forcément des traces, vous ne pourrez sûrement plus jamais vous exposer au soleil et serez peut-être obligée de suivre un traitement toute votre vie.

[[E]ither you return to Europe to receive treatment by chemotherapy and genetics. It will be a long, costly, painful, uncertain journey, necessarily leaving scars, you will probably never expose yourself to the sun again and perhaps will be obliged to undergo treatment for the rest of your life.] (Ligny, 2006: 725–726)

Or, she continues:

En une nuit – cette nuit-là même -, je vous débarrasse de cette maladie ... Cela veut dire que je prendrai la maladie en moi. Cela me coûtera un effort tel que je n’y survivrai sans doute pas. Ou, si je survvis, je serai à mon tour tellement malade que ma vie ne vaudra plus grand-chose.

[In one night – this very night – I’ll rid you of this disease ... It means that I’ll take the sickness into me. It will cost me an effort, since I’ll no doubt not survive. Or, if I do survive, I’ll be in my turn so sick that my life won’t be worth much.] (Ligny, 2006: 726)

The novel concludes with Hadé and Abou overriding Laurie’s objections, Hadé determining to take the cancer into herself, and Abou following behind, carrying his extremely ill but still pregnant wife, ‘tels deux jeunes mariés pénétrant dans la chambre nuptial’ [‘like two newlyweds penetrating the bridal chamber’] (Ligny, 2006: 728). The reader is left in little doubt that that this is a far better choice than ‘la voie de l’Occident’ [‘the way of the West’] (Ligny, 2006: 726). If there is hope in Ligny, then, it lies, not with Western science, as for Robinson, but in traditional native African sorcery and traditional native American warpaths. This kind of ‘primitivism’ seems to be a recurring trope in recent cli-fi, including even some of Robinson’s own, although not in either *2312* or *Aurora*.

David Mitchell is an English novelist currently living in Ireland, who was shortlisted for the Booker Prize in 2001 and again in 2004,

and whose work is often described as 'literary', although it betrays a recurrent tendency towards the fantastic. Even some of his apparently realist novels, *Black Swan Green* (2006) and *The Thousand Autumns of Jacob de Zoet* (2010) for example, have been retrospectively 'fantasised', as it were, by way of the incorporation of their characters into subsequent fantastic fictions. Mitchell himself advertised *The Bone Clocks* as a climate novel, but we need to note its complex mix of elements drawn from both fantasy and SF, a combination also deployed in the earlier *Cloud Atlas* (2004). In both novels, the more specifically science-fictional elements are those most clearly implicated in cli-fi. In both, a series of comparatively self-contained individual chapters, each of which might well be read as a discrete short story, are held together by an overarching fantasy narrative. In *Cloud Atlas* that narrative is essentially one of reincarnation, in *The Bone Clocks* it is a thoroughly fantastic struggle for immortality waged between the 'Horologists', who can naturally reincarnate, and their enemies, the 'Anchorites', who prolong their own lives through the quasi-cannibalistic ritual killing of children. This novel is structured into six chapters, loosely connected by the presence of a character named Holly Sykes, whom we meet in the first chapter set in 1984, as a 15-year-old running away from her home in Gravesend, and in the last set in 2043, as a mature woman living on the west coast of Ireland in a world beset by environmental collapse, preoccupied with how to protect her granddaughter Lorelei and the child refugee Rafiq.

This sixth chapter, which is in part a reworking of the short story 'The Siphoners', originally published in the cli-fi anthology *I'm With the Bears* (2011), is clearly the novel's most distinctly science-fictional component, and it is indeed mainly a matter of negative adaptation. Mitchell's early to mid twenty-first century is beset by the effects of anthropogenic climate change: 'Earth's population is eight billion, mass extinctions of flora and fauna are commonplace, climate change is foreclosing the Holocene Era' (Mitchell, 2014: 476–477). And all this is compounded by a series of dystopian 'catastrophes': radiation leakages from Hinkley Point nuclear power station (Mitchell, 2014: 527, 535); a permanent oil shortage (Mitchell, 2014: 476), so that everyone uses diesel; politico-economic subordination through the 'Chinese Concession' outside Cork (Mitchell, 2014: 527) and the Pearl Occident Company, or POC (Mitchell, 2014: 549); the collapse of the internet in the 'Netcrash' of 2039 (Mitchell, 2014: 532); and of the Irish state into 'the Pale', or Dublin manufacturing zone (Mitchell, 2014: 526), and 'the Cordon Zone' (Mitchell, 2014: 541) around the Chinese Concession, both run by 'Stability'; and effectively lawless areas elsewhere run by 'militiamen' and terrorised by

'Jackdaws' (Mitchell, 2014: 570). In short, this is 'the Endarkenment' (Mitchell, 2014: 533).

Holly's daughter, Aoife, and her Icelandic husband, Órvar Benediktsson, have been killed in an air crash caused by the 2038 'Gigastorm' (Mitchell, 2014: 523), leaving her to bring up their daughter Lorelei. Subsequently, Holly has adopted Rafiq, a probably Moroccan 'Asylumist', apparently the sole survivor of a shipwreck off the Cork coast. Holly is surely ventriloquising Mitchell himself when, reflecting back on the years since Aoife's death, she declares:

It's not just that I can't hold Aoife again, it's everything: it's grief for the regions we deadlanded, the ice caps we melted, the Gulf Stream we redirected, the rivers we drained, the coasts we flooded, the lakes we choked with crap, the seas we killed, the species we drove to extinction, the pollinators we wiped out, the oil we squandered, the drugs we rendered impotent, the comforting liars we voted into office – all so we didn't have to change our cosy lifestyles. People talk about the Endarkenment ... as if it's an act of God. But we summoned it, with every tank of oil we burnt our way through. (Mitchell, 2014: 533)

When the POC pulls out of Ireland for reasons of 'profitability' (Mitchell, 2014: 565), law and order collapse into civil strife, and Holly begins to fear for the children's safety. Government troops, militiamen and Jackdaws invade the town of Sheep's Head, fighting over its oil and solar panels, including Holly's own. When her friend, Mo, asks the militia leader, Hood, 'Would you treat *your* elderly relatives like this?', he replies: 'They had a better life than I did, mind. So did you. Your power stations, your cars, your creature comforts. Well, you lived too long. The bill's due. Today, ... you start to pay. Think of us as the bailiffs' (Mitchell, 2014: 571).

Thus far, the story is merely one of accumulating hopelessness. But here the fantasy frame narrative takes over. Dr Marinus, a leading horologist, who in chapter five set in 2025 had involved Holly in a decisive attack on the Anchorites' Chapel of the Blind Cathar, and who is himself a reincarnation of the Dr Marinus in *The Thousand Autumns of Jacob de Zoet*, has now been reincarnated as Harry Veracruz, adviser to the Icelandic president. Veracruz/Marinus arrives off the coast of Ireland aboard the Icelandic warship *IGGV Sjálfstæði* to rescue Lorelei, who is an Icelandic citizen by birth. Holly asks Marinus to take Rafiq, who is diabetic and running out of insulin, along with Lorelei. Marinus then uses his horologist's mind control powers to persuade the Icelandic

marines to take both children, but Holly is left behind to say goodbye in the full knowledge that she will never see them again. In the novel's closing lines, she watches the *Sjálfstæði* disappear: 'Incoming waves erase all traces of the vanishing boat, and I'm feeling erased myself, fading away into an invisible woman. For one voyage to begin, another voyage must come to an end, sort of' (Mitchell, 2014: 595).

If Iceland, and perhaps also Holly's extended family and friends, provide the novel with its eutopian enclaves, then the horologists provide it with a eutopian community. *The Bone Clocks* is thus doubly a critical rather than classical dystopia. The reader is nonetheless inevitably conscious of how fantastically contrived much of its final resolution necessarily remains. Iceland might well turn out to be a peculiarly isolated and protected refuge from the approaching real-world climate crisis; but if the only chances of escaping to it depend on the goodwill of reincarnated immortals, then one might be wise to discount them.

4. Positive Adaptation

As examples of the positive adaptation critical dystopia, we take three North American novels, the first two volumes of Atwood's *MaddAddam* trilogy, *Oryx and Crake* (2003) and *The Year of the Flood* (2009), and Claire Vaye Watkins's *Gold Fame Citrus* (2015). As we noted in Chapter 3, Atwood's SF is as much North American as Canadian and the trilogy's primary novum is genetic engineering rather than climate change, although anthropogenic warming nonetheless provides its primary mise en scène. *Oryx and Crake* and *The Year of the Flood* are parallel texts, both dealing with a bioengineered plague that nearly destroys the human race, both recounting the movement towards that catastrophe by way of extensive flashbacks, both culminating at the same point in time and space. Despite its slightly misleading title, *Oryx and Crake* is focussed on the relationship between two men, Jimmy, who survives the pandemic to become Snowman, and Glenn, or Crake, who bioengineered it, both of whom have been involved in a love triangle with the Asian girl Oryx. Crake designs the libido enhancing 'BlyssPluss' super-pill, which, he admits to Jimmy, will have sterility as a planned side effect:

It's not altruism exactly ... More like sink or swim ... As a species we're in deep trouble, worse than anyone's saying ... take it from me, we're running out of space-time. Demand for resources has exceeded supply for decades in marginal geopolitical areas, hence the famines and droughts; but very soon, demand is going to exceed

supply for everyone. With the BlyssPlus Pill the human race will have a better chance of swimming. (Atwood, 2004: 347)

But Crake conceals from Jimmy the fact that the pill will also carry the fatal 'JUVE virus', which he intends to wipe out homo sapiens, so as to make room for his bioengineered posthuman 'Crakers', peaceful, herbivorous creatures, immune to mosquito bites, who are occasionally sexually polyandrous, but normally sexually latent. By contrast, *The Year of the Flood* focusses on the relationship between two women, Toby, a leading member of the God's Gardeners environmentalist religious sect, and Ren, a onetime child Gardener. Both survive the catastrophe, Toby because she has barricaded herself inside the luxury spa where she has been working, Ren because she is locked into a bio-containment unit in the *Scales and Tails* brothel where she performs as a trapeze artist and hooker.

Every major social institution depicted in the two novels has been privatised and corporatised and is thus bent on some kind of positive adaptation: the OrganInc and HelthWyzer corporations, for which Jimmy's father had worked as a 'genographer'; the RejoovenEsence corporation, which hires Crake and enables his work on the Crakers and on BlyssPlus; CorpSeCorps, the private security force that polices the various corporate 'compounds'; SeksMart, the legal brothel corporation; the SecretBurgers hamburger chain, whose secret is the source of its meat; and so on. The world the corporations have made, it is clear, is one already threatened by extreme climate change. So, Jimmy remembers his mother 'rambling on' about their beach house 'that got washed away with the rest of the beaches and quite a few of the eastern coastal cities when the sea-level rose so quickly' (Atwood, 2004: 71); and Crake turns up at HelthWyzer High 'in September or October, one of those months that used to be called *autumn*' (Atwood, 2004: 81); so, Jimmy and Crake graduate in February, rather than in June, because 'June was now the wet season all the way up the east coast, and you couldn't have held an outdoor event then, what with the thunderstorms' (Atwood, 2004: 203); and Amanda, a onetime girlfriend of Jimmy's originally from Texas, claims 'to be able to remember the place before it dried up and blew away' (Atwood, 2004: 286–287); so, Jimmy dejectedly watches the news, 'more plagues, more famines, more floods, more insect or microbe or small-mammal outbreaks, more droughts' (Atwood, 2004: 298); and Amanda tells Ren about how in the Texan droughts 'their trailer was demolished in one of the hurricanes ... A lot of people drowned, but she and her mother held on to a tree' (Atwood, 2009: 100); so, Adam One, the Gardeners' leader, points in his sermons to 'the southern shores

of the Mediterranean – once fruitful farmland, now a desert’ (Atwood, 2009: 109) and, later, to ‘the Sea Creatures in their present peril and great suffering; which has come to them through the warming of the Sea’ (Atwood, 2009: 235); and Ren remembers ‘a line of deserted high-rises standing in the offshore water ... It was dry land out there before the sea levels rose so much, and all the hurricanes’ (Atwood, 2009: 495).

The dystopia becomes critical, in Moylan’s sense, at the point where corporate would-be positive adaptation is challenged by the God’s Gardeners, at once both a eutopian religious community and, quite literally, a eutopian enclave, at the EdenCliff Rooftop Garden in Sewage Lagoon, a ‘pleebland’ once known as Willow Acres. The Gardeners, whose longstanding members are named either Adam or Eve – as in Adam One, Adam Two, Eve One, Eve Two, and so on – according to their gender, combine Biblical and ecological beliefs and practices. Their collective life is organised around an elaborate calendar of saint’s days, from Saint Dian Fossey and Saint James Lovelock to Saint Rachel Carson, but also Saint Francis of Assisi, Jesus of Nazareth and Saint Jerome. They are strictly vegetarian and believe in honouring and preserving all plant and animal life. Their theology also prophesies ‘The Waterless Flood’ that will eventually destroy the human species. *The Year of the Flood* is simultaneously both sympathetic to, and critical of, the Gardeners. So, the reader is clearly meant to agree with much of Adam One’s Year Five Creation Day sermon, addressed to ‘Friends, Fellow Creatures and Fellow Mammals’: ‘By covering such barren rooftops with greenery we are doing our small part in the redemption of God’s creation from the decay and sterility that lies all around us, and feeding ourselves with unpolluted food into the bargain’ (Atwood, 2009: 13). As also with the conclusion to his Year Ten sermon on the Feast of Adam and all Primates: ‘Ours is a fall into greed: why do we think that everything on Earth belongs to us, while in reality we belong to Everything? We have betrayed the trust of Animals, and defiled our sacred task of stewardship’ (Atwood, 2009: 63). But the sect is clearly more patriarchally hierarchical than it readily admits; its science belies its religion and its religion belies its science; much of its liturgy and hymns – which are reproduced in great detail – is risible; and, perhaps most important of all, it is destroyed by the Flood, along with the corporations and their CorpSeCorps. This is what makes the first two volumes in the trilogy a dystopia, no matter how critical, rather than a eutopia. But *MaddAddam* is an altogether different matter, as we shall see in the chapter that follows.

Gold Fame Citrus is Claire Vaye Watkins’s first novel. She had previously published short stories that acquired a certain ‘literary’ reputation and also taught in various university creative writing programmes. Watkins

was brought up in the Mojave Desert, an experience that clearly informs the novel's depictions of a radically desertified California. Her father Paul Watkins was famously a member of the Charles Manson 'Family' and second-hand accounts of this experience equally clearly inform its depictions of the 'prophet' Levi Zabriskie and the sand dune colony he leads. Anthropogenic global warming provides the novel with its primary *mise en scène*:

[T]he Central Valley, America's fertile crescent, went salt flat, ... its farmcorps regularly drilled three thousand feet into the unyielding earth, praying for aquifer but delivered only hot brine, ... a major tendril of interstate collapsed into a mile-wide sinkhole, killing everybody on it, ... all of the Southwest went moonscape with sinkage, ... the winds came and ... Phoenix burned and ... a white-hot superdune entombed Las Vegas. (Watkins, 2016: 20–21)

Its primary *novum*, however, is the superdune, a vast dune sea known as the Amargosa, 'sand, a dead swath of it blown off the Central Valley and the Great Plains' (Watkins, 2016: 72), located between Los Angeles and Las Vegas, steadily expanding, and named after the first mountain range it swallowed. Most people have long since been evacuated from California, relocated into what are in effect labour camps, leaving behind a hardcore of countercultural intransigents. But as the climate crisis deteriorates, even that option becomes less available to the remaining Californians, or 'Mojavs' as they are derogatorily known: 'There's militia at the Oregon border ... Washington State had stopped accepting Mojav relocation applications' (Watkins, 2016: 56). There are clear parallels here with Bacigalupi's *The Water Knife*, subject to the obvious reversal that his powerful Calis have become Watkins's powerless Mojavs.

The novel's two main characters are Luz Dunn, a former model and native Californian, who turned down a government 'evac', and Ray Hollis, originally from Indiana and a veteran of the 'forever war' (Watkins, 2016: 6), long AWOL from the military. As the novel opens, Luz and Ray are lovers squatting in the abandoned mansion of a Los Angeles starlet. Casually acquiring a lost two-year-old child whom they name 'Ig', they determine to leave California and seek help to do so from Ray's friend Lonnie, who outlines the obstacles in the way of conventional escape routes. But there is an alternative, he explains: 'I'd go to the Armagosa ... There *is* a town out there ... run by a prophet. Very spiritual place. Very primal ... This prophet ... is descended from a long line of dowsers. Incredibly gifted. He finds the water' (Watkins, 2016: 72). The prophet is Levi, who does indeed run a town, or colony,

on the edge of the Armagosa, but, as Ray eventually learns, or at least alleges, he is not so much a dowser as a criminal, who 'hijacks aid convoys. I saw photos of the aid convoys on fire. That's where he gets the water' (Watkins, 2016: 287). The portrait of Levi, always charismatic, occasionally ridiculous, by turns deeply attractive and deeply repulsive, is by far the novel's most powerful feature. Watkins vividly depicts her character's capacity to make his followers believe the unbelievable: 'His words had a way of making the complicated comforting, making the listeners' abundant fears instead evidence of sensitivity and keenness ... He ... transformed the colony from a place of isolation and hardship to a place of beauty and abundant blessings' (Watkins, 2016: 184).

Levi's vision of the dune sea teeming with life is utterly implausible, most especially so in the transparently ridiculous pages of his *NEO-FAUNA of the AMARGOSA DUNE SEA a primer* (Watkins, 2016: 193–200). But his indictment of establishment America nonetheless rings true and is borne out, moreover, by other 'evidence' in the novel, not least by Ray's own experience of 'Limbo Mine', or 'Impermanent Retention Facility Nine': 'you fucked half the country, killed rivers, depleted millennia of aquifer, fed arsenic to children and lied about it, forced citizens once again into internment camps, let people die in holding pens' (Watkins, 2016: 228–229). Levi's belief that the nuclear industry plans to nuke the Armagosa, so as to blast it to glass and use it as a nuclear waste storage facility, might well be paranoid. But, then again, it might not. Either way, his objections to the industry ring true: 'We should be spending money on technology to neutralize the waste – industry should have to fund that research. They should have been doing that from the beginning instead of ditching the shit in storage pools and saying it's everyone's problem' (Watkins, 2016: 209). Yet he is possibly a murderer and certainly a sexual predator, with a 'frank and elegant' erection (Watkins, 2016: 205), who deliberately gets Luz hooked on narcotic 'root', and eventually steals Ig from her.

If there is any truth at all in Levi's allegations against the nuclear industry, of which we know him to be a former employee (Watkins, 2016: 140), then the industry is obviously engaged in quite spectacular positive adaptation. And Levi's colony – and, indeed, the whole Californian counterculture, of which it is representative – is both a eutopian community and a eutopian enclave, within the unfolding climate catastrophe. But, then, the colony itself is also a kind of positive adaptation, an opportunity for advantage, certainly for Levi and Nico, perhaps also for others. And Ray and Luz represent a challenge to it, 'contaminants among us', as Levi describes them (Watkins, 2016: 322). This complicated set of relations is an important part of what makes

Gold Fame Citrus a critical, rather than classical, dystopia. The novel also exhibits a further feature of Moylan's critical dystopias, that is that they reflect upon their relations with socio-political reality through their internal accounts of textual interventions. This is clearly the case with Watkins, most obviously perhaps through the rival and contradictory accounts of Levi given by Lonnie, Luz, Dallas, Ray, the *On the Lam* TV show (Watkins, 2016: 283–284) and an anonymous psychiatrist (Watkins, 2016: 323–326). We do not know what the truth is, but we do know from various intratextual sources – not only Levi himself, but also Lonnie, Ray and his cellmate Sal in *Limbo Mine* – that it is always connected to structures of power. This is not quite the 'militant' eutopianism of Moylan's critical dystopias (Moylan, 2000: 199), but rather something much more evasively 'postmodern'. Nonetheless, there is room in the novel even for militancy. Witness Lonnie's diagnosis of the climate crisis: 'In fact there was no water crisis ... What they called drought was merely the mechanism of a long overdue social contraction. A little agony was just what this place needed ... Slough off the bourgeoisie!! Euthanize the comfort culture!' (Watkins, 2016: 77).

In so far as Watkins makes her readers aware of the imbrication of truth in power, aware of the anthropogenic origins of extreme climate change, aware of the possibility – and stupidity – of militant eutopianism, then her text is indeed semi-critical. But it invariably sidesteps these various insights in the direction of something that is nearly, but not quite, postmodern relativism. Hence, the strangely meaningless ending in which the drought is broken and Luz accidentally drowns, a meaninglessness that has been busily worked towards by way of a repeated stress on the fact that she cannot swim: "I'm okay," Luz shouted back over the miraculous roar of water, all those prayers answered late. "I'd be okay," she revised, smiling before she slipped forever under, "if I could just get my feet under me" (Watkins, 2016: 339).

5. Gaia

As examples of the Gaian critical dystopia, we take Brian Aldiss's *Helliconia* trilogy, comprising *Helliconia Spring* (1982), *Helliconia Summer* (1983) and *Helliconia Winter* (1985) from the system's core, and Frank Schätzing's more recent *Der Schwarm* (2004) from its semi-periphery. As we noted in passing in Chapter 1, the *Helliconia* trilogy can be considered an early example of cli-fi, except that it deals with climate change on the planet of Helliconia, rather than on Earth, the causes of which are the Helliconian equivalent of geogenic rather than anthropogenic.

There are, of course, many examples in SF of geogenic and xenogenic extra-terrestrial climate change, Octavia Butler's *Xenogenesis* trilogy (1987–89), for example, or Karen Traviss's *Wess'har Wars* series (2004–8) and N.K. Jemisin's Hugo Award winning *Broken Earth* trilogy (2015–17). But these are not cli-fi, in our sense, precisely because the climate change either is not anthropogenic or does not take place on Earth. The *Helliconia* trilogy remains relevant to our study, however, in so far as it establishes direct parallels between life on Helliconia and on Earth, especially with respect to the guiding spirits of the two planets, respectively the Original Beholder and Gaia.

Aldiss was, along with J.G. Ballard and Michael Moorcock, one of the three key figures in British 'New Wave' SF. He was an immensely prolific SF writer and editor as well as a historian of the genre, vice-president of the international H.G. Wells Society, a Science Fiction Writers of America Grand Master, the winner of two Hugo Awards, one Nebula Award, and one John W. Campbell Memorial Award (for *Helliconia Spring*) and, like Winterson, a recipient of the OBE for services to literature. Unlike Winterson, he seems to have had no doubt that his fiction was SF. Aldiss's *Helliconia* is located about 1,000 light years from Earth in a binary star system, orbiting Batalix, a sun much like Earth's, every 480 days (the 'small year'), while Batalix itself orbits Freyr, a much hotter sun, very elliptically every 1,825 small years (the 'Great Year'). Great Year seasons therefore vary from ice age like conditions in winter to extreme heat in summer. The planet is home to two intelligent species, native humans and the horned and befurred minotaur-like 'phagors', especially well-suited to cold conditions, who were the original dominant species when the planet orbited only Batalix. But after Batalix was captured by Freyr's gravitational field, intelligent humans evolved from various species of native semi-humans. These full humans become increasingly dominant as each Great Year proceeds from spring to summer. The central subject matter of the trilogy's Helliconian narrative is thus the struggle for dominance between humans and phagors. But the outcomes in this struggle are ultimately determined by the climate change produced by the Great Year, which is thus the primary novum, at least in the first two volumes. All of this is observed in great detail from the giant Earth Observation Station, Avernus, which is in orbit around Helliconia transmitting comprehensive data back to Earth.

In *Helliconia Spring*, both the phagors and the Helliconian humans believe in an 'Original Boulder', much more fundamental than any particular gods, which sustains all life on the planet. In the later volumes, this Original Boulder becomes the 'Original Beholder', who, it

is clear, is the Helliconian counterpart to Earth's Gaia. This cosmology is explained in detail in *Helliconia Winter*, where Aldiss describes the Original Beholder as Gaia's 'lusty sister' (Aldiss, 1985: 182). In this third volume, moreover, the Original Beholder and Gaia themselves become primary nova, thus transforming the novel into a kind of 'deep ecology' SF, where humans, phagors and indeed all life is predicated upon the ruling planetary spirits. This shift from the second to third volume is occasioned, not on Helliconia, but on Earth, where in 4901 AD, one megacorporation, 'Co-System Assemblage', or COSA, owns 'the hide of every human on the planet'. Capitalism has reached its apogee, Aldiss continues: 'It made a small percentage on every lungful of oxygen breathed. And it paid out its stockholders in carbon dioxide' (Aldiss, 1985: 101–102).¹ As a direct result, nuclear war breaks out between Earth and its colonies on Mars, Venus, Mercury and the moons of Jupiter, the final effect of which is a 'nuclear winter' on Earth itself. 'Helliconia was celebrated for its long winters', Aldiss writes: 'But those winters were of natural occurrence: not nature's death, but its sleep, from which the planet would reliably rouse itself. The nuclear winter held no promise of spring' (Aldiss, 1985: 102–103). On Helliconia, these natural homeostatic equilibria had been maintained by the Original Beholder, on Earth by Gaia: '[T]he Earth mother in whom all living things, from sequoias to algae, whales to viruses, had their being. Only mankind had grown up and forgotten Gaia ... In committing genocide, it almost slew Gaia. She was slow to recover' (Aldiss, 1985: 136).

But recover she does, primarily because 'races' of people marginalised by the old order, those who had once been poor, now come forward to inherit the Earth. So: 'The world awoke again. Gaia forgave them' (Aldiss, 1985: 137). And by 6700 AD Gaia is convalescent. These new Terrans, or 'terrestrials' in Aldiss's phrase, resume their ancestors' fascination with Helliconia, realise that Helliconian humans are more estranged than phagors from the Original Beholder, and determine to rectify this situation by beaming empathy to Helliconia. In so doing: 'The terrestrials ... were acting as a focus of consciousness for the whole biosphere. The empathic link was not a weak thing. It was a psychic equivalent of magnetism or gravity; it bound the two planets. A more startling way of putting it would be to say that Gaia communicated directly with ... the Original Beholder' (Aldiss, 1985: 181–182).

It must be obvious that the *Helliconia* trilogy is profoundly and deliberately Gaian in conception. As Jack Voller observed only a few years after its completion, the Romantic potential of Lovelock's science

¹ Throughout the trilogy, the Helliconia narrative is written in plain type, the Avernus and Earth narratives in italics.

is ‘most fully realized in the *Helliconia* novels’ (Voller, 1989: 151). The trilogy is dystopian in all its major aspects: the Helliconian Great Year leads humans and phagors alike into a series of catastrophes; Earth is very nearly destroyed by nuclear war; and the Avernians, cut adrift from their home planet, degenerate into perversity and insanity. But the dystopia is also critical in so far as those who best hear the voices of the Original Beholder and Gaia – the phagors on Helliconia, the poor who ‘lived on islands or in wildernesses, at the tops of mountains or on untamed rivers, in jungles and swamps’ on Earth (Aldiss, 1985: 137) – constitute proto-eutopian enclaves and communities. The latter is an early instance of the ‘primitivist’ trope we observed at work in Ligny’s *Aqua*TM. On Earth itself this leads ultimately to a positively eutopian outcome: at the conclusion to *Helliconia Winter*, the eutopians who inhabit the Earth of 7583 AD are, like so many eutopians before them, a little smug and condescending, especially in their attitude towards Earth’s past and Helliconia’s present; but they are moving ‘into a new phase of being where the magic of individual experience was to be shared, not stored; awarded, not hoarded’ (Aldiss, 1985: 279).

As we noted in Chapter 2, the Yrr in Schätzing’s *Der Schwarm* are the ocean become conscious of itself, which might not be exactly what Lovelock meant by Gaia, but nonetheless comes close: the ocean does cover over 70 per cent of the Earth’s surface. The Yrr are certainly much more than merely a second intelligent species, like Aldiss’s phagors, although this is how Schätzing and his main protagonist, Sigur Johanson, initially introduce them (Schätzing, 2005: 572). But, as Johanson himself later explains:

Bei ihnen ist jede geistige Leistung kollektiv und in den Genen verankert. Sie leben in allen Zeiten zugleich. Menschen hingegen verkennen das Vergangene und ignorieren das Kommende. Unsere gesamte Existenz ist fixiert auf den Einzelnen und dessen Hier und Jetzt.

[For the yrr every thought process is collective and embedded in the genes. They inhabit every era simultaneously. Humans don’t have a clear view of the past and they don’t pay attention to the future. Our whole existence centres on the individual, the here and now.] (Schätzing, 2005: 858; Schätzing, 2007: 756)

When the novel opens, the planet’s seas are already in serious trouble. As the molecular biologist, Bernard Roche, explains: ‘Giftattacken auf Meerestiere, neuartige Korallenkrankheiten, infizierte Seegraswiesen’

[‘Toxins were killing marine life, coral was succumbing to new forms of disease, and beds of algae had become infected’] (Schätzing, 2005: 234; Schätzing, 2007: 194). And the driving force behind this, it is clear, is corporate capitalism, most especially the petro-chemical industries. ‘Die Konzerne sind die neuen Auftraggeber der Forschung’ [‘Research is in the hands of big business’], Gerhard Bohrmann – a real person, a Bremen geologist who actually advised Schätzing on the novel – tells Johanson: ‘Die industrie bezahlt die Forscher, nachdem der Staat es nicht mehr kann’ [‘The state can’t pay for science, so the money comes from industry’] (Schätzing, 2005: 256; Schätzing, 2007: 213).

Matters deteriorate further when a series of ‘anomalies’ are observed in different locations around the world: Johanson himself is commissioned to analyse a previously unknown species of marine worm in the North Sea, which he eventually realises is destabilising the methane clathrate in the continental shelf; Leon Anawak, a Canadian marine scientist employed by a whale watching company off Vancouver Island, investigates attacks on shipping made both by whales and by sea-borne mussels, which incapacitate their rudders; in Australia and South Africa swimmers are attacked by sharks and jellyfish; and France suffers from an epidemic of lobsters contaminated by a new species of lethal *Pfiesteria*. An international scientific task force is set up to investigate these anomalous phenomena, located originally at Whistler and later on board the *USS Independence*, and including both Johanson and Anawak among its researchers. As *Pfiesteria*-infested crabs attack New York, Washington and Boston, and the Gulf Stream comes to a stop, Johanson hypothesises that these might all be intentional attacks by an intelligent oceanic species he names the Yrr. Johanson is clearly a version of the scientist-hero long familiar to generations of SF readers. Anawak is a rather different matter, since he is not only a scientist, but also an Inuit with active connections to his tribal people. In British Columbia, George Frank, a Nootka Indian chief, tells him that: ‘[E]s ist der Kerngedanke fast aller indianischen Kulturen ... Alles ist eins. Was mit dem Fluss passiert, passiert mit den Menschen, den Tieren, dem Meer’ [‘[I]t’s the central teaching of just about all Indian culture ... “Everything is one”. If anything happens to the river, it affects humans, animals and the sea’] (Schätzing, 2005: 309; Schätzing, 2007: 259).

Anawak later visits his family in Nunavut, where he discusses the problem with his uncle, Akesuk, an Inuit shaman, who advises him that:

[D]ieses Problem könnt ihr nicht mit Wissenschaft lösen, Junge. Ein schamane würde dir sagen, dass ihr es mit Geistern zu tun bekommen habt, den Geistern der belebten Welt, die in den Wesen

wandern. Die Quallunaat haben begonnen, das Leben zu vernichten. Sie haben die Geister gegen sich aufgebracht, die Meereshöttin Sedna. Wer immer deine Wesen im Meer sind, ihr werdet nichts erreichen, wenn ihr versucht, gegen sie vorzugehen ... Sie sind Teil derselben Welt, wie deine Hände und Füße Teile desselben Körpers sind. Lernt, sie zu verstehen, anstatt sie zu bekämpfen.

[[T]his isn't a problem you can solve with science. A shaman would tell you that you're dealing with spirits, the spirits of the once-living that now inhabit the Earth's creatures. The qallunaat started destroying life. They angered the spirits, the spirit of the sea, Sedna. No matter what these beings are, you won't achieve anything by trying to fight them ... They're part of our world, just as your hands and feet are part of your body ... Learn to understand them instead of fighting them.] (Schätzing, 2005: 639; Schätzing, 2007: 551)

The scientist as shaman's nephew provides an interesting twist on the kind of cli-fi primitivism we have already observed elsewhere. The novel is thus organised around a structural contradiction between the global military-industrial complexes on the one hand, and a combination of native peoples and scientists on the other, with the latter functioning as the kind of eutopian communities that make the dystopia critical rather than classical.

But the eventual plot resolution lies in the hands of the Yrr, who respond positively to the Yrr natural pheromone released into the ocean by British journalist Karen Weaver shortly after the sinking of the *Independence*. A year later, in the novel's epilogue, another of the scientists, Samantha Crowe, a SETI researcher loosely based on the real Jill Tarter, reflects that:

Einmal sind wir zu weit gegangen, und das Netz hat beschlossen, sich unserer zu entledigen. Einstweilen herrscht Waffenruhe. Zu welchen Schlüssen die Yrr auch gelangen mögen, wir täten gut daran, ihnen die Entscheidung so leicht wie möglich zu machen.

[Humanity has overstepped the mark once already, and was almost excluded from the web of life. For the moment there's a truce. Whatever conclusions the yrr may be coming to, we'd do well to make their decision as straightforward as possible.] (Schätzing, 2005: 987; Schätzing, 2007: 880)

We have been treating Aldiss's Gaia and Original Beholder and Schätzing's the Yrr as equivalents to or substitutes for Lovelock's Gaia and, in many respects, so they are. But the Lovelockian Gaia is nonetheless a much less sentimental creature than these, since she will react to restore planetary equilibrium, just as they do, but without any particular concern for humanity or phagor. In truth, it is highly unlikely that Lovelock's Gaia would have forgiven humanity a nuclear winter; certainly, no such consideration was accorded the dinosaurs after the Cretaceous–Paleogene extinction event of 60 million years ago, caused by something similar to a nuclear winter, but triggered by a massive asteroid impact. Nor would Lovelock's Gaia be at all likely to declare a 'truce' with humanity. The very eutopianism that makes these novels critical thus also tends to undermine their scientific credibility, despite the fact that Schätzing's *Der Schwarm* is extraordinarily well researched, as evidenced by pages of acknowledgements, including a declared debt to the four real scientists who appear as characters in the novel. The weakness of both is what Voller identified as a strength in Aldiss, its Romanticism. *'But how could anyone be sure that those tutelary biospheric spirits, the Original Beholder and Gaia, had a real existence?'*, Aldiss asks at one point. The answer is at once as startling as it is unconvincing:

There was no objective proof, just as empathy cannot be measured. Microbacterial life has no knowledge of mankind: their umwelts are too disparate. Only intuition can permit mankind to see and hear the footsteps of those geochemical spirits who have managed the life of a functioning whole world as a single organism. (Aldiss, 1985: 218)

Our sixth and final substantive response to climate change was fatalism but here, as with the classical dystopia, we postpone our discussion until Chapter 6.

Chapter 6

The Problem of Fatalism in Dystopian Climate Fiction

Our sixth type of response to climate change is fatalism, which, as we have already observed, presents peculiar problems for the kinds of fiction intended as cautionary tales. In this chapter we explore the logics of fatalism in climate fiction as they variously function in the classical dystopia, the critical dystopia and the time-travel story.

1. Fatalism in the Classical Dystopia

For the classical dystopia our examples will be provided by two British texts, Maggie Gee's *The Flood* (2004) and Jeanette Winterson's *The Stone Gods* (2007), and one Finnish, Antti Tuomainen's *Parantaja* (2010). *The Flood* skilfully chronicles the kinds of social inequality that will tend to occur under climate change, but also makes clear the link between its eponymous flood and the fatalism of its enormous cast of characters, some carried over from her earlier *The White Family* (2002). As Alfred Hickling astutely observed, *The Flood* is 'less a sequence of events than a continuous skein of interrelated moments, all of which could be perceived as happening at once. In narrative terms, this means a great deal of restless skipping about, momentarily alighting on a character or situation and returning to it many pages later' (Hickling, 2004). The sheer scale of her cast allows Gee to represent many diverse demographics – old, young, black, white, rich, poor – in what is clearly a future London now part of the empire of Hesperica. 'The city [where] it was always raining' is tidally vulnerable and prone to recurrent flooding (Gee, 2004: 9). Its precise location in time is intentionally vague, somewhere in 'the twenty-fifth year since the city's docks had been turned into a pleasure zone for international tourists'. But its people are unmistakable analogues of contemporary Londoners, the bearers of a quotidian and distinctly middle-class fatalism:

Headlights queued in rows on the motorways, workers trying to escape the city, their exits slowed by the many detours put into place where roads were flooded. Water on roads, walls, bridges, washed the light into long slurs of colour, peacock-eyed where the traffic lights stared. Trapped motorists listened to their radios; more rains predicted; demonstrations in the south and east, where the populace claimed they were being neglected, their basements left flooded, their drains left blocked. Business as usual. They sighed and switched off. (Gee, 2004: 85)

Like Atwood in *Oryx and Crake*, Gee also depicts a youth culture morbidly fascinated by the spectacle of disaster: 'Nothing much happening this weekend. All the exciting stuff was in other cities. Protests in Varna where a massive new dam was said to be threatening the whole coastline ... Eco-protesters envisaged tidal waves, global disaster, millions drowned' (Gee, 2004: 59).

As the flooding and endless rain take their psychological toll on the citizenry, the government, led by the pseudo-dictator Mr Bliss, attempts to quell unrest by announcing 'The Gala' to celebrate the purported end of the rains. This is, however, merely a distraction from the reality of continued flooding and from the war the Bliss administration is waging against a distant Muslim country. The parallels with the Blair Government's simultaneous indulgence in the Millennium Dome and the second Gulf War are difficult to ignore. Predictably, the poor and the unglamorous are excluded from The Gala and confined to the city's outskirts in 'The Towers', public housing permanently flooded at its base. Here too the parallels with the class divisions of contemporary British reality are unmistakable. So, a street preacher foretelling 'the last days' warns that: 'The rich and decadent would suffer: old women ... painted women; weak women; adulterers, actors, celebrities ... the falsely happy, the vilely lucky, drug-takers, stockbrokers, lying prophets, all those whose sins had brought destruction on the city' (Gee, 2004: 17). Gee's narrative both relies on and wryly plays with the notion of renewal and rebirth central to traditional flood narratives. As the famous painter Ian insists, the impending flood will be 'The end and the beginning of the world' (Gee, 2004: 52).

As the narrative proceeds towards its climax, the sense of unavoidable doom becomes palpable: unprecedented rains are coming and so too is the flood. In the novel's near apocalyptic closing pages, The Gala, Mr Bliss and Hesperica are all swept away: 'they do not end in fire, but water' (Gee, 2004: 333). But this is not quite the end, for immediately thereafter the child protagonists, Zoe and Lola, surface from the flood

and are transported Alice-like into a sunlit round house in Kew Gardens, where the novel's previous characters reappear, each now more empathetic and loving: 'Dreaming themselves, they are as they wish. All that they ever hoped to be ... They pass without seeing us, homing, home, here in the city whose name is time, glimpsed long ago, across the river, the ideal city which was always waiting' (Gee, 2004: 340–341). This is a heaven or paradise rather than a eutopia, a properly supernatural conclusion to what turns out to be a quite literally apocalyptic novel. But the very other-worldliness of this denouement means that it cannot and does not detract from the gloomy fatalism of the preceding narrative.

Winterson is a famously lesbian 'literary' writer, but she is also, like Gee, English by nationality, a professor of creative writing – at the University of Manchester – and recipient of the OBE for services to literature. She herself insisted that *The Stone Gods* was not SF, thereby incurring the wrath of Ursula Le Guin, who complained that 'Winterson is trying to keep her credits as a "literary" writer even as she openly commits genre' and was thus guilty of the 'curious ingratitude of authors who exploit a common fund of imagery while pretending to have nothing to do with the fellow-authors who created it' (Le Guin, 2007: 17). For our purposes, as for Le Guin, this novel is very clearly SF, and equally clearly cli-fi. Its primary novum is not climate change, however, but rather the 'Robo *sapiens*' Spike, a beautiful and highly intelligent female robot capable of lesbian (and straight) sexual love. But the novel's recurring *mise en scène* is nonetheless anthropogenic environmental despoliation and extreme climate change. As Captain Handsome tells Spike, 'a planet that has collapsing ice-caps, encroaching desert, no virgin forest and no eco-species left reads like gutted to me' (Winterson, 2007: 56).

As we have previously observed, classical dystopias are not necessarily simple texts and this is certainly true of *The Stone Gods*. The novel is structured into four chapters, each organised around a love relationship between a Billie and a Spike. In the first, set millions of years ago on planet Orbus, which has been mined and polluted to the point of becoming near uninhabitable, the human Billie Crusoe and the robot Spike are crewmates who become lovers, during an expedition to the recently discovered 'Planet Blue'. This must be the primordial Earth, given that it would be suitable for human habitation were it not already inhabited by dinosaurs. The crew deliberately redirect an asteroid into the planet in order to wipe them out. The plan had been that the effects would last for only months, but the meteor hits the wrong point of impact and triggers an ice age that will last 'years – perhaps decades'

(Winterson, 2007: 75). Most of the crew try to escape, but Spike and Billie stay behind in the ship, then camp out after it loses power. Spike sets up a repeating signal bounced off the Moon, in the hope that when intelligent life reappears it will remember them. Eventually her batteries run down and Billie freezes to death. In the second chapter, set on Easter Island during the eighteenth century, the love relationship is between a young Billy Crusoe, now male, who has been abandoned by Captain Cook, and a Dutch man named Spikkers, whose sailor father had married a native woman. Like Orbus, Easter Island has been brought to the point of environmental collapse, in this case by the worship of the eponymous Stone Gods: 'The island trees and all of this good land were sacrificed to a meaning that has now become meaningless. To build the Stone Gods, the island has been destroyed' (Winterson, 2007: 113). Spikkers falls in love with Billy, but is killed while trying to end the conflict between the two factions that are destroying each other's idols. In the third, set on Earth 'Post-3War', the main narrator is again a Billie, living in a post-world war Three dystopian future Earth that closely resembles Orbus, a Billie who again falls for a newly developed Robo *sapiens* Spike. Once again, the planet is on the point of collapse: '[C]arbon dioxide in the atmosphere rose to 550 parts per million, the ice-caps melted, and Iran launched a nuclear attack on the USA ... The rest, as they say, is history. But this isn't history, this is Post-3War' (Winterson, 2007: 131). In the fourth chapter, set in the same time and place as the third, Billie and Spike escape from Tech City to the nearby ghetto of Wreck City. We learn that before the war Billie had been studying a repeating signal coming from space, which she and Spike now locate using the disused Lovell Telescope. Spike realises that the signal is both very ancient and very technologically sophisticated. As troops from Tech City move in to attack Wreck City, she dates the signal to the time of the dinosaur extinction and shows that it is in fact a line of code for a Robo *sapiens*. Once the message is decoded it becomes apparent that it is from the ship on Planet Blue. In a thoroughly postmodern twist, Billie eventually claims that she wrote *The Stone Gods*, but cannot finish it because she still does not know how it will end. She then leaves Spike, saying they will meet again in 65 million years, and is shot and killed by one of the Tech City soldiers.

There are thus two sets of repeating story arcs in the novel, those telling of the romantic-erotic relationships between Spike/Spykkers and Billie/Billy, and those telling of environmental despoliation and collapse. The first suggests very strongly that the only lasting value is love, the second that human nature dooms human history to repeat the same kinds of disastrous mistake. As Billie comments after she and Spike

leave the ship on Planet Blue: 'What if we really do keep making the same mistakes again and again, never remembering the lessons to learn but never forgetting that it had been different, that there was a pristine place?' (Winterson, 2007: 87). Billy comes to a similar conclusion on Easter Island: 'Mankind, I hazard, wherever found, Civilized or Savage, cannot keep to any purpose for much length of time, except the purpose of destroying himself' (Winterson, 2007: 109). And the novel's own last line is simply: 'Everything is imprinted for ever with what it once was' (Winterson, 2007: 207). So, the human race repeatedly destroys itself and its environments in a circular logic that can only be judged both pessimistic and fatalist. The novel is at its strongest in the satire directed at the Orbus military-industrial complex and in its poignant depictions of the joys of romantic love. But its science is often specious: how plausible is it that a civilisation as scientifically advanced as that of Orbus would leave behind no visible remains other than a single repeating signal from a dying lesbian robot? And Captain Handsome's notion that life moves from planet to planet, destroying each in turn as it proceeds (Winterson, 2007: 56), is not only scientifically implausible but also desperately pessimistic. This is not so much the Gaian notion that life will somehow survive, as a specifically anti-Gaian notion that somehow it will not. The novel's places – its topoi – are thus all ultimately without social hope, which is why it functions as a classical rather than critical dystopia. Love is its sole positive value, as in many other classical dystopias, but it pertains only to couples rather than to communities: the third term in any possible love triangle, Handsome for example, is written out. There is thus no hope within the text, only the extra-textual hope that the novel might somehow function as a warning. But its targets – environmental destruction, global warming, space exploration, nuclear war, heteronormativity – are so dispersed as to cast doubt on even this limited prospect.

In Chapter 3 we cited Tuomainen's *Parantaja* as an interesting example of an SF/crime hybrid fiction. It is also very obviously in Moylan's terms a classical as distinct from critical dystopia. The novel's protagonist-narrator, Tapani Lehtinen, is a poet living in a near future, climate-ruined Helsinki, whose journalist wife Johanna disappears two days before Christmas, and it tells of his three-day search for her. The city itself is near continuously rain-sodden, its metro and seaside suburbs flooded, its railway station packed with climate refugees from the south. As Tapani wryly observes: 'Ohitin kokonaisia maita ja maanosia, halkaisin kielialueita ja murteita. Helsinki oli vihdoinkin kansainvälinen' ['I passed whole countries and continents, crossed languages and dialects. Helsinki had finally become an international city']

(Tuomainen, 2013a: 208; Tuomainen, 2013b: 198). Tapani discovers that Johanna had been investigating a serial killer who styles himself 'Parantaja' ['the Healer'], a killer who murders business executives and politicians he deems in some way responsible for climate change. DNA evidence suggests that Parantaja is in fact Pasi Tarkiainen, a one-time medical student who supposedly died five years previously in a flu epidemic. Tapani's computer searches reveal that Johanna and Pasi had once lived together and her old friend Elina Kallio explains that she, Johanna and Pasi had all as students been radical environmental activists. The crime narrative follows Tapani in his search for Johanna, for Tarkiainen and the latter's ruthless criminal accomplice Max Väntinen, a search that eventually leads to the railway station where the killers had planned to catch a train north. In the denouement Tapani and police Chief Inspector Harri Jaatinen succeed in rescuing Johanna, but Tarkiainen nonetheless escapes. And in the climactic encounter between Tapani and Pasi, the poet and the killer, the latter insists that: 'Mä olen Tapani hyvän puolella. Ei mulla aikoinaan ollut sen vähäisempää tavoitetta kuin maailman pelastaminen. Nyt kun maailman ei voi pelastaa, pitää huolehtia siitä, että hyvä elää ainakin yhtä pitkään kuin pahuus ja itsekkyyt' ['I'm on the side of good, Tapani. There was a time when I strove for nothing less than saving the world. Now that the world can't be saved, I have to make sure that good continues to live for as long as evil and selfishness'] (Tuomainen, 2013a: 215; Tuomainen, 2013b: 204).

The key phrase here is 'Nyt kun maailman ei voi pelastaa' ['now that the world can't be saved']. For, it is precisely this view of the planet as already inevitably and irreparably damaged, as much the stance of the novel itself as of Tarkiainen in particular, that turns it into a radically fatalistic classical dystopia. So, for example, Tapani ruefully observes of his and Johanna's apartment that: 'Niitä ei ollut aikoinaan suunniteltu jatkuviin myrskytuuliin ja puolen vuoden sadekausiin. Ja siinä vaiheessa kun ymmärrettiin, että tuulet ja sateet olivat tulleet jäädäkseen, oli liian myöhäistä' ['They weren't designed for continuous high winds and rain for half the year, and by the time people realized that the wind and rain were here to stay it was too late'] (Tuomainen, 2013a: 25; Tuomainen, 2013b: 20). So, the house in Kivinokka that Johanna had once shared with Pasi, generating its own energy, entirely recyclable, sustainable and non-polluting, was nonetheless 'parikymmentä vuotta liian myöhään' ['twenty years too late'] because 'oli ympäristö jo muuttunut siinä määrin ettei alueella ja sen edistyskäsellisyydellä ollut mitään merkitystä' ['the environment was already so changed by then that the innovations were meaningless']

(Tuomainen, 2013a: 82; Tuomainen, 2013b: 76). So, Tapani's old flame Professor Laura Vuola, reflecting on the failure of her own youthful activism, observes that 'Paluuta entiseen myötäili arkitasolla hetkelliseen niukkuuteen ja vähempään kulutukseen kyllästyneet kansan halu elää kuten ennenkin: itsekeskeisesti, ahneesti ja vastuuttomasti – juuri niin kuin oli joskus opetettu' ['The return to the old ways was echoed by the desire of a populace tired of monetary scarcity, of consuming less, to live like they had before: self-absorbed, greedy, and irresponsible – the way they'd always been taught to live'] (Tuomainen, 2013a: 129; Tuomainen, 2013b: 119). So, even the hope that oil supplies might run out had proven illusory: 'Öljy ei ollut vielääkään loppunut, vaikka sitä oli ennustettu jo vuosikymmeniä ... Kun maailma jonain päivänä loppuisi, öljyä olisi säiliölaivoittain ja satamittain; miljardeja tynnyreitä mustaa kultaa otettavaksi mukaan matkalle ikuisuuteen' ['The oil hadn't run out yet, although they'd been predicting it would for decades ... When the world ended one day we would still have tankers full of oil, ports full of it, billions of barrels of black gold, ample fuel for a trip to eternity'] (Tuomainen, 2013a: 134; Tuomainen, 2013b: 124).

There is, nonetheless, evidence of would-be eutopian resistance throughout *Parantaja*. Pasi, Johanna, Elina and Laura have all been involved with environmental activism 'kun tieto ilmastonmuutoksen vakavuudesta tilapäisesti yhdisti ihmisiä ja loi puitteet monille hienoille ja hyvää tarkoittaville yhdistyksille, järjestöille ja puolueille' ['when information about the severity of climate change temporarily united people and laid the framework for many fine and well-meaning organizations, associations, and political parties'] (Tuomainen, 2013a: 129; Tuomainen, 2013b: 119). But this has proven almost entirely futile, leaving only Tarkiainen's bloody search for 'Oikeus' ['Justice'] (Tuomainen, 2013a: 215; Tuomainen, 2013b: 204), by which he means revenge, and which even he admits is too late to change anything. Bereft of social hope, the reader is left with individual sexual love as the only outstanding positive value in *Parantaja*, as it was in *The Stone Gods* and in many other classical dystopias. For Tuomainen's Tapani and Johanna, as for Winterson's Billie and Spike, the one remaining consolation lies in their own romantic-erotic relationship. As Tapani reflects after reading an unrepentant email from Tarkianen the following Good Friday:

Jotakin tapahtuu kun kosketan Johanna. Jokin sydämessä liikahtaa, sanoo, että nä on hyvä.

Ja näin on hyvä. Olen osa sitä ja se on osa minua. Me olemme niin onnellisia kuin kaksi ihmistä voi tässä maailmassa olla. Mitä tahansa tapahtuukin, minä rakastan Johanna.

[Something happens when I touch Johanna. Something in my heart stirs, something says this is right – this is good.

And it is good. I'm part of her, and she's part of me. We're as happy as two people can be in this world. Whatever happens, I will love Johanna.] (Tuomainen, 2013a: 221; Tuomainen, 2013b: 211)

What will happen, we know, is that sooner rather than later the world will end.

These fundamentally pessimistic novels pose the more general theoretical objection often raised against dystopias, that their pessimism kills the hope a warning might need to trigger. As Williams famously observed of Orwell's *Nineteen Eighty-Four*, 'on such a construction the exile could not win, and ... there was no hope at all' (Williams, 1963: 283). It is a judgement echoed by Jameson, when he writes that the force of Orwell's text 'springs from a conviction about human nature itself, whose corruptions and lust for power are inevitable, and not to be remedied by new social measures or programs, nor by heightened consciousness of impending dangers' (Jameson, 2005: 198). We might dissent from this judgement on *Nineteen Eighty-Four*, while nonetheless conceding that something very like it might well apply to *The Flood*, *The Stone Gods* and *Parantaja*. For Jameson this is not the whole story, however, in so far as he, like Moylan, also identifies the critical dystopia as the 'negative cousin' of eutopia by way of Robert Heinlein's 'if this goes on' principle (Heinlein, 1940). It is to the problem of fatalism in these negative cousins of the cli-fi eutopia that we now turn.

2. Fatalism in the Critical Dystopia

Our three examples of fatalism in the critical cli-fi dystopia are each drawn from the periphery of the world SF system, one from Finland, Emmi Itäranta's *Teemestarin kirja* (2012), and two from Australia, Alexis Wright's *The Swan Book* (2013) and James Bradley's *Clade* (2015). Itäranta's *Teemestarin kirja*, literally *The Tea Master's Book*, is her first novel, parts of which were originally written in English as work towards an MA in Creative Writing at the University of Kent. The novel won the Kalevi Jäntti Award for young writers in Finnish in 2012 and was shortlisted for the Tähtivaeltaja Award for best SF book published in Finnish in 2013. It has been translated into English by Itäranta herself and also into Arabic, Czech, Danish, Estonian, French, Georgian, German, Hungarian, Italian, Japanese, Norwegian, Portuguese, Spanish and Turkish. Itäranta's English translation, as

Memory of Water, was also shortlisted for the 2015 Arthur C. Clarke Award for best SF novel published in Britain. Anthropogenic climate change appears initially only to provide the novel with its *mise en scène* of a world in which there is no longer either ice or white winter. Its primary socio-political *novum* is the authoritarian 'Uuden Qianin' ['New Qian'] military dictatorship, which rules an empire that extends from Xinjing to New Piterburg, Mos Qua and Ural, and on to the occupied areas of the Scandinavian Union, where the protagonist and main narrator, Noria Kaitio, lives in a small village a few hours from the city of Kuoloyarvi (today an uninhabited locality in the Russian district of Murmansk). As the narrative proceeds, however, it becomes apparent that the New Qian and its control over water are themselves effects of climate change. The novel is framed by a prologue, in which someone we later learn to be Noria is running out of water and anticipating her own death, and an epilogue, in which Noria's friend Sanja reaches Lian Kaitio, Noria's mother, in Xinjing and tells of how her daughter died. The intervening substantive content is organised into three parts, the first centred on Noria's relationship with her father Mikoa Kaitio, a tea master training her to be his successor; the second centred on her own role as tea master and her friendship with Sanja after Mikoa dies and Lian moves to take up an academic position at the University of Xinjing; the third centred on Noria's house arrest as a water criminal. All but the epilogue are narrated by Noria, the epilogue itself in the third person.

Itäranta's dystopia works at two levels, that of a climate-ruined world short of water and littered with the remains of old-world profligacy, and that of increasingly brutal and brutalising military repression. When Noria and Sanja piece together the history recorded in the old books left by previous tea masters, with the log of the Jansson expedition to the north, conducted during the 'Hämärä vuosisata' ['Twilight Century'] immediately after the collapse of the old world, and recorded on archaic compact discs, they discover the common roots of this double dystopia:

Se oli kertomus tuhosta ja raunioista, valtameristä, jotka kurkottivat kohti mannerten keskustoja ja nielivät maata ja makeaa vettä. Miljoonista ihmisistä, jotka pakenivat kodeistaan, sodista, joita käytiin sulavien jäiden alta paljastuneista polttoaineresursseista, kunnes maan suonet vuotivat kuiviin. Ihmisistä, jotka haavoittivat maailmaansa, kunnes menettivät sen ... Se oli tarina, jonka Uuden Qianin vallanpitäjät olivat yrittäneet hävittää, kuten olivat hävittäneet melkein kaiken muunkin entismaailmasta kertovan.

[It was an account of ruin and devastation, of oceans reaching towards the centres of the continents, swallowing land and fresh water. Millions fleeing their homes, wars fought over fuel resources revealed under the melting ice, until the veins of the earth ran dry. People wounding their world until they lost it. ... It was a story those holding power in New Qian had sought to destroy, just like they had destroyed almost everything else about the past-world.] (Itäranta, 2014: 318–319; Itäranta, 2015: 253–254)

The sources of eutopian resistance are also double, in the first place, the traditional non-Western wisdom of the tea masters, as represented by Noria's father, in the second, the newer knowledges of academic scientists, as represented by her mother and by the Jansson expedition. Both are the product of communities stretching over time and space well beyond these particular individuals. So Mikoa teaches Noria the ancient tea ritual, reveals to her the secret location of the hidden mountain spring, and explains that 'Kaikki maailmassa ei ole ihmisten. Tee ja vesi eivät kuulu teemestareille, vaan teemestarit kuuluvat teelle ja vedelle. Olemme veden vartijoita, mutta ennen kaikkea olemme sen palvelijoita' ['Not everything in the world belongs to people. Tea and water do not belong to tea masters, but tea masters belong to tea and water. We are watchers of water, but first and foremost we are its servants'] (Itäranta, 2014: 116; Itäranta, 2015: 91). And Lian tries to explain how the winters disappeared, observing that 'Useimmat uskovat, että se muuttui itsestään, vaati omakseen sen, minkä aika oli täysi. Mutta paljon tietoa katosi Hämärän vuosisadalla, ja on niitäkin, jotka uskovat, että ihmiset muuttivat mailman, tahtomattaan tai tahallaan' ['Most believe that it changed on its own, simply claimed its due. But a lot of knowledge was lost during the Twilight Century, and there are those who think that people changed the world, unintentionally or on purpose'] (Itäranta, 2014: 53; Itäranta, 2015: 40).

What makes the dystopia critical is the potential that these eutopian hopes might someday be realised. This is what the discovery of the first compact disc in the 'muovihauda' ['plastic grave'] inspires in Noria: '[E]ttei maailma ollut kuiva ja karrella ja kuolemaisillaan, ei kokonaan' [[T]here must be a reason to believe that the world wasn't dry and scorched and dying beyond all repair'] (Itäranta, 2014: 175; Itäranta, 2015: 137). And it is what the seven silver discs inspire in Lian and Sanja in the novel's closing line: 'Tänä aamuna maailma on tomua ja tuhkaa, mutta ei toivosta tyhjä' ['This morning the world is dust and ashes, but not devoid of hope'] (Itäranta, 2014: 330; Itäranta, 2015: 263). These hopes are so far from practical realisation, however, as to render

them utterly ineffectual in the face of a world that cannot in fact be changed. Under house arrest, Noria is confronted by Commander Taro, a renegade tea master now an officer in the New Qian military, who attempts to recruit her as a spy. Noria refuses, in full knowledge that this will lead to her execution, explaining herself thus: 'Uskon, että vaikeita valintoja on tchtävä jokaisena päivänä, siitä huolimatta, että hyvin tietää, ettei mitään palkkioita ole ... Koska jos mitään muuta ei ole kuin tämä, se on ainoa tapa jättää elämästään jälki, jolla on jotain merkitystä' ['I believe we must make hard choices every day despite knowing that there is no reward ... Because if this is all there is, it's the only way to leave a mark of your life that makes any difference'] (Itäranta, 2014: 309–310; Itäranta, 2015: 246). In turn, Noria asks Taro why he continues to hoard power despite knowing it must eventually fade. 'Koska jos mitään muuta ei ole kuin tämä ... Voin yhtä hyvin nauttia siitä niin kauan kuin sitä kestää' ['Because if this is all there is ... I might as well enjoy it while it lasts'] (Itäranta, 2014: 310; Itäranta, 2015: 247) he replies. The key line here, spoken by both Noria and Taro, is 'jos mitään muuta ei ole kuin tämä' ['if this is all there is']. The point, clearly, is that for all practical purposes this is indeed all there is. Hence, the novel's underlying pessimism and attendant socio-political fatalism.

Wright is an indigenous Australian writer from the Waanyi people in the highlands of the Gulf of Carpentaria, whose novel *Carpentaria* (2006) won Australia's leading literary prize, the Miles Franklin Award, as well as the Queensland Premier's Literary Award and the Vance Palmer Prize for Fiction. *The Swan Book* is very obviously cli-fi – Wright's Australia has been ravaged by flood, fire, drought and blizzard – and also science-fictional in so far as it is a future story set in the late twenty-first century. But its narrative strategies, which alternate between interiority and exteriority, the real and the imaginary, the living and the dead, mythology and history, are closer to Latin American magic realism than to the more conventionally realist strategies normally deployed in SF. It is, then, at once an assertively Aboriginal and an assertively 'literary' text. The novel is set among the northern Aboriginal 'swamp people', living around what had once been a lake, now climate-changed into a sand-silted swamp, under the oppressively 'interventionist' policies of the Australian Government, which uses its white army to 'control the will, mind and soul of the Aboriginal people' (Wright, 2013: 47). The protagonist, Oblivia, is a disowned and damaged, mute, gang-raped, indigenous child, who is discovered, after having slept for ten years post-traumatically in the bowels of a eucalyptus tree, by a white woman, Auntie Bella Donna of the Champions, the sole-surviving refugee from the disaster of the European climate change wars. Bella takes her in

and brings her up, teaching her the poetry, stories and songs of Europe. But after Bella's death Oblivia is effectively abducted and forced into marriage to the 'messianic' Warren Finch, who is about to become the country's first indigenous president. Finch locks Oblivia away in an apartment tower somewhere in a flooded 'southern city', which might or might not be Sydney, undergoing thoroughly dystopian moral and environmental collapse. Her only company are the ghosts of Bella, her old nemesis the Harbour Master, and his talking monkey, Rigoletto, that is until she murders Finch, or perhaps does not – the text is deliberately ambiguous – and then escapes from the city.

This rather bald plot summary suffices to suggest the novel's magical-realist qualities, but we need also add that the eponymous swans are themselves a crucial motif throughout: Bella has been brought to Australia by a single white – that is European – swan, a creature she longs for but can never be reunited with; she tells Oblivia stories about the white swans of Europe; black – that is, Australian – swans follow and guide Oblivia at central moments in the story; they fill the wedding hall when she marries Finch; they eventually find her in the southern city, swarming into it in quasi-biblical fashion, their apparent bad health driving her into flight; and they fly above her when she joins a northward-bound refugee march. The point of all this is that indigenous Australians have always known swans to be black, while Europeans have understood them to be an 'evil' aberration from the rational norm ever since their first encounter on the twelfth day of Christmas in 1697 (Wright, 2013: 181–182). If Oblivia's relationship with the swans provides the novel with its primary science-fictional (or science-fantastic) novum, anthropogenically induced extreme climate change is nonetheless its primary science-fictional *mise en scène*:

When the world changed, people were different. Towns closed, cities were boarded up, communities abandoned, their governments collapsed ... Mother Nature? Hah! Who knows how many hearts she could rip out? She never got tired of it. Who knows where on Earth you would find your heart again? People on the road called her the Mother Catastrophe of flood, fire, drought and blizzard. These were the four seasons which she threw around the world whenever she liked.

In every neck of the woods people walked in the imagination of doomsayers and talked the language of extinction. (Wright, 2013: 6)

Throughout the novel, we are repeatedly reminded of how much this world has indeed changed. So, Bella remembers what happened to

people affected by 'years of droughts, high temperature and winds in some countries, or in others, the freezing depths of prolonged winters'; Finch's name is 'saturated in the hot and humid air of climate change'; the swamp people think it cold because the temperature has 'plummeted from 44 to 33.5 degrees Celsius'; Oblivia watches from her tower as 'tidal surges flooded through the sewers into the lower, poorer, and central parts of the city ... when violent hail storms from cyclonic weather struck the coastline'; and Rigoletto has 'seen flooding on seaboard city streets all over the world. It was really just as natural as seeing water flooding in the lanes of Venice, Bangladesh or Pakistan' (Wright, 2013: 25, 123, 126, 239, 284).

There are eutopian enclaves in this disastrously changed world, the poor, the refugees and the swans, but more importantly the indigenous Australians, whose traditional stories and law about their land, or 'Country', and its weather are counterposed to the alienated stories and repressive laws behind the Government's intervention. This is not the kind of 'primitivism' we observed in Ligny, Aldiss and Schätzing, for a number of reasons. First, Wright writes from within Aboriginal culture rather than as a European appropriating and (mis)representing that culture and, as a result, her version of Aboriginality is deeply complex rather than simplistic idealisation. This is especially apparent in the novel's treatments both of the swamp people's denial of Oblivia's existence and of Finch and other indigenous people bent on success in the white world. Second, Wright's distinctively Aboriginal belief in the deep connection between her people, their place and their stories, and of the absence of such connections in the European colonisers, informs the whole narrative. Almost all Australian indigenous cultures make claims to such connections stretching back to what they call the 'Dreamtime'. Interestingly, recent research on Aboriginal mitochondrial DNA strongly supports the truth-value of these stories: modern Aboriginal Australians appear to be descended from one founding population that arrived in the continent about 50,000 years ago; those first people seem to have moved around the west and east coasts, meeting somewhere in southern Australia only 2,000 years later; thereafter, in a demographic pattern quite different from those in Eurasia, populations seem to have remained in much the same specific areas right up until the European invasions in the eighteenth and nineteenth centuries (Tobler et al., 2017). Third, and, perhaps most importantly for non-Aboriginal readers, the novel's deeply dystopian sense of what Europeans have already done to the Australian continent and its peoples becomes an anticipation of what they are now able to do to the world: '[T]he day had come when modern man had become the new face of God, and simply sacrificed the whole Earth'

(Wright, 2013: 12). As Tony Birch, an indigenous Australian writer and critic, has observed, Aboriginal peoples have been experiencing continuously catastrophic anthropogenic – or, at least, Anglogenic (our joke, not his) – climate change ever since the British first arrived in 1770 (Birch, 2015).

The Swan Book is a fatalistic text nonetheless, despite its anger, wit and charm, quite simply because the ruination of Oblivia and her swans, the swamp people, Australia, and the world, continues inexorably, in much the same way as had the British conquest itself. As the book tells us early on: ‘The swamp people ... were yelling and screaming, *Weren’t we supposed to be the traditional owners?* ... An Army general put in charge from the Government said they were the traditional owners of a convenient dumping ground for unwanted people’ (Wright, 2013: 50). And at its close: ‘You can see swans sometimes, but not around this place. It is a bit too hot and dry here ... Maybe *Bujimala*, the Rainbow Serpent, will start bringing in those cyclones and funnelling sand mountains into the place. Swans might come back. Who knows what madness will be calling them in the end?’ (Wright, 2013: 334).

Bradley is a locally acclaimed non-indigenous Australian ‘literary’ writer and critic, with a modest international reputation, whose second adult¹ SF novel to date is *Clade*, which shares a common fatalistic pessimism with *The Swan Book*, albeit in a very different register. It traces the intertwined histories of related families across four generations, from the original couple of Adam and Ellie Leith, respectively a scientist and a painter, through their daughter Summer and her son Noah, then Noah’s onetime teenage lover Lijuan, and her daughter Izzie, as these are shaped by the extreme climate changes of the twenty-first century. Its ten chapters proceed in strictly chronological order over a period roughly coextensive with Adam Leith’s adult life. As the novel opens, he is in Antarctica charting the passage of the summer solstice, and Ellie in Sydney, awaiting the results of a fertility test. He is a thoroughly professional scientist, we learn, who has never succumbed to despair about climate change, ‘unlike some of his colleagues’, because he prefers to believe that ‘faced with looming disaster, politicians and business leaders would be forced to look for solutions’. But, as conditions continue to deteriorate, he has become ‘increasingly alarmed’ (Bradley, 2015: 13). Three years after Summer’s birth, this alarm is already fully

¹ Bradley’s 1999 novel *The Deep Field* is adult SF – it was shortlisted for an Aurealis Award for Best Science Fiction Novel – but not cli-fi. More recently, he has published *The Silent Invasion*, the first in a Young Adult SF trilogy, which again is not explicitly cli-fi.

justified: even in urban Sydney electricity supply has become unreliable; food spoils; appliances do not work; the child suffers from asthma and almost dies in hospital; the city streets are massively overcrowded with cars; and the news is all 'about the power cuts and the climate negotiations in Bangkok, which have reached an impasse yet again' (Bradley, 2015: 28).

At one level, *Clade* is a series of intimate stories about a small group of closely related people. At another, however, it is also the story of a series of interconnected global climate events: glaciers calving icebergs half the size of cities; huge die-offs of birds; widespread crop failures; the collapse of the fishing catch; mega-blizzards in North America, tornados in China, and methane ruptures in Siberia; fires burning around Sydney's outer fringes; fierce tropical storms in England; catastrophic flooding of fields and towns in East Anglia; tightening water restrictions; the collapse of bee populations; and a global pandemic (Bradley, 2015: 16, 42–43, 46–47, 66, 76, 80, 126, 129–130, 145–173). All this impinges on the Leith family directly or indirectly: Adam and Ellie separate under the pressure; Summer runs away to Cambridge in England; Adam rescues her and seven-year-old Noah from the Cambridge flood waters; Adam, Noah and Lijuan hide from the plague in his parents' old cabin in a New South Wales national park. It is all driven directly or indirectly by anthropogenic global warming: '[S]ummer will come again, and again, each warmer than the last, each bringing with it the promise of change, of loss' (Bradley, 2015: 17). And it all increasingly seems simply inexorable. As Adam says to Summer, while they are sheltering from the floods, 'We keep talking about trying to stop what's happening, slow it down somehow, but I'm not sure that's even possible any more ... The problem is ... we can't get any distance, can't see what's happening for what it is' (Bradley, 2015: 102).

As in *Teemestarin kirja* and indeed many other cli-fi texts, the eutopian alternatives to this apparent inexorability are represented by either scientists or non-Western 'others'. The scientists are, in the first instance, Adam's colleagues in Antarctica, whose 'work here is bringing them close to something pure, something normally obscured' (Bradley, 2015: 15). But throughout the novel we register science's capacity to record and explain, but not prevent, the developing climate crisis. Noah follows in his grandfather's footsteps and eventually becomes one of the astronomers who make the momentous discovery that a signal from 500 light years away has the quality of language. It is, however, a discovery that can have no practical effect on anything: 'it will be five hundred years before the message reaches SKA-2165, another five hundred before anyone hears back' (Bradley, 2015: 227). The non-Western others

here are not indigenous people, but rather the ‘illegals’ like Amir, a Bangladeshi climate refugee, a medical doctor and beekeeper Ellie meets and befriends. He is struggling to protect beehives from ‘ACCD ... Accelerated colony collapse disorder’ (Bradley, 2015: 116) and his fellow illegals from arrest by the Australian authorities. A security crackdown on illegal immigrants leads Ellie to search for Amir and his friends Mishkat and Riya: ‘Around their building there are signs of raids and resistance ... Stopping outside Mishkat and Riya’s she runs to the door but as she opens it a woman in a black security uniform appears, her face obscured behind a helmet and visor. “Sorry,” the woman says, “This area is restricted”’ (Bradley, 2015: 141).

Amir escapes the raids by hiding with his bees, who themselves escape colony collapse ‘for now’ (Bradley, 2015: 143). But when Ellie asks how they can ‘have surrendered so much to their worst natures’ (Bradley, 2015: 141), the question is directed at more than the security services.

The presence of these eutopian enclaves makes the novel a critical rather than classical dystopia, but their absolute failure makes it fatalistic nonetheless. The text’s last word is thus Noah’s:

The ice is almost gone, but while it may take millions of years, there is little doubt that one day it will return, creeping back to cover the land, and the world will change once more, the turmoil and destruction of the past century being little more than a spasm, an interregnum in the great cycles of the planet’s existence. Perhaps there will still be humans then, men and women as different from him as he is from those ancient people on the plains of Africa; perhaps some of them will have spread outwards, to the stars, borne there in great ships just as boats bore the first humans across the earth’s oceans. Either way they will carry within them the memory of this time, this past, like a stone borne in the mouth, just as he bears the memory of those ancient travellers in him. (Bradley, 2015: 224–225)

3. Time-travelling and Fatalism

In climate fiction environmentalists sometimes enjoy the luxury of an option denied their real-world counterparts, that of travelling backwards in time so as to cancel out in advance the effects of anthropogenic global warming: no industrialisation, no anthropocene. But, as SF writers have long known, travelling back through time is an inherently paradoxical process, a quality best summed up by the question: ‘What would

happen if one went back and killed one's grandfather?' *The Encyclopedia of Science Fiction* records that such time-paradox stories usually lead 'either to a singularly appropriate *reductio ad absurdum* or to a cunning literary move which appears to resolve the paradox by removing or avoiding the seemingly inevitable contradiction'. These latter, it adds, normally involve some version or another of Fritz Leiber's 'Law of the Conservation of Reality', that is, the notion that history itself is resistant to significant amendment or alteration (Edwards and Stableford, 2015; Leiber, 1958). Both options, but especially the latter, encourage a kind of retrospective fatalism, in which, no matter how desirable the prospective changes attempted by time travellers, these nonetheless prove ultimately impracticable. And, so far as we can see, this remains true for cli-fi in particular as much as for SF in general. As examples we cite, respectively, Ben Elton's *Time and Time Again* (2014) and Wolfgang Jeschke's *Das Cusanus-Spiel* (2005). Thereafter, we turn to a brief consideration of time travel as psychic projection rather than physical journey, the science-fictional equivalent to Homer and Aeschylus's Cassandra, as represented by the figure of Samandra in Jennifer Mills's *Dyschronia* (2018).

Elton is a left-wing English comedian and author, probably best known for his work on the *Blackadder* TV series, who had nonetheless published some 14 novels before *Time and Time Again*. These were mainly but not exclusively comic, and a number of them, especially *Stark* (1989), *Gridlock* (1991) and *This Other Eden* (1993), had combined environmentalist thematics with SF tropes. *Time and Time Again* is less comic and less environmentalist than any of those earlier novels. Its SF novum is time travel rather than anthropogenic warming, but it nonetheless assumes climate change as an important part of its *mise en scène*. The novel is set in 2024, when Hugh 'Guts' Stanton, an ex-SAS soldier and current media adventurer, is summoned to his old Cambridge college, Trinity, by the master, Professor Sally McCluskey, who will eventually inform him that Sir Isaac Newton bequeathed to the masters of Trinity the knowledge that time is not linear, but rather a kind of coil, such as to allow for movement between selected points in space and time. More specifically, Newton calculated that it would be possible to travel from Istanbul in 2024 to Constantinople in 1914. If Stanton agrees, his mission will be to proceed to Sarajevo, so as to prevent Gavrilo Princip from killing the Austrian Archduke Franz Ferdinand, thence to Berlin to assassinate the German Kaiser Wilhelm, thus preventing the First World War and so producing a 'better twentieth century than the one we were born into' (Elton, 2014: 97).

When McCluskey first asks Stanton to name 'humanity's biggest mistake' he nominates climate change: 'Got to be the big one, hasn't

it? Earthquakes, tsunamis, droughts, floods, tornadoes, mini bloody ice ages. The Gulf Stream gets turned off and suddenly East Sussex is Northern Canada' (Elton, 2014: 23). But 'climate change is a *consequence*', she replies, and 'global warming ... is *also* a consequence' (Elton, 2014: 23). Nonetheless, it is clear from the circumstances of their meeting that the climate is indeed in deep trouble: 'the storm raging above Great Court was gathering force. A rare warm thermal current, lost and directionless in the climatic chaos that had torn it from its ancient course, had brought rain among the snow and hail' (Elton, 2014: 35). But the root cause according to McCluskey is the the First World War, when Europe first lost its way (Elton, 2014: 40). 'The insane, perverse, *wilful* self-destruction of a collective culture that had been *four thousand years* in the making, smashed *utterly* overnight', she argues: 'The Soviet Union corrupting Marx's great idea into a contagious global nightmare in which entire populations would be murderously enslaved. And the United States destined to take the worship of competition, consumption and excess to the current point of planetary extinction'. Stanton objects that 'you can't blame the Americans solely for the collapse of the environment'. But McCluskey is insistent that 'they started it. Who taught the peoples of the world to consume beyond their needs? Beyond even their *desires*? To consume simply for the *sake of consuming*?' (Elton, 2014: 42). And so, he is recruited to become a 'Companion of Chronos' and journey back to 1914, accompanied initially by McCluskey.

Stanton's mission is a complete success, not only does he save the archduke and kill the kaiser, he also gets to travel in luxury on the Orient Express, conduct a highly gratifying sexual affair with an Irish socialist feminist, the beautiful Bernadette Burdette, and meet both Rosa Luxemburg and Karl Liebknecht. The romance, adventure and political-historical narratives are great fun, but the time-travel story nonetheless comes with a stern warning from Isaac Newton and Richard Bentley, the eighteenth century master of Trinity: 'Any hypothetical change ... no matter how minor, would immediately open up the possibility of an infinite number of unknowable variables ... We might very well make matters worse' (Elton, 2014: 331). This takes us to Stanton's encounter with the time traveller Katie, short for KT503b678, who has been sent back precisely so as to prevent him from assassinating the kaiser (Elton, 2014: 366). She comes from a future in which the kaiser's murder led directly to a brutal right-wing police state in Germany, which in turn prompted a successful socialist revolution in 1916, thence Gregor Strasser's murder of Luxemburg and his becoming the German Stalin. 'You think you live in a shit century? ...', she asks:

nothing to worry about but something called *global fucking warming*, whatever that is. Try living in a century where the *entire planet* is ruled by a fourth-generation Communist lunatic. Where the *entire planet* is one vast network of prison camps ... doing mass synchronized dances in the Red Squares of Berlin, London, Moscow and Washington. Thousands prancing about with red ribbons in their hands while the Party fossils stand on their platforms and gloat ... Your century was paradise! Why didn't you leave well alone? (Elton, 2014: 368–369)

Katie's future is in effect a global North Korea, a *reductio ad absurdum* if ever there was one. Nonetheless the reduction can yet become even more absurd. Stanton and Katie have left letters in Constantinople warning future time travellers of the effects of their travelling. But Stanton then discovers 12 earlier letters, the 'stories of a dozen centuries. A dozen *twentieth* centuries': 'The same hundred and eleven years repeated over and over again beginning each time in 1914 ... But each time the result had been the same. A nightmare catalogue of human brutality and human misery. War and genocide. Bigotry and fear' (Elton, 2014: 379). The novel's point, powerfully underlined when Stanton is 'taken out of the loop' by yet another time traveller (Elton, 2014: 384), is ultimately Newton and Bentley's, that history simply cannot be 'put right'.

Jeschke, who died in 2015, was a key figure in contemporary German SF. He edited Heyne Verlag's SF and Fantasy list from 1979 until his retirement in 2002 and was guest of honour at the 1990 World SF Convention at The Hague. Environmentalist thematics informed a number of his earlier fictions, notably *Midas oder Die Auferstehung des Fleisches* (1989), but anthropogenic global warming is absolutely central to *Das Cusanus-Spiel*, which won the 2006 Deutscher Science Fiction Preis for best novel and the 2006 Kurd-Laßwitz-Preis for best German SF novel. As with *Time and Time Again*, its primary novum is time travel, but extreme climate change, here combined with the effects of a nuclear disaster on the Franco-German border, nonetheless provides its primary *mise en scène*. The novel's protagonist, Domenica Ligrina, is a recently graduated botanist living in a mid-twenty-first century Rome threatened by the rapid northward spread of Saharan desertification. Refugees from the south have flooded into the city and are labelled 'Moros', or Moors, by the Romans, but, as Domenica insists to her boyfriend Bernd: 'Die meisten dieser Leute sind einfältige Bauernburschen aus dem Mezzogiorno, die durch die Dürre von ihrem Land vertrieben worden sind' ['Most of those people are simple country boys from the Mezzogiorno who have been driven from their land by

the drought'] (Jeschke, 2008: 60; Jeschke, 2013: 55). When drought finally breaks after more than a year and a half, 'Die halbe Sahara muß in den Straßen Roms gelegen haben. Der staubfeine Sand hatte binnen Minuten alle Abwasserleitungen verstopft' ['Half the Sahara must have been in the streets of Rome. The sand, fine as dust, had within minutes clogged all the sewers']. As a result, an evil-smelling sludge backs up into basements and low-lying houses throughout the city: 'Es war nur eine Frage der Zeit, bis Gelbfieber, Malaria und Fälle von Ruhr auftraten' ['It was only a matter of time before yellow fever, malaria, and cases of dysentery would appear'] (Jeschke, 2008: 89; Jeschke, 2013: 78–79). There is thus a real prospect that Rome, the *Caput Mundi*, 'der Mittelpunkt der Welt, könnte eines Tages aufgegeben werden müssen' ['the centre of the world, might one day have to be given up'] (Jeschke, 2008: 53; Jeschke, 2013: 50).

A whole series of schemes have been devised to cope with climate change, from a Gibraltar dam intended to stabilise Mediterranean sea levels through to a nanotechnological recovery of the submerged parts of Venice, but, for all their ingenuity, none seem to rise to the historical occasion. When Domenica and her friend Renata contemplate 'die neue Damm' ['the New Dam'] designed to protect north-western Europe, the novel records that:

Der 'Atlantikwall' witzelten die einen ... aber den meisten verging der Spott angesichts der anrennenden Fluten im Frühjahr und im Herbst. Das Wasser in den Ozeanen stieg unerbittlich, und ganz Holland lag inzwischen unter dem Meeresspiegel.

[The 'Atlantic Wall,' some quipped ... but the mockery was lost on most people in the face of the onrushing floods in spring and autumn. The water in the oceans rose unrelentingly, and all Holland was now below sea level. (Jeschke, 2008: 478–479; Jeschke, 2013: 369–370)

The Vatican, which abandons Rome for Salzburg, has however established a research facility, the *Instituto Pontificale della Rinascita della Creazione de Dio*, which in 2052 is recruiting scientists for an attempt to restore flora destroyed in 'die Todeszone' ['the death zone'] of France and Germany. Climate change has further exacerbated this problem. As the American scientist Sarah observes to Domenica, 'Wenn eine Klimaänderung so rasch vonstatten geht wie diesmal, haben die Pflanzen keine Zeit, abzuwandern. Sie werden überrannt' ['When climate change occurs as quickly as it has this time, the plants have

no time to migrate. They are overrun'] (Jeschke, 2008: 104; Jeschke, 2013: 89). The Instituto Pontificale has, nevertheless, discovered time travel and hopes to use it to recover the ancestors of now extinct species. Its physicists have learnt that there are waves moving backwards and forwards through space-time, which they designate 'Solitone' ['solitons'], and which humans can ride in either direction. Domenica is recruited for scientific fieldwork, which turns out not to be in the irradiated zone, as some of her friends had feared, but rather in the fifteenth century.

Already in the twenty-first century she has become fascinated by the real Renaissance humanist philosopher, Cardinal Nicholas of Kues, or Cusa, that is, Nicolaus Cusanus, whose tomb in the church of San Pietro in Vincoli lies near the temporary home of the Instituto. There, Domenica speculates on what the young 'Nico' would have been like when she tries unsuccessfully to persuade Bernd to make love to her on Cusanus's tomb (Jeschke, 2008: 56–57; Jeschke, 2013: 52–53). Later – or, rather, very much earlier – when she is denounced as a witch in the fifteenth century, Domenica crosses paths with the cardinal himself. Their various encounters, retold with slight differences according to timeline, differences so slight the repetitions almost seem typographical errors (Jeschke, 2008: 188, 460; Jeschke, 2013: 151, 355), affect both Cusanus's future and Domenica's past and present. The significance of Cusanus for Domenica, for Jeschke, and for the reader, is that, like Erasmus and More, he represents the possibility of a humanist opposition within Catholicism, as distinct from the Protestant opposition external to it, and thus the possibility of an earlier reconciliation between science and the Church than occurred historically. So, a chapter entitled 'Die Cusanische Acceleratio' ['The Cusan Acceleratio'] includes a brief summary of key developments in the making of the modern world in a different timeline from our own, commencing from Cusanus's foundation of the humanistic Accademia Romana in 1460. In 1825 in this timeline, 'Weltweit wird ein Ansteigen des Meeresspiegels registriert' ['A worldwide rise in the sea level registered']. As a result, 'Joseph Gay-Lussac ... äußert die Vermutung, daß zwischen der exzessiven Verbrennung von Petroleum seit nunmehr 300 Jahren und der Veränderung des Weltklimas ein ursächlicher Zusammenhang bestehen könnte' ['Joseph Louis Gay-Lussac ... advances the hypothesis that there could be a causal connection between the excessive burning of petroleum over the previous three hundred years and the change in the global climate'] (Jeschke, 2008: 343; Jeschke, 2013: 268)]. So, scientific understanding of global warming has indeed advanced well beyond that in our timeline, but only because so too has industrial pollution.

The eponymous 'Cusanus-Spiel' refers to the 'ludo globi', or game of spheres, invented by Cusanus shortly before his death, played with balls the centre of gravity of which is slightly off, thus making the results necessarily unpredictable (Jeschke, 2008: 107–108; Jeschke, 2013: 91–92). For Cusanus himself, as for Bertolino Falcotti, Domenica's boss at the Instituto, the game demonstrates the fundamental unpredictability of events. But the results of time travel are not always quite so unpredictable: attempts to ride the solitons always fail if directed to prevent events such as the Franco-German nuclear disaster. Within any particular timeline, then, something like Lieber's law seems to operate. As Domenica comes to know Don Fernando and the Angel, time natives able to travel more or less freely on the solitons, to and from Highgate, the outermost world where life exists, and thus the point where solitons reverse direction, she comes to understand how the overall functioning of the multiverse constrains apparently free behaviours. The Angel, or Hermes as he is also known, tells her:

Wir sind sehr beweglich, ja. Aber sind wir deshalb frei? ... Etwas Besonderes? Eine schwierige Frage ... Es gibt Milliarden von Lymphozyten in einem Körper. Sie entstehen und vergehen. Sie haben eine wichtige Funktion. Aber ist deshalb eine von ihnen etwas Besonderes? Ich glaube nicht.

[We're mobile, yes. But are we therefore free? ... Special? A difficult question ... There are billions of lymphocytes in a body. They come into being and pass away. They have an important function. But is one of them therefore special? I don't think so.] (Jeschke, 2008: 699; Jeschke, 2013: 536)

Das Cusanus-Spiel is a much more intellectually demanding novel than *Time and Time Again*, but they nonetheless share certain features. Both are clearly climate dystopias in so far as Stanton's, Katie's and Domenica's worlds are substantially shaped by serious deteriorations in the global climate between our time and theirs. Both are clearly critical dystopias in so far as they include would-be eutopian enclaves, the Companionship of Chronos and the Instituto Pontificale respectively. And both are ultimately conducive to a fatalism akin to that in Wright and Bradley.

Analogous considerations arise with Mills's *Dyschronia*, a recent Australian climate fiction concerned not so much with time travel as with the capacity to see into the future. For the dyschronia of the title refers not to a literary genre depicting worse times, as it does more conventionally, but rather to a fictional medical condition in which 'pain and

perception of time have created a dissociative loop, a splitting; migraine as a self-fulfilling prophecy' (Mills, 2018: 64). The novel's protagonist, Sam, short for Samandra – the reference to Cassandra is obvious – lives in the small rural town of Clapstone located somewhere on the southern coast of Australia. The town is doomed and Sam's intermittent 'migraines' permit her to foresee the manner of its doom. Her peculiar medical condition – and it is very peculiar, arguably 'unique' – provides the novel with its primary science-fictional novum, but the primary *mise en scène* is nonetheless anthropogenic climate change. We are told repeatedly that the climate is warming: 'It's a hot morning, strange for the season'; 'We try to remember what we've read about ... drought, about the ice caps'; 'this desert is coming to us, metre by metre, year by year'; 'It was another record-breaking summer'; 'Tropical storms had been marching south, a little further each year'; 'The warming they were seeing should not have been happening this far south' (Mills 2018: 11, 38, 97, 143, 158, 242). Clapstone's doom is manifest initially by way of sudden loss of access to the sea and the death of thousands of cuttlefish: 'the fact of it is that the waves – the shore – the water itself has recoiled. It has pulled away, embarrassed' (Mills, 2018: 14). Scientifically, this *mise en scène* is almost as improbable as the novel's novum, given that global warming will normally produce rising rather than falling sea levels, engulfment rather than being left literally high and dry. But the descriptions of the abandoned coastline are wonderfully evocative. And this is, in turn, followed by a series of accumulating mini-catastrophes each foretold by Sam: the closure of the town's Aspc Asphalt plant, which leads to six suicides by former employees; a flood that the townspeople turn to their temporary advantage; the bizarrely unsuccessful attempt to create a local theme park memorialising the cuttlefish; and the eventual pollution of the town to the point where the 'Department of Sustainable Communities' rezones it as 'an unviable region for settlement' (Mills, 2018: 196).

The novel's key philosophical conundrum, with which Sam wrestles throughout, is whether or not the negative outcomes she foretells are actually inevitable. The fact that she tries and fails to foresee positive alternatives very much suggests so: 'There is no being, only escape and returning, moving forward, moving back. Other people have stories. She has repetition, regression. Fate, which is the same as being dead' (Mills, 2018: 220). Her visions might nonetheless be warnings rather than predictions, in which case 'she must be free. Nothing was inevitable' (Mills, 2018: 242). The novel's barely coherent short concluding chapter tilts decisively in favour of the second proposition: 'The universe spills out around her, a jumble of infinite possible mistakes. Infinite possible.

Infinite' (Mills, 2018: 354). But the overwhelming weight of prior textual evidence, of the entire story, in short, clearly falls in favour of the first. And whatever the last chapter might suggest to the contrary, Clapstone's future remains direly predictable: 'It's a fantasy, that belief the earth will heal itself. Here, most of the stuff that tries to grow doesn't make it ... Even the gums by the river, geriatric now, have turned a ghastly grey' (Mills, 2018: 82).

Time travel, whether physical or psychic, is perhaps the most improbable novum in the whole of the SF repertoire, so it might seem strange to worry about its real-world implications. But the fatalist conclusion that there is little we can do to offset anthropogenic warming, and that our efforts might even make matters worse, does have such implications, and these might well be regretted. In the following chapter we turn to a set of cli-fi texts that are either situated in a base reality very similar to our own or in eutopian better worlds. Neither of these types exhibit fatalistic tendencies of the kind that concerned us in this chapter, but they do typically exhibit many of our other ideal-typical responses to climate change.

Chapter 7

Base Reality Texts and Eutopias

There seem to be far fewer climate eutopias than climate dystopias. There is a case to be made, nonetheless, that these are likely to become more culturally significant as the climate crisis develops. As Kim Stanley Robinson recently argued:

Climate change is inevitable – we’re already in it – and because we’re caught in technological and cultural path dependency, we can’t easily get back out of it ... It has become a case of utopia or catastrophe, and utopia has gone from being a somewhat minor literary problem to a necessary survival strategy. (Robinson, 2016: 9)

Robinson has not only identified the challenge of eutopia, but also made serious attempts to address it. He has also, however, produced examples of what we have described as ‘base reality texts’. In Chapter 3 we identified, alongside eutopias and dystopias, a sub-set of climate fictions in which socio-political arrangements are neither distinctively better nor distinctively worse than, but rather much the same as, those in contemporary, or ‘base’, reality. We commence this chapter, then, with a discussion of such base reality texts. Perhaps unsurprisingly, there seem to be more of these than there are eutopias. In ideal typological terms, they could logically include all six of our responses to anthropogenic warming, but empirically we have been able to identify instances only of denial, mitigation, negative and positive adaptation, and fatalism, but not of deep ecology. The reasons for this should be clear: most such ‘Gaian’ texts envisage the planetary system saving itself from climate change through the destruction of the human race; this is nowhere near happening yet, so is unlikely to exist in any contemporary base reality text. Analogous considerations also limit, but do not prohibit, the likelihood of deep ecology eutopias: only the most determinedly misanthropic of ecowarriors could read the destruction of our species

as a eutopian outcome. This is why there are so few Gaian base reality texts and eutopias. We might also add that in social science, as in natural science, negative findings can be as significant as positive.

1. Base Reality Texts

Three of our examples of base reality texts are taken from the US American core, respectively, Michael Crichton's *State of Fear* (2004), Barbara Kingsolver's *Flight Behavior* (2012) and Robinson's own *Green Earth* (2015b); a fourth, Umoya Lister's *Planetquake* (2010) is from the South African periphery. As we noted in Chapter 4, Crichton's *State of Fear* is almost certainly the best-known instance of denialist cli-fi. Crichton, who died of cancer in 2008, was a highly successful commercial novelist and screenwriter, medically trained, whose print SF included *The Andromeda Strain* (1969), *The Terminal Man* (1972), *Sphere* (1987), *Jurassic Park* (1990), *Timeline* (1999), *Prey* (2002) and *Next* (2006), the first five of which were all adapted for cinema. He also wrote and directed a number of SF films, notably *Westworld* (1973), *Looker* (1981) and *Runaway* (1984). *State of Fear* was a considerable commercial success, but nonetheless has never been adapted for cinema. The novel was, however, widely cited with approval by global warming sceptics, notably Senator Jim Inhofe, who made it 'required reading' for the US Senate Committee on Environment and Public Works during his chairmanship (Janofsky, 2005). And, despite being fiction rather than journalism, it received the 2006 Journalism Award from the American Association of Petroleum Geologists (Dean, 2006). It was, then, a deeply controversial text in the United States and almost certainly contributed to the kind of climate scepticism that eventually informed the policies of the Trump administration. The novel derives much of its rhetorical power from a set of distinctly non-fictional components: the 'Author's Message' (Crichton, 2009: 715–721), which outlines Crichton's own views on the subject of climate change; an appendix on 'Why Politicized Science is Dangerous' (Crichton, 2009: 723–731); a second appendix on 'Sources of Data for Graphs' (Crichton, 2009: 733–735), which makes no mention of the IPCC's various reports; and an impressively long 38-page bibliography, which does include the relevant IPCC publications (Crichton, 2009: 752–753). Many of the scientists so cited claimed Crichton had actually misrepresented their research and the more general scientific community clearly took exception to his novel. Myles Allen, head of the Climate Dynamics Group in the Department of Physics at Oxford, wrote that '*State of Fear* ... is ... likely to mislead

the unwary Although this is a work of fiction, Crichton's use of footnotes and appendices is clearly intended to give an impression of scientific authority' (Allen, 2005: 198). The Union of Concerned Scientists took much the same view: '*State of Fear* has characters debating data ... and concepts that cast doubt on the validity of global warming evidence ... Readers may understandably take away some misconceptions from his book' (Union of Concerned Scientists, 2005). We are neither of us scientists and, in any case, both the science and the scientists can speak for themselves. But we do note the kind of rhetorical sleight of hand by which Crichton seeks to bolster his case. At one point, he has Jennifer Haynes, an environmental lawyer, show Peter Evans, the novel's protagonist, data for average global temperatures 1880–2003, which rise steadily, and for US temperatures 1880–2000, which do not. The obvious question is how to explain the anomaly. She asks him 'which country do you imagine has the best-maintained network of weather stations over a large area?'; he replies: 'The US?'; she says 'Right. I think there is no dispute about that' (Crichton, 2009: 111). One can easily imagine the average American reader nodding their immediate approval. But no evidence is given in support of the claim. And for the period 1880–1940, that is the entire first half of the data set, the figures from the two global super-powers, the British and French empires, would very likely have been more reliable and certainly far more extensive.

The core of the novel is, of course, its fictional narrative. And here the pros and cons of climate science, which are, in reality, much less debatable than Crichton suggests, are almost entirely superseded by a wildly improbable adventure story, in which environmental activists and climate scientists are cast in the role of villains. Environmental activism is here represented by the Environmental Liberation Front (ELF), a ruthless ecoterrorist group willing to assassinate anyone who stands in their way, and climate science by the National Environmental Resource Fund (NERF), a philanthropy funded by millionaire George Morton and directed by lawyer Nicholas Drake. National Security Intelligence Agency agent John Kenner describes the ELF thus to Morton's lawyer Evans: 'It's an underground extremist group. Supposedly made up of ex-Greenpeace and Earth First! Types who thought those organizations had gone soft ... They've burned hotels in Colorado, houses on Long Island, spiked trees in Michigan, torched cars in California' (Crichton, 2009: 227). This is no doubt a plausible enough description of some real American radical environmentalist groups: Earth First! certainly spiked trees and the Earth Liberation Front, the real ELF, almost certainly engaged in arson. But Crichton's

ELF plans to go much further, to attempt to manufacture a tsunami timed to hit the Californian coast just as Drake is winding up an NERF conference on extreme climate change. The fictional ELF have murdered Jonathan Marshall, an English graduate student living in Paris who worked out how to 'make' tsunamis, and now they are planning on mass murder.

As for NERF, John Henley, its PR man, explains to Drake:

Back in the 1970s, all the climate scientists believed an ice age was coming ... But once the notion of global *warming* was raised, they immediately recognized the advantages. Global warming creates a crisis ... A crisis needs to be studied, it needs to be funded, it needs political and bureaucratic structures around the world. And in no time at all, a huge number of meteorologists, geologists, oceanographers suddenly became 'climate scientists'. (Crichton, 2009: 394)

Again, this is no doubt a plausible enough description of certain aspects of real American science: in the 1970s, climate scientists had indeed believed in an approaching new ice age, scientists do indeed need funding, and some meteorologists, geologists and oceanographers have no doubt found it easier to acquire funds as climate scientists. But Crichton's suggestion that the entire scientific consensus over anthropogenic warming is in fact some kind of colossal fraud takes the whole matter a great deal further. The observation in his 'Author's Message' that 'Research funding is almost never open-ended or open-minded. Scientists know that continued funding depends on delivering the results the funders desire' (Crichton, 2009: 720) calls into question the intellectual credibility, not simply of climate science, but of all science. And yet, we all know from our own practical experience of the world that, by and large, science actually *works*.

The novel's adventure narrative is brought to a climactic confrontation near Pavutu, on the island of Gareda in the Solomons, where Evans, Kenner and a group including the NERF-supporting movie star Ted Bradley are captured by rebel cannibals. Bradley is killed and eaten, in a fate Crichton might well have wished on Hollywood leftists like George Clooney and Matt Damon, but the remainder of the group escape and succeed in preventing the ELF tsunami. The Garedan cannibals are a no doubt deliberate inversion of the primitivist trope we have observed at work in cli-fi. Returning to Los Angeles, Evans agrees to work for Morton's successor organisation to NERF, which will 'run environmental research as a business. And cut the crap' (Crichton, 2009: 711). A key part of this 'crap' is the novel's eponymous 'state of fear', which Norman

Hoffman, an Emeritus Professor of Sociology, explains thus during the climate change conference:

the military-industrial complex is no longer the primary driver of society ... the last fifteen years we have been under the control of an entirely new complex, far more powerful and far more pervasive ... the politico-legal-media complex. The PLM ... Politicians need fears to control the population. Lawyers need dangers to litigate, and make money. The media need scare stories to capture an audience ... *this is the way modern society works* – by the constant creation of fear. (Crichton, 2009: 573–574)

He adds for good measure that the universities have, since the 1980s, acquired a new social role as ‘creators of new fears for the PLM ... factories of fear’ (Crichton, 2009: 577–578). Hoffman is a comparatively minor character, represented as a slightly obsessive eccentric, but nonetheless these might well be Crichton’s own views. The point about politicians does after all have a certain global validity. But the military-industrial complex has surely been doing very good business – the war on terror, war in Afghanistan, Iraq and Syria – since the al-Quaeda attack on the New York World Trade Center in September 2001. And, in any case, lawyers, movie stars and academics are much less important in other advanced capitalist societies than in the United States. Unlike Liu Cixin, Crichton’s climate denial is situated in this world, in this time; and, unlike McEwan’s, it calls into question the science as well as the scientists; it thus importantly prefigures the Trump administration’s ‘War on Science’.

Kingsolver’s *Flight Behavior* is also very obviously set in base reality and, although its sympathies ultimately lie with both the science and the scientists, these are initially approached from the vantage point of those who understand neither. Kingsolver herself is a scientifically trained, prize-winning ‘literary novelist’, who is to date the author of seven novels. Although ecological themes clearly inform some of her earlier fiction, especially *Prodigal Summer* (2000), *Flight Behavior* is nonetheless her only climate fiction to date. Set in the southern Appalachians in the American Bible Belt, the novel’s protagonist, Dellarobia Turnbow, has married young as a result of an unwanted and, as it turned out, unsuccessful pregnancy by Cub Turnbow. In her late 20s and dissatisfied with the boredom of marriage and motherhood, she hikes up the nearby mountain intending to meet a young telephone repairman for her first tentative attempt at adultery. En route, however, she is confronted by the extraordinary sight of

the trees in the valley below covered with what we later learn are monarch butterflies. Dellarobia herself likens the way the 'forest blazed with its own internal flame' and the 'Trees turned to fire' to a 'sci-fi movie' and to the Biblical 'burning bush' (Kingsolver, 2012: 13–14). Initially, the last meaning wins out, when she interprets this strange vision as a cautionary miracle and returns home, abandoning the urge to infidelity. But the entire novel is structured around a conflict between the Biblical mores of Feathertown and the scientific values of the Afro-American entomologist Professor Ovid Byron and the team he brings in to study the monarchs. The novel makes extensive use of Biblical tropes, especially those of the Great Flood, but it sides decisively with science nonetheless. The altered migration pattern of the monarch butterflies, which normally fly between Canada and Mexico, is thus a synecdoche of larger, global climatic changes. It is also a properly science-fictional novum, since the real monarch butterflies have yet to settle on Tennessee.

The butterfly roost soon becomes famous in Feathertown, across the United States and around the globe, which generates a whole series of conflicting responses. Cub's father, Bear, wants to log the mountainside and resents them as an impediment; Hester, Cub's mother, wants to charge tourists for entry to see them; and the local church deems them a sign of God's goodwill toward the people of Feathertown. But then Byron and his graduate students arrive, Dellarobia allows them to set up a laboratory and temporary accommodation on the farm and is eventually employed by him as an assistant. For Byron, 'the most interesting and alarming question' is why 'a major portion of the monarch population that has overwintered in Mexico' should now aggregate 'for the first time in recorded history, on the farm of the family Turnbow' (Kingsolver, 2012: 122). And the answer is climate change: 'We are seeing a bizarre alteration of a previously stable pattern ... Climate change has disrupted this system ... we want to get to the bottom of that as best we can, before events of this winter destroy a beautiful species and the chain of evidence we might use for tracking its demise. It's not a happy scenario' (Kingsolver, 2012: 228–229). This is not mitigation, nor even positive adaptation, but rather an absolutely minimalist variant of negative adaptation, the attempt to minimise damage by tracking the demise of a species for the scientific record. But when Dellarobia tries to explain to her husband that global warming has forced the monarch butterflies on to their farm, that something is actually wrong with the whole Earth, he dismisses the idea contemptuously: 'Al Gore can come toast his buns on this ... Weather is the Lord's business' (Kingsolver, 2012: 260–261).

Scientific prediction and Biblical prophecy converge in the novel's denouement, on a day when the radio has 'churned all morning with strange accounts ... Flood and weather warnings, disasters. Something beyond terrible in Japan, fire and flood' (Kingsolver, 2012: 429). The mountain snows melt and flood the Turnbow farm, so that both their car and their house begin to float away. Dellarobia is alone – Cub at work, their children at school – but is able to climb the hill to reach higher ground and safety. Earlier in the novel she had asked Byron what would happen to the monarch butterflies that might survive their sojourn in Feathertown. They will go into 'a whole new earth', he replied: 'Different from the one that has always supported them. In the manner to which we have all grown accustomed' (Kingsolver, 2012: 325). From the hill above the farm Dellarobia watches the surviving monarchs escape over flooded farmland:

Man is born unto trouble ..., she thought, words from the book of Job, made for a world unravelling into fire and flood ... her eyes held steady on the fire bursts of wings reflected across water, a merging of flame and flood. Above the lake of the world, flanked by white mountains, they flew out to a new earth. (Kingsolver, 2012: 432–433)

There is hope, then, in this base reality, not the unfounded optimism of Crichton's novel, but rather practical hope: that Dellarobia, who has decided to leave Cub, will go to college; that their son Preston might grow up to be a scientist; that both monarch butterflies and human beings will somehow muddle through despite the terrible climate changes actually occurring now.

Green Earth is, as we have already noted, the 2015 omnibus edition of the earlier *Science in the Capital* trilogy and Robinson himself regards it as a 'realist novel', that is, as a base reality text. The key institutions it depicts – the presidency, the Senate and the Pentagon, the Republican and Democrat political parties, the National Oceanic and Atmospheric Administration, the National Science Foundation and the University of California San Diego – are indeed each recognisable from contemporary American society. But in the novel these base reality institutions are confronted by a series of climate crises that might occur in the near future but have not done so as yet. These are each examples of what Suvin would describe as a novum and thus give Robinson's realist novel a distinctly science-fictional character. In 'Part One: Forty Signs of Rain', the melting Arctic ice cap causes coastal California to be plunged into the 'June Gloom' of 'a permanent El Niño'; extensive and

excessive rains beset the entire country; and eventually transform an inundated Washington DC into a 'city floored with water' (Robinson, 2015b: 21, 256). In 'Part Two: Fifty Degrees Below', meltwater from the collapsing ice caps causes the Gulf Stream to stall, which in turn results in much colder temperatures, bordering on a new Ice Age, all around the North Atlantic: 'It was one of the ironies of their time that global warming was about to freeze Europe and North America' (Robinson, 2015b: 456). In 'Part Three: Sixty Days and Counting', sea levels rise very rapidly as carbon emissions cook the planet, culminating in near catastrophe in China: '[T]he Chinese have trashed China itself, and ... entered a major ecological crash ... the cumulative impacts were going to kill entire regions and endanger the lives of one-sixth of humanity' (Robinson, 2015b: 1044). The key protagonists – Frank Vanderwal, a biomathematician from UC San Diego temporarily working at the NSF; Phil Chase, Democratic senator for California and later president of the United States; and Charlie Quibler, Chase's environmental policy adviser – are variously engaged in attempts at mitigation, negative adaptation and even positive adaptation.

Mitigation is a recurrent theme in the novel, from Yann Pierzinski's algorithmic calculation that the introduction of genetically altered lichen into temperate forests will result in a CO₂ drawdown of billions of tons (Robinson, 2015b: 147); through Diane Chang's proposals for carbon capture and sequestration (Robinson, 2015b: 370); to the Quibler family's installation of solar panels in their own home (Robinson, 2015b: 1064). But the single most spectacular act of mitigation occurs as climate engineering in Part Two, when the US Navy is put to work on an international project to disperse billions of tons of salt into the Arctic and Atlantic Oceans, in order to raise salinity levels and thereby restart the Gulf Stream (Robinson, 2015b: 652–653). Negative adaptation, or harm minimisation, is also a recurrent theme. The central motif here is Khembalung, a fictional low-lying island state near the Bay of Bengal, at immediate risk from rising sea-levels and extreme weather (Robinson, 2015b: 102). As the Khembali ambassador, Drepung, explains to Anna Quibler, 'Over the years we have built a nice town ... The whole island has been ringed by dikes. Lots of work. Hard labor ... Dutch advisors helped us. Very nice' (Robinson, 2015b: 48). But even Dutch engineering proves ultimately insufficient: just as Vanderwal and the Quiblers are visiting, Khembalung is finally overwhelmed by catastrophic floods (Robinson, 2015b: 400–401). This means the demise of the island itself, but not of its Buddhist culture, which the Khembalis carry with them into resettlement in Maryland (Robinson, 2015b: 650, 657). In ancient Tibetan scripture Khembalung is one of the mythical

'hidden lands' created by the Indian Buddhist master Padmasambhava (Reinhard, 1978). Both Robinson's use of the name and the novel's more general tendency to romanticise Khembali Buddhism are instances of the primitivist trope we observed at work elsewhere in recent cli-fi. But there is nothing romantic about the fictional island's fate, very likely to be shared by real-world islands such as Tuvalu and Kiribati: '[I]t looked like a shallow green bowl, submerged in brown water until only an arc of the bowl's rim remained in air' (Robinson, 2015b: 404).

In so far as *Green Earth* toys with the notion of positive adaptation this is centred on the figure of Phil Chase, a fictional character very loosely based on the real Al Gore. When we first meet Chase, he is caught up in the routine frustrations of the practical politics of combating global warming, busily presenting climate bills, sanguinely taking what he can from the senatorial committee and Congress, always under pressure from Charlie Quibler to do more. 'So Phil! Are you going to do something about global warming now?', Quibler shouts from a launch sailing along the Mall, at the end of Part One. 'I'll see what I can do!' Chase replies (Robinson, 2015b: 282). In Part Two, he announces his intention to run for the presidency, very spectacularly from a hot air balloon at the North Pole: 'This beautiful ocean, free of ice for the first time in humanity's existence, is sign of a clear and present danger' (Robinson, 2015b: 454). Chase wins the election and, taking the oath, pledges to explore all peaceful means 'to hand on to the generations to come a world that is as beautiful and bountiful as the one we were born into' (Robinson, 2015b: 752). This implies more than mere mitigation or negative adaptation, however: it turns out to offer the promise of a distinctly positive form of adaptation. So, in a 'Cut to the Chase' blog, written shortly after he has survived an assassination attempt, the President writes:

Empires are one of the most evil and destructive of human systems ... America ... one of the great achievements of history ... was so successful that we became an empire by accident. Then we had to stand down. We had to divest ... Capital is created by everyone, and should be owned by everyone. People are owed the worth of what they do, and whatever they do adds to humanity somehow ... and is worth a living wage and more. And the Earth is owed our permanent care. And we have the capability to care for the Earth and create for every one of us a sufficiency of food, water, shelter, clothing, medical care, education, and human rights ... Eventually I think what will happen is that we will build a culture in which no one is without a job, or shelter, or health care, or education, or the rights to their own life. Taking care of

the Earth and its miraculous biological splendor will then become the long-term work of our species. We'll share the world with all the other creatures. It will be an ongoing project that will never end. (Robinson, 2007: 478–479)

This passage from *Sixty Days and Counting*, which is omitted from *Green Earth*, shows Chase – and Robinson – at their most radical, perhaps even most eutopian, envisaging types of adaptation to the global climate crisis that will actually produce a positively better world. It's difficult to know why exactly Robinson chose to delete these lines from the later version, whether he considered them 'telling readers things they already knew', 'extraneous details' or 'excess verbiage' (Robinson, 2015b: xii). But it strikes us as likely to be none of these. Rather, we suspect the decision arose from a growing awareness, based in the empirical experience of contemporary American realities, of just how implausible it must appear to many readers, perhaps most, that any Democrat president could ever say such things. *Green Earth* turns out to be a realist novel after all.

Our fourth example, *Planetquake*, was published in England by a specialist 'Christian publisher', but it seems clear that the author is not only Christian but also South African: the novel is largely set in southern Africa, Umoya Lister is an admitted pseudonym, and Umoya in Zulu means the life force as distinct from the physical body. The main protagonists are Dr Ashleigh Kolokotronis-Fraser, a 'mixed race' South African chemist, her husband, Dr Timothy Fraser, a Scottish geologist, and their two children, Andrew and Morag, all of whom are Presbyterian Christians. The novel begins just before Easter in the year the climate collapses, in a world that is recognisably our own, and runs through until the following January, by which time everything has been changed utterly. At the opening Ash is working in Norway, Tim in South Africa, and the children are with his parents on Iona in Scotland. Ash is at Spitsbergen when the melting Arctic ice triggers earthquakes in Greenland and Norway, which cause massive eruptions of methane into the atmosphere, which in turn destroy the ozone in the stratosphere (Lister, 2010: 28, 34). Tim has studied the Paleocene/Eocene Thermal Maximum (PETM), when the Earth suddenly warmed by 10 degrees Fahrenheit 55 million years ago, and thinks this might be the closest analogue to modern global warming (Lister, 2010: 71, 131). The destruction of the ozone layer allows ultraviolet rays to wipe out much of the grain crop in the northern hemisphere (Lister, 2010:140). This is followed by uncontrollable fires across the United States, Canada, Russia and China, which blot out the sunlight and create a 'nuclear

winter' effect (Lister, 2010: 159–161). The Monsoon weakens and fails, resulting in widespread food shortages, which lead to nuclear wars between China and North Korea and between Pakistan and Iran (Lister, 2010: 163, 262–263, 275–278). Ash, Tim and their global network of scientific contacts spend much of the novel monitoring these processes and lobbying political leaderships, especially in the United States, to act to mitigate the effects of the climate crisis.

There is a thriller sub-plot, however, with a Zimbabwean supervillain, Professor Hokoya Imbwa, intelligent, handsome and ruthless, a veteran of Mugabe's Fifth Brigade and 'a major godfather of the African mafia', now heavily involved in the development of South African coal power stations (Lister, 2010: 93–94), who has ambitions to become an African Hitler (Lister, 210: 483–484). Neither Christian nor Muslim, Imbwa is a 'New Pagan' and has three wives, the Zimbabwean Blessing, the Somali Sara and the French Simone, all of whom bear on their buttocks the brand of his pedigree Afrikander cows (Lister, 2010: 233). Imbwa attempts to frame Ash and Tim on false criminal charges, tries to seduce Ash into becoming his fourth wife and both of them into becoming his tame highly paid climate scientists, he attempts to assassinate Tim, and finally kidnaps their children, all as ways of trying to silence them. Ash is powerfully attracted to Imbwa – 'It made me hungry with lust. My flesh leapt when he put his arm round me' (Lister, 2010: 238) – but nonetheless eventually comes to see him as Satan (Lister, 2010: 240).

The most intellectually interesting aspect of the novel is its attempt to explain, popularise and reconcile two very difficult discourses, those of climate science and predestinarian Christian theology. For, of course, Presbyterianism is a specifically Calvinist, rather than merely generically Christian, religion. Many of Ash and Tim's South African contacts, but especially Professor Aaron Soga, are associated with the 'University in Alice', the real Christian University of Fort Hare, which includes among its alumni Nelson Mandela and Desmond Tutu, Oliver Tambo and Seretse Khama, Govan Mbeki, Steve Biko and Robert Mugabe (Lister, 2010: 58–59). The climate catastrophe means that in this fictional near future year 'there were no rainbows' (Lister, 2010: 7). And it falls to Aaron Soga to point out to Tim the theological as well as the scientific implications of this absence: 'The Rainbow is the sign of the Covenant between God and all Creation. For thirty pieces of economic silver, have we crucified the Rainbow of Grace?' (Lister, 2010: 78). In Calvinistic orthodoxy the ultimate salvation or damnation of each and every individual is understood to be predetermined by God from the beginning of time. As the seventeenth century English

Presbyterian divine William Prynne put it: ‘God from all eternity hath, by his immutable purpose and decree, predestined unto life ... only a certain select number of particular men ... which number can neither be augmented nor diminished; others hath he eternally and perpetually reprobated unto death’ (Prynne, 1965: 232).

This doctrine can very easily be extended into an understanding of all history as similarly predetermined. In the words of *The Westminster Confession of Faith*, ‘GOD, from all eternity, did, by the most wise and holy counsel of His own will, freely, and unchangeably ordain whatsoever comes to pass’. The confession adds, however, ‘yet so, as thereby neither is God the author of sin, nor is violence offered to the will of the creatures’ (III: 1). So, Tim and Ash are driven to wrestle with the conundrum thereby posed, that of the relation between free will and divine predestination: ‘Can an Intelligence evolve such that it is able to step outside the Universe and create itself? ... Does God truly play dice, but foreknow how the dies will fall, to sustain the best of all worlds?’ (Lister, 2010: 448). This combination of theology and science must remain daunting for the scientist and theologian as much as for the lay reader. But its logical outcome is clearly a ‘double predestination’, both scientific and theological, as ominously fatalistic as Calvin’s own. As Tim explains to his father Sandy at the very end of the novel: ‘The old geologists divided time into the Primary, the time of old crystalline rocks, the Secondary, up to the end of the dinosaurs, the Tertiary, when mammals came, and the Quaternary, with ice ages and humans. But now the Quaternary has ended. The Fourth Age of Earth is closed. Now, this year, we leave Eden. The Fifth Age begins’ (Lister, 2010: 509).

2. (Mainly) Critical Eutopias

As we noted in Chapter 5, there is a classically eutopian sub-plot in Aldiss’s *Helliconia Winter*, the third volume in his critical-dystopian Gaian trilogy, but it is located on Earth rather than on Helliconia. And, as we also observed there, the eutopia is not at all central either to the trilogy or to the third novel itself. Elsewhere, we have been unable to find classical eutopias in commercially published climate fiction.¹

¹ We say commercially published because one further instance we could have cited is Pam Giblin’s *Nemeton* (1992), a self-published Australian novel set on a small Tasmanian peninsula cut off by rising sea levels. Out of the novel’s ‘Collapse’ there emerges a kind of neo-tribal, Gaian-feminist, post-carbon, ecotopian community.

The logical possibility exists of further classical eutopias, however, and it is not difficult to imagine a warming world offering pleasant rather than unpleasant outcomes, at least for those living in colder climates. But to date this option has not really been taken up. Critical eutopias, by contrast, certainly do exist and typically focus on the socio-political corollaries of more or less successful attempts at mitigation and adaptation. Obvious instances from the long history of the genre include Morris's *News from Nowhere*, Huxley's *Island*, Callenbach's *Ecotopia*, Le Guin's *The Word for World is Forest*, Robinson's *Pacific Edge*, and Pacigalupi's *The Windup Girl*. We could now retrospectively designate all of these as 'solarpunk', borrowing the term from Gerson Lodi-Ribeiro's Portuguese-language short story collection *Solarpunk: Histórias ecológicas e fantásticas em um mundo sustentável*, its English translation by Fábio Fernandes, and Adam Flynn's 'Solarpunk: Notes Toward a Manifesto' (Lodi-Ribeiro; 2013; Lodi-Ribeiro, 2018; Flynn, 2014). Most self-declaredly solarpunk has taken the form of online polemic, manifestos and short story collections, rather than full-length novels or films. Our examples of critical eutopian cli-fi novels, although not self-identified as solarpunk, nonetheless fall within the general remit of the term: Robinson's *New York 2140* (2017) from the system's core; Fleck's *MAEVA!* trilogy (2008–15) from the semi-periphery; and Atwood's *MaddAddam* (2013) from the periphery.²

Robinson's *New York 2140* is the latest in a series of attempts by its author at both eutopia (*Pacific Edge*, the *Mars* trilogy, *Antarctica* and *The Years of Rice and Salt*) and climate fiction (the *Science in the Capital* trilogy, *Green Earth* and *Aurora*). It is, however, the first of his novels to combine the two, so as to depict a specifically eutopian outcome from global climate crisis. Initially, climate change appears to function in the novel only as its dystopian *mise en scène*. By the early to mid twenty-second century sea levels have risen by 50 feet, so that the whole of Lower Manhattan has long since been flooded. But the buildings that remain standing are still inhabitable, their lower floors

² We might also briefly mention another peripheral example, *Split by Sun: The Tragic History of the Sustainocene* (2018) by Tom Faunce, Professor of Law at the Australian National University. Faunce's eutopia is organized around the 'Global Synthetic Photosynthesis Project', which provides the world with clean fuel, food and fertilizer. It is a critical eutopia partly because of the 'War to End the Corporatocene' fought to bring this society about, partly because the president of the Whole Earth Council, Zula Calabiyau, has been subject to repeated assassination attempts, and partly because of resistance by 'unreconstructed corporate recusant[s]' like Vice-President Gordon Lizzard (Faunce, 2018: 7, 18).

transformed into dockyards, the streets that once ran between them into canals traversed by vaporetos and water taxis. The city is as thoroughly capitalist as ever. As Jeffrey Rose ('Jeff') explains to his friend Ralph Muttchopf ('Mutt'): 'The prices are always too low, and so the world is fucked ... We've been paying a fraction of what things really cost to make, but meanwhile the planet, and the workers who made the stuff, take the unpaid costs right in the teeth' (Robinson, 2017: 4). *Mise en scène* established, the main plot seems at first to be a detective mystery about Mutt and Jeff's disappearance from their temporary home in a 'hotello' on the 'farm floor' of the old Met Life tower on Madison Square. But this turns out to be a MacGuffin, the trigger for a more important political narrative which moves the novel towards its eventual eutopian climax. And that too is a result of climate change: Hurricane Fyodor batters the city so badly as to prompt what amounts to a popular constitutional revolution.

The narrative is divided into eight parts, each subdivided into eight sections, each devoted to a particular character or characters: Mutt and Jeff, the two kidnapped 'coders'; Inspector Gen Octaviasdottir, a NYPD detective called in to investigate their disappearance; Franklin Garr, a market trader for the aptly named WaterPrice; Vlade Marovich, the superintendent, or manager, of the building from which Mutt and Jeff disappeared; an anonymous New York citizen who explains periodically how the city works; Amelia Black, an internet 'cloud' star, famous for taking off her clothes, who heads an internet show about wildlife survival; Charlotte Armstrong, a lawyer defending the rights of immigrants, who calls in Inspector Gen to investigate Mutt and Jeff's disappearance; and Stefan and Roberto, two 12-year-old 'water rats', orphaned scavengers with their own scavenged boat, in the business of submarine exploration. Inspector Gen, Franklin, Amelia and Charlotte are all Met Life tower tenants, Vlade also lives in the tower, and Stefan and Roberto scavenge around its periphery. The legal status of such property in the 'intertidal' is open to dispute, since it has in effect become a new commons. The Met building itself is a cooperative but some anonymous entity wants to buy it for twice its declared value and is apparently also willing to sabotage the building by drilling holes that will let water into the basement floors. As the citizen observes, 'wherever there is a commons, there is enclosure' (Robinson, 2017: 210).

Like *Green Earth, New York 2140* explores the possibilities for mitigation and both positive and negative adaptation. Mitigation motifs are present throughout, from the Met building's farm floor to the citizen's account of how diesel-burning container ships were replaced by sail-powered 'containerclippers' and aircraft by solar-powered freight airships

(Robinson, 2017: 379). But the citizen repeatedly cautions that it has been too little, too late: 'People stopped burning carbon much faster than they thought they could ... They closed that barn door the very second the horses had gotten out. The four horses, to be exact' (Robinson, 2017: 139). The citizen – and Robinson – are at one point deliberately dismissive about adaptation (Robinson, 2017: 377), but the struggle over what kinds of adaptation are possible and who will or will not benefit thereby actually provides the novel with a key organising device for its political narrative. So, the citizen tells us that 'The remarkable rise [in sea levels – AM and JRB] had been bad for people – most of them. But at this point the four hundred richest people on the planet owned half the planet's wealth, and the top one percent owned fully eighty percent ... For them it wasn't so bad' (Robinson: 2017: 205). Amelia's efforts aboard the *Assisted Migration* dirigible are a kind of negative adaptation – her latest mission is the transfer of 200 surviving wild polar bears to Antarctica – but can seem comically ineffectual. Her internetcast message is, nonetheless, very powerful: 'we have to nurse the world back to health. We're no good at it, but we have to do it' (Robinson, 2017: 259).

If *Green Earth's* Phil Chase had been an Al Gore figure, then the various inhabitants of the Met building turn out to be this novel's composite Bernie Sanders. Vlade plays a crucial role in rescuing Mutt and Jeff from the sunken container in which they are imprisoned (Robinson, 2017: 314–316). Franklin advises Charlotte that a 'financial general strike' organised by the Householders' Union, could prevent a Government bailout of the banks (Robinson, 2017: 348–349). After the hurricane, Inspector Gen faces down the armed private security forces 'protecting private property' in Upper Manhattan (Robinson, 2017: 515). Amelia announces on camera that 'it's democracy versus capitalism. We the people have to band together and take over ... Anyone who stops payment on their odious debts ... immediately becomes a full member of the Householders' Union' (Robinson, 2017: 528). Charlotte persuades her ex-husband, Larry Jackman, now head of the Federal Reserve, that bank nationalisation should be the price for a financial bailout, and runs for Congress as a Democrat, campaigning against the banks: 'Make that whole giant leech on the real economy into a credit union, and squeeze all that blood money we've lost back into us' (Robinson, 2017: 554). She is elected, the banks are nationalised, Congress passes a 'Piketty tax' on income and capital assets and 'a leftward flurry of legislation' is 'LBJed through Congress' (Robinson, 2017: 574, 601, 602, 604). The 'pushback was ferocious as always, because people are crazy and history never ends', the citizen warns: 'There are no happy

endings! Because there are no endings' (Robinson, 2017: 604). But this is as eutopian an ending as any in recent climate fiction. And it is complemented by a whole series of individual happy endings: Stefan and Roberto really do discover sunken treasure, British gold from the Revolutionary War aboard the remains of *HMS Hussar*; Vlade and his ex-wife Idelba really do get back together; Charlotte really does strike up a successful sexual relationship with Franklin, who is 16 years her junior; the political battle for New York really is 'a Pyrrhic defeat' in which 'the losers of a Pyrrhic victory ... are really the winners ... They lose, then they say to each other, Hey we just lost a Pyrrhic victory! Congratulations!' (Robinson, 2017: 572, 590, 598).

The key weakness is that all this happiness is far too easily bought, most especially so at the political level. Robinson's first eutopian novel, *Pacific Edge*, was, as Moylan acknowledged, a late addition to the 'critical utopian' canon (Moylan, 1995: 4), its ecotopian El Modena of 2065 characterised both by difference, most obviously that between Greens and New Federals, and imperfection, best represented in the plans to develop Rattlesnake Hill, the area's last remaining wilderness. As Robinson himself explains, however, his friend Terry Bisson alerted him to the book's key flaw: 'Stan ... there are guns under the table' (Robinson, 2016: 3). Bisson's remark provided *Red Mars* with a chapter title, and the trilogy as a whole provided a detailed account of three revolutions because, as Robinson adds, 'I felt that in *Pacific Edge* I had dodged the necessity of revolution' (Robinson, 2016: 4). Robinson sees *Antarctica* and *The Years of Rice and Salt* as his next two eutopian novels and, in purely formal terms, this is almost certainly so. But these too dodge the 'necessity of revolution', the first by substituting science for politics, the second by projecting its alternative history into an alternative future. In *Forty Signs of Rain*, however, as in the whole of *Green Earth*, politics is indeed paramount, but politics of a kind that is deliberately non-revolutionary and non-eutopian, in which a charismatic Democratic president saves the world. *New York 2140* resumes this political vision, its hopes now vested in radical Democratic congresswomen and the good fortune that the Federal Reserve might be headed by one of their ex-husbands.

But these hopes are 'utopian' in the pejorative sense of being hopelessly impractical. The notion that either of America's two pro-big business parties could ever be converted to ecosocialism is simply radically improbable. As Gore Vidal famously observed: 'There is only one party in the United States ... and it has two right wings: Republican and Democrat' (Vidal, 1977: 268). And at one level Robinson knows this to be the case: 'We can't imagine the bridge

over the Great Trench, given ... the massively entrenched power of the institutions that shape our lives – and the guns that are still there under the table, indeed right on the table’ (Robinson, 2016: 8). The improbability level is increased, moreover, by the fact that in the novel neither any significant changes to the American constitution nor any significant changes to the banking system have been achieved between now and 2140. The president is still not directly elected, the Senate is still ludicrously unrepresentative, the House of Representatives is still elected by the anachronistic first past the post system; in short, it is still an eighteenth century constitution. As for the banks, they have been bailed out by the US taxpayers three times between 2008 and 2140. Given institutional arrangements as sclerotic as these, which have survived and prospered during a 50-foot rise in sea levels, how realistically likely is it that this could be effectively challenged as a result of one hurricane, no matter how devastating? Ultimately, the novel’s eutopia is betrayed by its utopianism.³

Dirk C. Fleck has been perhaps the most determinedly eutopian of all cli-fi writers in contemporary Germany. An environmental activist, professional journalist and SF writer, he won the Deutscher Science Fiction Preis for best novel in 1994 for *GO! Die Ökodiktatur* (1993) and again in 2009 for *Das Tahiti-Projekt*, the first in the *MAEVA!* trilogy. Since 1993 Fleck has been a supporter of the Equilibrist Society founded by Eric Bihl and Volker Freystedt, the central idea of which is ‘Lasst uns mit der Natur wirtschaften und nicht gegen sie!’ [‘Let us work with nature, not against it’]. The trilogy itself comprises *Das Tahiti-Projekt* (2008), *MAEVA!* (2011), reissued as *Das Südsee-Virus* in 2013, and *Feuer am Fuss* (2015). And the society actively promotes it on its website as ‘Die Vision wird fühlbar’ [‘The vision becomes tangible’] (Equilibrismus, 2017). *Das Tahiti-Projekt* is set in 2022, *MAEVA!* in 2028 and *Feuer am*

³ This utopianism is genuinely Robinson’s own, not merely that of the novel. As he has recently explained: ‘We could use the Democratic Party ... to elect a majority in Congress to enact a New Deal flurry of changes. Corporations could squeal but they couldn’t make the army go onto the streets against the people. In this country the corporations can’t do that’ (Robinson and Feder, 2018: 97). In *Red Moon* – which is not actually cli-fi – Robinson projects similarly utopian aspirations on to the Chinese Communist Party: ‘People were in the streets, but mainly to celebrate a return to democracy ... It was hard to shoot such crowds. In that fundamental sense, it was the same in China. The army and security forces were so far holding off’ (Robinson, 2018: 432). This vision of both the United States and the People’s Republic, the Democratic Party and the Communist Party, seems to us as improbable in reality as in fiction.

Fuss in 2035, and in combination they recount the immediate future history of a world threatened by climate collapse, but ultimately saved by Equilibrist notions propounded by Maeva, originally as president of Tahiti, later as head of the 'United Regions of the Pacific', later still of the 'United Regions of the Planet' (Fleck, 2011: 209). The URP develops initially as a loose ecotopian alternative to the old United Nations, inspired by the success of Maeva's Tahiti-Projekt, but soon opens itself up to sub-national regions like Alaska, South Tyrol, Dithmarschen and Alsace as well as to nation states (Fleck, 2011: 209).

As Maeva herself summarises the aims of the Pacific-wide extension of the Tahitian Projekt in her opening address to the URP:

Zum ersten Mal in unserer Geschichte sind wir mit der selbst verursachten Zerstörung aller biologischen Grundlagen konfrontiert. Keine Generation vor uns hatte eine solche Bedrohung auszuhalten. Die eigentliche Frage, die wir uns also zu stellen haben, lautet: kollektiver Selbstmord oder geistige Erneuerung?

[For the first time in history we are confronted with self-caused destruction of all biological resources. No previous generation had to deal with such danger. The question we are faced with is: collective suicide or spiritual renewal?] (Fleck, 2011: 65)

Spiritual renewal means, above all, a return to more traditional ways of life and to the wisdom of the shamans, as represented in Tahiti by Rauura. When the URP sends shamans out to newly recruited occidental regions as inverse missionaries, their task to advise on how to recreate sustainable society, the Lakota-Sioux Running Wolf tells the Alsatians that 'SEIN ist ein spirituelles Vorhaben, GEWINNSTREBEN ein materieller Akt. Ihrer Tradition folgend, haben die Indianer immer versucht, das bestmögliche Volk zu *SEIN*. Teil dieses spirituellen Prozesses war und ist es, Besitz wegzugeben' ['BEING is a spiritual intention, PURSUIT OF PROFIT a material act. Following their tradition, the Indians tried to *BE* the best possible people. A part of these spiritual processes was and is, to give away property'] (Fleck, 2015: 182). Much later Ehawee, another Lakota-Sioux shaman, will explain that 'Dies ist im Prinzip die ganze Weisheit meines Stammes. Wenn die Verschmutzung der Erde rückgängig gemacht werden soll, müssen wir als erstes die Verschmutzung in unseren Herzen und Köpfen beseitigen' ['This is in principle the entire wisdom of my tribe. If the pollution of the Earth is to be made to recede, we have first to rid ourselves of the pollution in our hearts'] (Fleck, 2015: 305). For a shaman, albeit a professor, Running

Wolf is very au fait with the Western philosophical canon, citing Newton, Descartes, Locke, Adam Smith, Hegel and Marx as instances of ‘alten europäischen Konflikt zwischen Sein und Gewinnstreben, man könnte auch zwischen SEIN und NICHTSEIN sagen’ [‘the same old European conflict between being and the pursuit of profit, one could also say between BEING and NOT-BEING’] (Fleck, 2015: 181–182). It is very difficult not to read this as an instance of cli-fi primitivism, projecting a Western counter-ideal on to an idealised non-Western other.

Maeva herself is the trilogy’s key political actor, whether understood as a concrete individual or as ‘der Maeva-Mythos ... im Cyberspace möglich geworden’ [‘the Maeva-Mythos ... made possible by Cyberspace’] (Fleck, 2011: 170). But its protagonist and sometime narrator is her much older lover, the German Cording, a journalist who works for the British news magazine *EMERGENCY*. Their relationship can itself at times be read as an instance of eroticised primitivism, in so far as Maeva is young, beautiful and Polynesian, Cording middle-aged, cynical and European. At the end of *MAEVA!* Rauura and Maeva’s brother Omai, who are opposed to her role in the URP, stage a coup in Tahiti, banish her to the remote island of Rapa Iti, and announce that she has been killed in a plane crash. Cording has in fact also betrayed her by agreeing to spy on her for them. This is the moment of greatest danger to Maeva, to which she responds in the most traditional of spiritual terms, by receiving a full-body tattoo, thus becoming transformed into a Tupapa’u, or Tahitian mythical avenger. At the beginning of *Feuer am Fuss* she emerges from hiding, becomes reconciled with Omai, and sets out to strengthen and further promote the URP. They also attempt to win over one of the more dynamic and charismatic of the mega-rich leaders, Malcolm Double U. But Maeva and Cording are never reconciled: he is diagnosed with a fatal illness, flies to Mali where they spent time together in 2028, and walks off into the Sahara Desert, effectively committing suicide (the cover illustration depicts precisely this scene).

Re-enthused, ‘Die URP-Regionen nehmen inzwischen ein Viertel der gesamten Oberfläche ein’ [‘The URP-Regions now takes up one quarter of the surface of the Earth’] (Fleck, 2015: 208). And the ecotopian restructuring of the Regions radically transforms their mode of production. In Alsace, ‘Viele Bauern sind dazu übergegangen, wieder mit Pferden zu arbeiten anstatt mit Traktoren. Die Massentierhaltung ist abgeschafft, die überwiegende Zahl der Elsässer ist Vegetarier geworden’ [‘Many farmers had already begun working with horses instead of with tractors. Mass animal husbandry has been abolished, the overwhelming majority of Alsatians have become vegetarian’]. Moreover, ‘Feldfrüchte und Bäume existieren ... in freundlichster Partnerschaft. Auf den einst Tristen

Ackerflächen wachsen nun Pappeln, Eichen und andere Bäume in langen Reihen' ['Crops and trees exist ... in the friendliest of partnership. On the once sad paddocks, poplars, oaks and other trees grow in long rows'] (Fleck, 2015: 315). Interestingly, this is not primitivism – Fleck is at pains to stress that the Alsatians had adopted such measures well before the arrival of the Lakota-Sioux delegation – but rather a reference back to Europe's own pre-industrial past reminiscent of *News from Nowhere*: one thinks of Morris's orchards near the site of what had once been Trafalgar Square (Morris, 1977: 221–222). This transformation massively enhances the health and vitality of the planet. As Malcolm Double U tells Maeva: '[D]er CO₂-Ausstoß auf der Erde auf den Stand von vor hundert Jahren zurückgegangen war' ['[G]lobal CO₂ emissions had returned to the level of a hundred years ago']. Moreover, he also reports on 'den neuesten Schätzungen zur Bevölkerungsentwicklungen berichten, die übereinstimmend zu belegen glaubten, dass die Zahlen stagnierten oder sogar rückläufig waren' ['the newest estimates of population growth, which agree that the number is either stagnating or is decreasing'] (Fleck, 2015: 341). Add to this the fact that the URP is now financially secure and we know that we are on our way to eutopia.

It is a critical eutopia characterised by both difference and imperfection, as in the struggles between Maeva's cosmopolitanism and Rauura's localism. Indeed, Fleck's handling of alternative ecotopian visions is at times very astute. One of the trilogy's more interesting sub-plots is in the encounter between the URP and the Californian ecodictatorship of ECOCA. The similarity between ECOCA and Callenbach's original *Ecotopia* is no doubt intentional, as is the commentary that likens it to Kampuchea under the Khmer Rouge (Fleck, 2011: 246). In *Feuer am Fuss* Cording travels to ECOCA to report on the impending show-trial of kidnapped former President Obama, who is charged with a capital offence of having given Monsanto free reign in the then still United States. But, as with Robinson's *New York 2140*, the trilogy's key weakness is that its happy endings come far too cheaply, Cording's death notwithstanding. In reality not only is there no Maeva and no URP, but Tahiti has not even gained independence from France. Nor do there seem to be many billionaires willing to fund experiments like the URP. In short, this trilogy's eutopia is also 'utopian' in the pejorative sense of being hopelessly impractical. That its utopianism is projected on to an exoticised and eroticised non-Western other merely compounds the problem. As Gabriele Dürbeck has observed, Fleck's 'depiction of Tahiti and the Tahitians is filled with a kind of problematic exoticism that jeopardizes the ecological worth and broad applicability of the book' (Dürbeck, 2017: 326).

As we noted in the previous chapter, Atwood's *MaddAddam* provides the eutopian conclusion to her primarily dystopian cli-fi trilogy. Set in the immediate aftermath of the first two novels, the Earth's climate is as damaged as ever, but the very success of Crake's JUVE virus has opened up the prospect of a Gaian revival, since 'with the people gone from the cities and roads, who knew how soon the bears would begin to come down from the north?' (Atwood, 2013: 14). But Atwood later undercuts this option, observing that: 'Speculations about what the world would be like after human control of it ended had been – long ago, briefly – a queasy form of popular entertainment ... earnest experts lecturing about all the wrong turns taken by the human race' (Atwood, 2013: 32). Not Gaia, then, nor mitigation since it is far too late for any of that. So, as in the first two volumes, the key question becomes adaptation, initially mainly negative, but ultimately positive. The novel opens with Ren and Toby, the main protagonists of *The Year of the Flood*, rescuing Amanda Payne, another onetime Gardener, but also a onetime girlfriend of Jimmy, the Snowman, the surviving protagonist in *Oryx and Crake*, from two violent 'Painballer' criminals. Ren, Toby and Amanda meet up with Jimmy and the Crakers, and begin to build some kind of community, while nonetheless also struggling to ward off the vengeful Painballers. The narrative is initially focussed on Toby, but her love affair with Zeb, the Adam Seven of *The Year of the Flood*, leads us into his distinctly cyberpunk – or perhaps, more accurately, biopunk (Schmeink, 2016: 72) – backstory, which in turn leads into the story of how his half-brother Adam had become the Adam One of the God's Gardeners. So, Zeb tells his story to Toby and she re-tells this story to the Crakers. *MaddAddam* is a story about storytelling, then, which ends appropriately enough with two short chapters entitled 'Book' and 'The Story of Toby', both concerned above all with the logic of storytelling.

All this storytelling has two important functions. Extratextually, it fills in for the reader the gaps left by the first two volumes, explaining the connections between Adam and Zeb, the God's Gardeners, the MaddAddamite scientists and Crake. This allows Atwood to pursue her satire on late-capitalist and – in the novel – late-human society. So, for example, in Santa Monica, 'rising sea had swept away the beaches, and the once-upmarket hotels and condos were semi-flooded. Some of the streets had become canals, and nearby Venice was living up to its name' (Atwood, 2013: 168–169). Intratextually, however, it serves to demonstrate how a community between the few surviving humans, the Crakers and eventually the Pigoons – intelligent, telepathic genetically modified pigs – can be built around Toby's storytelling and the communal mythology thereby produced. As Atwood reminds us

at the novel's outset, Crake had tried to rid the Crakers of symbolic thinking and music, 'but they have an eerie singing style ... and have developed a religion, with Crake as their creator, Oryx as mistress of the animals, and Snowman as their reluctant prophet' (Atwood, 2013: xiii). All that their religion now lacks is a written culture and a sacred book, which Toby eventually provides them. Her amanuensis will be Blackbeard, the young Craker child whimsically so named by Crake, who regards her as a font of all wisdom (Atwood, 2013: 92). She teaches him to write (Atwood, 2013: 202–204) and he will conclude the novel by reading from her Book and also 'from the Story of Toby that I have written down at the end of this Book' (Atwood, 2013: 388), which tells of Zeb and Toby's deaths.

Storytelling aside, in the post-catastrophic present very little happens in *MaddAddam*: the Painballers continue to threaten the nascent community; Toby tends Jimmy-the-Snowman back to health; humans and Crakers interbreed; humans and pigeons are reconciled around a mutual agreement, brokered by Crakers, not to kill or eat each other; Adam One turns out to be still alive but a prisoner of the Painballers; there is a final battle in which the community defeats and kills the Painballers, but Adam and Jimmy are both killed; and that is about it. But a eutopia has been created nonetheless. So, Blackbeard reads from the Book, telling of how Crake and Oryx 'together they made us, and made also this safe and beautiful World for us to live in' (Atwood, 2013: 385). It is a critical eutopia, marked by difference, between humans, pigeons and Crakers, and imperfection, as in the sexual jealousies between Toby and the much younger and aptly named Swift Fox. More importantly, it is strictly speaking a posthuman rather than human eutopia. For, as Toby has already explained to the Crakers, Crake had understood that:

The people in the chaos cannot learn. They cannot understand what they are doing to the sea and the sky and the plants and the animals. They cannot understand that they are killing them, and that they will end by killing themselves ... Either most of them must be cleared away while there is still an earth, with trees and flowers and birds and fish and so on, or all must die when there are none of those things left. Because if there are none of those things left, then there will be nothing at all. Not even any people. (Atwood, 2013: 291)

So, he made the 'Great Emptiness' within which their community could finally flourish.

We have criticised both Robinson's *New York 2140* and Fleck's *MAEVA!* trilogy for their utopianism, which might seem an odd charge to level against such deliberately eutopian texts. But we were careful to specify in each case that we meant utopian only in the pejorative sense of being hopelessly impractical. We should add here that this impracticality is a purely textual matter, not a question of whether or not such ideas would or would not work in the real world, but rather that there is no real intratextual plausibility to the mechanisms by which the eutopia is achieved within the novels. A comparison with Morris's *News from Nowhere* will serve to make the point. Whatever we make of Morris's eutopia, and even if we positively prefer Bellamy's *Looking Backward*, the processes by which it is achieved through the revolution of 1952 are entirely plausible, unsurprisingly so perhaps, in so far as they both rehearse the real history of the Paris Commune and in some respects anticipate that of the Russian Revolution (Morris, 1977: 286–320). Neither Robinson nor Fleck manage to carry this off. But Atwood surely does. In terms of the internal logics of her trilogy, the eventual posthuman eutopian outcome makes perfect sense. As a real-world prospect it offers precious little consolation for the millions to be wiped out by Crake's BlyssPluss pill, but the fictional logic is nonetheless impeccable. As the novel concludes:

Thank you.

Now we will sing. (Atwood, 2013: 390)⁴

3. Cli-fi Narratives in Summary

In this and the previous six chapters we have been concerned primarily with narrative fictions, mainly novels, but also to some extent graphic novels and short stories. In Chapter 8, we deliberately shift focus towards other media, where the framing categories we borrowed from utopian studies will inevitably appear less relevant. Before proceeding thence, however, it would be as well to summarise our findings to date. We should begin by questioning the common assumption that classical

⁴ Interestingly, Craig Russell's *Fragment*, another Anglophone Canadian climate fiction, begins as a base reality text, but ends in a similarly posthuman eutopian outcome, when 'the Nation of Whales, claiming ownership of everything outside the 200 mile coastal limits' is admitted to the United Nations (Russell, 2016: 212). The closing line, 'It is time to sing again' (Russell, 2016: 214), refers to whale song, but nonetheless also echoes *MaddAddam*.

dystopias are either less complex or less rhetorically effective than critical dystopias. As we have seen in the cases of Winterson's *The Stone Gods* and Liu's *三体*, classical dystopias can in fact be richly complex. Much secondary commentary in utopian studies seems to work on the assumption that the most persuasive dystopian texts will be 'critical', in Baccolini and Moylan's sense of maintaining an intratextual utopian impulse. But we doubt this need be so. Quite the contrary, a text might well be more persuasive as extratextual warning the more completely it eliminates resistance from within itself. The distinction between classical and critical dystopia is certainly worth making formally, but it need not and should not operate invidiously. Relatedly, we need also to be wary of the similarly common assumption that 'genre' texts are necessarily less complex or less rhetorically effective than 'literary' texts. Robinson's genre fictions *Aurora* and *New York 2140* are as formally complex and arguably at least as rhetorically effective as Atwood's more 'literary' *MaddAddam* trilogy. This is to restate empirically the case we previously advanced theoretically, against both Rieder and Ghosh, that the binary opposition between 'literary' and 'genre' fiction is a distinction fundamentally not worth the making. Some individual texts are more formally complex than others, no doubt, and some individual readers more sophisticated than others, but these variations have no bearing on the matter of any supposed hierarchy of genres.

Moving from form to substance, we can begin by noting the relative decline of mitigation as an organising motif in climate fiction. Indeed, the technofix of climate engineering, which derives very directly from earlier pulp SF tropes, seems to figure prominently only in the early stages of the sub-genre, as for example in Herzog's *Heat*. Just as the scientific consensus abandoned mitigation in favour of adaptation so too has SF. It is worth noting, however, that climate engineering has been an increasingly salient feature in Robinson's recent SF. Mitigation is nonetheless an increasingly rare motif in cli-fi more generally, while negative adaptation has become increasingly common and is now almost certainly the dominant variant among both classical and critical dystopias. Moving from dystopia to eutopia, we can observe that there seem to be far fewer climate eutopias than climate dystopias. There is a case to be made, nonetheless, that these are likely to become more culturally significant as the climate crisis develops: when the climate heats up so too will the writing. There are certainly a few critical eutopias, albeit not classical eutopias, already available in commercially published climate fiction. Finally, we should note that there seem to be more base reality texts than there are eutopias. Logically, these could include all six of our responses to anthropogenic warming, but

empirically we have been able to identify instances only of denial, mitigation, negative and positive adaptation, and fatalism, but not of Gaia. Such as they are, then, these are our findings with respect to the climate novel. In Chapter 8 we will turn to cli-fi in other media.

Chapter 8

Cli-fi in Other Media

In Chapter 2 we established an ideal typology of climate fictions that we used to structure our analyses of particular cli-fi novels or novellas in Chapters 4–7. But in Chapter 2 we also referred in passing to climate fiction in other media and promised some further analysis of these. Here, we try to deliver on that promise, at least in so far as it applies to other kinds of print media (short stories, published poetry, comics and graphic novels), recorded popular music, and audio-visual media (cinema, television and videogames). There are, of course, other relevant cultural forms: one thinks, for example, of *Flooded McDonald's* (2017–2022) by the Danish art collective Superflex, currently on exhibition at Das Naturhistorische Museum Bern; or of the decayed and flooded Sydney Opera House on the home page of Hisaharu Motoda's *Artworks* (2018). But these fall outside our own areas of expertise and one sometimes simply has to admit to one's limitations. In any case, the forms on which we have chosen to focus are all mechanically or electronically reproducible, therefore more likely to reach wider audiences, and thus more central, sociologically speaking, to our more general culture.

1. Other Print Media

The three major narrative forms of written SF are the trilogy, the novel (and novella) and the short story. Thus far, we have been mainly concerned with novels and trilogies, apart from in our opening discussion of the pre-history of cli-fi in American pulp fiction. We turn now to a slightly more detailed account of short story fiction. Before we do so, it is worth registering a crucial difference between the longer and short forms. The often-made claim that SF is a 'literature of ideas' is actually much more applicable to the trilogy and the novel than to the short story. The very shortness of short stories predisposes them

against narrativising complex ideas and towards what we might term 'conceits', in the sense of the surprising comparison often delivered by way of a concluding 'twist' in the tale. This said, a number of cli-fi short stories are indeed readily available in print. Jean-Louis Trudel's *Les Marées à venir* (2009) and Alexander Weinstein's *Children of the New World* (2016) are both collections of short-form fiction that envision a range of different futures, some of which can very plausibly be read as climate fiction. Yann Quero's edited collection *Le Réchauffement climatique et après ...* (2014) brings together cli-fi stories by 15 contemporary French writers. *Everything Change* (2016), edited by Manjana Milkoreit, Meredith Martinez and Joey Eschrich, is a free-to-download anthology that draws its title from Margaret Atwood. It features 12 stories from Arizona State University's 2016 climate fiction short story contest, judged and selected by Kim Stanley Robinson, who provides it with a foreword, and bookended by a concluding interview with Paolo Bacigalupi by Ed Finn. Porter Anderson's *Warmer* (2018) is an Amazon Original edited collection available on Kindle, explicitly marketed as short cli-fi, which includes contributions by Pulitzer Prize winner Jane Smiley and National Book Award finalists Lauren Groff and Jess Walter. But two short story collections stand out both for the high profile of their contributors and for their singular focus on anthropogenic climate change, Mark Martin's *I'm With The Bears: Short Stories From a Damaged Planet* (2011) and Gregory Norminton's *Beacons: Stories For Our Not So Distant Future* (2013). Interestingly, in both cases the anthology format imposes a kind of cli-fi narrativity on individual stories that do not necessarily possess it in isolation.

The title of *I'm With The Bears* refers to a line from Dave Foreman's 'Strategic Monkeywrenching', a chapter in the collectively authored anarcho-environmentalist *Ecodefense: A Field Guide to Monkeywrenching* (1993). The line in question, which also provides the collection with an epigraph, reads: 'John Muir said that if it ever came to a war between the races, he would side with the bears. That day has arrived' (Foreman, 1993: 25). As title and epigraph suggest, and as the 'Introduction' by 350.org's Bill McKibben affirms: 'These stories ... represent a real departure from most literary work. Instead of being consumed with the relationships between people, they increasingly take on the relationship between people and everything else' (McKibben, 2011: 3–4). The collection comprises a concluding prose poem by Atwood and nine short story length contributions by a number of well-known cli-fi novelists, including Bacigalupi, Robinson, T.C. Boyle, Nathaniel Rich, David Mitchell and Toby Litt. Boyle's 'The Siskiyou, July 1989' tells of an environmentalist protest forestalled by the local sheriff's counter

blockade. Its concluding line – ‘If a protest falls in the woods and there’s no one there to hear it, does it make a sound?’ (Boyle, 2011: 33) – bespeaks a sad blend of heroism and fatalism. Robinson’s ‘Sacred Space’, a vivid description of a hiking trip in the Californian Sierra Nevada, is actually an extended extract from *Sixty Days and Counting*, which perhaps does not quite work as a short story. Rich’s ‘Hermie’ is the sadly comic story of a marine biologist attending an academic conference, suddenly confronted by a talking hermit crab, the Hermie of the title, with whom he played as a child. Litt’s ‘Newromancer’ – the play on *Neuromancer*, both in the title and in its closing line is deliberate – is a fantasy love story set in a 2040 so desperately short of resources that Britain has decided ‘to reenact the events of 1940 *exactly* a hundred years to the day later’ (Litt, 2011: 120). Mitchell’s ‘The Siphoners’ is, as we have already noted, an early draft of what would become a chapter in *The Bone Clocks*. But, as we also noted, Mitchell’s novel is structured as a series of comparatively self-contained individual chapters held together by an overarching fantasy narrative. Stripped of the frame struggle between horologists and anchorites and with paraffin substituted for solar panels, ‘The Siphoners’ is a darkly pessimistic story that concludes with Avril Bredon, its counterpart to Holly Sykes, realising she has no choice but to opt for ‘mercy beans’, that is suicide pills (Mitchell, 2011: 137, 139). Bacigalupi’s ‘The Tamarisk Hunter’ is also an early draft for a later novel, in this case *The Water Knife*, but here rehearsing, not so much the plot, as the *mise en scène* of a future American South West starved of water by the Californian ‘Calies’.

Norminton’s *Beacons* is perhaps a less high-profile gathering of voices with an at times distinctly Scottish flavour, featuring stories by Alasdair Gray, Joanne Harris, Liz Jensen, Adam Thorpe, A.L. Kennedy and, once again, Toby Litt, and guided throughout by Norminton’s introductory edict that: ‘If hope is a moral imperative, telling stories may be one way of obeying it’ (Norminton, 2013: ix). In ‘A Is For Acid Rain, B Is For Bee’, Harris ponders the near future extinction of bees through the eyes of a child stumbling upon a rare, real bee while playing football in the park. In ‘Goodbye Jimmy’, Gray uses the distinctly Scottish conceit of ‘The Head’ and ‘Jimmy’ meaning God and his son, to debate the imminent demise of the world. Ushering Jimmy out of his office, The Head explains with a paternalistic wave of the hand that: ‘Fossil fuels should be exclusively used as fertilizer, and housewives when shopping should use net bags instead of the plastic sort which add to the price of what they buy.’ To which his son replies: ‘Nobody with wealth and power will believe me if I say that! ... Owners of companies wrecking the ecosphere are buying self-sustaining bunkers where they and their

like can survive when everyone else is poisoned!' (Gray, 2013: 33). In 'We're All Gonna Have the Blues', Rodge Glass uses flood to great literal and metaphorical effect, describing a claustrophobic conversation between a chief campaign consultant and the leader of a major European environmentalist political party in a subterranean jazz club in Krakow. The drunker they get, the more their talk turns to the slow violence of climate change: 'And this is when he sees it happening, at the back end of one of our bleakest days, the water steadily rising, creeping up on us like old age' (Glass, 2013: 44). This decidedly non-apocalyptic prognosis is framed in clearly fatalistic terms: 'he was gonna give up the game for good. Buy a hut on top of a hill and hope the waters didn't reach him' (Glass, 2013: 53). Glass uses the discourse of fatalism to especially dramatic effect in the story's closing moments, when the politician goads his consultant with a vision of the waters breaking the banks of the Vistula. And, as they turn toward the club entrance, there is a sudden 'force pushing against the door' (Glass, 2013: 54).

The short stories in *Beacons* range from grittily realistic to wonderfully fantastical and even absurdist climate fictions. At the realist extreme, we find Clare Dudman's 'Like Canute', in which publisher Sophie, after reading an eco-villagist manifesto, is fired for recommending its publication. The story ends on what is becoming a recurrent cli-fi leitmotif, that of a bee pollinating. In 'Meat', A.L. Kennedy depicts a father born sufficiently long ago to recall talk of meat consumption, who attempts to cook a contraband portion of red meat to share with his son. In 'What Is Left to See?', James Miller, author of the eco-thriller *Sunshine State* (2010), develops a formally experimental piece, framed by the story of a writer in Greece hearing about a superstorm landing on the east coast of the United States, but chiefly focussed on the permanent floodscape of Florida in 2037 by way of online exchanges between #Me5elle and her friends. The twist is that these exchanges are themselves works of fiction produced by the writer: '[S]he was writing a story about a girl from the future in the form of her diary and conversations with friends. This way the reader would find out what had changed in the world and what was still the same' (Miller, 2013: 91). At the more fantastical end of the speculative narrative range, Toby Litt's 'The Gloop' frames a philosophical analogy about the Anthropocene by way of an ice-cream sundae; Tom Bullough's 'The Red Waste' is a post-catastrophic depiction of a violent pagan wasteland; Holly Howitt's 'The Weatherman' imagines a future society in which wealthy cities maintain their wealth by technologically controlling the weather, producing clement conditions at the metropolitan core while desertifying peripheries known as 'sandtowns'. In Lawrence Norfolk's 'Earthship'

desert-based eco-communes in landbound arks follow a charismatic cult leader in anticipation of the eventual Great Flood.

Short-form fiction tends to occlude long-term processes of climate change, focussing rather on what Robinson, in discussion with Gerry Canavan, calls 'moments of dramatic breakdown' precisely because these 'are narratizable' (Canavan and Robinson, 2014: 243). This might explain why post-catastrophic fatalism features so strongly in short fiction. But, as Robinson continues, 'if we do that we're no longer imagining the peculiar kinds of ordinary life that will precede and follow' those moments (Canavan and Robinson, 2014: 243). The novel form, he concludes, is generally better suited to the grander narrative demands of anthropogenic climate change because 'the novel proper has the flexibility and capaciousness to depict any human situation ... That's what the modern novel was created to do, and that capacity never leaves it' (Canavan and Robinson, 2014: 245). This is not necessarily to endorse the pessimism commonplace in literary magazines about the supposedly terminal state of short fiction. The recent popularity of the SF anthology television series hints, to the contrary, at the form's possibilities for adaptation. Both *Black Mirror* (2011–19) and *Philip K. Dick's Electric Dreams* (2017) suggest that short climate fiction might be well suited to television and streaming services. Its non-appearance to date has been more an effect of television's general reluctance to deal in cli-fi than of any particular problems with shorter narrative forms.

Like short fiction, climate change poetry is published overwhelmingly in anthologies. Poetry is, no doubt, less amenable to analysis through our earlier ideal typology than are many other literary forms, since it tends towards the lyric rather than the narrative. According to Adeline Johns-Putra, climate change poetry draws on ecopoetics rather than on older forms of nature poetry. 'Ecopoetry', she writes, 'can be distinguished from traditional nature poetry by its emphasis on the interconnectedness of human and nonhuman life in a time of unprecedented anthropogenic environmental damage' (Johns-Putra, 2016: 271). She locates the beginnings of climate change poetry at the turn of the millennium, citing two publications as foundational, Jonathan Skinner's *Ecopoetics* in the United States and Peter Abbs's *Earth Songs* in Britain; and two more recent British anthologies as seminal, Neil Astley's *Earth Shattering* and David Knowles and Sharon Blackie's *Entanglements* (Skinner, 2001; Abbs, 2002; Astley, 2007; Knowles and Blackie, 2012).

The Guardian newspaper's online climate change poetry initiative, 'Keep It in the Ground', curated by the British poet laureate Carol Ann Duffy, was also significant. Described as 'a climate change poem a day', its 20 original poems are packaged as multimedia, partnered

with complementary art or photography and, in all but four cases, embedded audio readings by high-profile actors such as James Franco, Jeremy Irons, Michael Sheen, Maxine Peake, Ruth Wilson, Iain Glen and Iwan Rheon. While *The Guardian* has a history of partnering poetry with environmental causes, for example its '10:10' campaign to reduce carbon emissions in 2009, Duffy's curation deals quite explicitly with anthropogenic climate change. Moreover, its writers relate intertextually to prose cli-fi. David Sergeant, for example, opens his 'A Language of Change' with an epigraph drawn from Robinson's *2312*: '[A]s capitalism writhed in its internal decision concerning whether to destroy Earth's biosphere or change its rules' (Sergeant, 2015). At its core this collection is defined by the hermeneutics required to grasp the interconnected complexity of the Anthropocene. In 'Extinction', Jackie Kay finds 'We closed the borders' to correspond to 'No birds, no bees ... no Poles, no pollen ... No polar bears, no ice, no dice' in a series of dizzying associations (Kay, 2015). In 'Still Life with Sea Pinks and High Tide', Maura Dooley speaks more directly to how 'Our melting, shifting, liquid world won't wait for manifesto or mandate, each warning a reckoning' (Dooley, 2015). In 'Nostalgia', Don Paterson speculatively laments:

Last night when the waters rose again
 I rowed out to the beeless glade
 and lay down on the grass. My sister
 taught me to watch the stars this way
 lest I think that heaven was up, or heaven,
 lest I forget the stars are below us
 where they sink and sail into the dark like cinders. (Paterson, 2015)

The digital anthology format is crucial in so far as it can embrace a wide array of poetic forms – some more specifically engaged with anthropogenic climate change than others – under the single banner of climate change poetry. In isolation each composition might not be easily read thus, but in sequence they clearly are.

Comics and graphic novels, or 'illustrated literature' as Stan Lee describes them (Lee, 2009: 4), have a substantial albeit very recent history of storytelling about climate change. In Chapter 1 we discussed Jean-Marc Rochette and Jacques Lob's 1984 *Le Transperceneige* at some length and also its 2013 cli-fi cinema adaptation as *설국열차/Seolgungnyeolcha*. Setting aside the first two of Rochette's three sequels, all of which take anthropogenic global cooling as their *mise en scène*, cli-fi graphic literature generally commences around 2010. Josh Neufeld's non-fiction best-seller *AD: New Orleans after the Deluge* (2010), nominated for both an Eisner and

Harvey Award, recounts the experiences of a handful of residents during and after Hurricane Katrina. Grant Calof and Eric Eisner's *H2O* (2011) is an uninteresting single-issue comic, depicting a not-too-distant future in which an attempt to geoengineer rainfall destroys the atmosphere. Image Comics's *Great Pacific* series (2013–15), written by Joe Harris and drawn by Martín Morazzo, details how errant oil heir Chas Worthington attempts to settle a sovereign nation on a floating island of garbage, in the midst of environmental catastrophe and resource hyper-exploitation. Rochette and Olivier Bocquet finally concluded the *Transperceneige* series with *Terminus* (2015). The *Dark Fang* series (2017–18), written by Miles Gunter, drawn by Kelsey Shannon and published by Image, is promoted as an 'ecological action series', which follows Valla, an underwater vampire turned eco-warrior, whose home is destroyed by an oil spill and who subsequently hunts down oil barons and government officials.

The longest running and perhaps most famous Anglophone cli-fi text in graphic literature is Brian Wood's *The Massive* (2012–14), published by Dark Horse. Set on the environmental-action trawler *Kapital*, Captain Callum Israel and his crew search the earth for its sistership *The Massive*, which went missing sometime during the year long global 'Crash'. Wood is a major figure in the graphic novel, whose oeuvre includes *DMZ* and *Northlanders* as well as stints writing for *X-Men* under Marvel and *Star Wars* under Dark Horse. *The Massive* offers a particularly poignant, albeit nihilistic, assessment of what it might mean to be an environmentalist in a dying world. Although prone to radical apocalypticism, the series subverts this formally and stylistically. Wood's depiction of anthropogenic climate catastrophe is tonally subdued and refreshingly non-fetishist. As Jamais Cascio points out in his introduction to the first volume: '*The Massive* ... doesn't revel in destruction; when scenes describing the planetary crisis show up, they make clear that this was a true disaster, not a disaster movie' (Cascio, 2012: i). Wood condenses the urgency and temporality of climate collapse into a single year as a narrative device, rather than an illogical extrapolation from real-world science. *The Massive* therefore functions as analogy, an unusually experimental feature given the form's general reliance on literal exposition. As Cascio explains, *The Massive* does not explicitly blame the Crash on anthropogenic climate change, but nonetheless nearly all its fictional disasters 'parallel the kinds of real-world problems we could very well see over the course of the next century' (Cascio, 2012: i). The gaps in Wood's narrative, never expressly connected for the reader, seem a strategic necessity of its formal composition. As in McCarthy's *The Road*, to name the apocalypse would be to unravel the analogy and so reduce its narrative and philosophical depth to a kind of environmental alarmism.

2. Recorded Popular Music

There is a rich tradition of SF in popular music. Important examples include: in Britain, David Bowie during the Ziggy Stardust years, Hawkwind, which intermittently included Michael Moorcock as a band member, and Pink Floyd; in Germany, Kraftwerk; and in the United States, Jefferson Starship. But there has until very recently been little in the way of specifically cli-fi oriented music. The time lag between the emergence of cli-fi in literature and in music is thus very marked. Whereas literary cli-fi seems to have developed as a more or less direct response to the scientific consensus, chronology suggests that cli-fi music probably developed as a response to climate politics rather than climate science. So, musicians became very publicly involved in calls for action over climate change during the run up to the 2015 United Nations Climate Change Conference in Paris, when an open letter calling for an 'ambitious and inspiring international agreement' (Monroe, 2015) was signed by Björk, Thom Yorke of Radiohead, Bowie, and Damon Albarn of Blur and Gorillaz. Pathway to Paris, at which Yorke performed, was designed to bring 'musicians, artists, activists, climate change experts, academics, politicians and innovators to participate in a series of events, dialogues and leading initiatives to help turn the Paris Agreement into reality' (Pathway to Paris, 2015). But even in 2015 Yorke himself remained sceptical about the prospects for a cli-fi equivalent to the 1960s protest song:

Dans les années 60, les chansons contestataires étaient assez efficaces. Mais si j'écrivais une protest song sur le changement climatique en 2015, ce serait vraiment merdique. On ne peut plus changer les mentalités grâce à une seule chanson, un livre ou une œuvre d'art.

[In the 60s, you could write songs that were like calls to arms, and it would work ... It's much harder to do that now. If I was going to write a protest song about climate change in 2015, it would be shit. It's not like one song or one piece of art or one book is going to change someone's mind.] (Monbiot and Yorke, 2015)

Subsequent developments have nonetheless gone some way towards countering such scepticism. Here we need to distinguish between individual songs, which function much like individual poems, essentially in the lyrical mode, and concept albums, which can introduce significant elements of narrativity. Artists who have written and produced individual

songs include: Björk in Iceland; Stahlberger in Switzerland; Modest Mouse, Bad Religion, Ben Harper, Beastie Boys and John Grant in the United States; Radiohead and Billy Bragg in England; K.I.Z., Meyah Don, Alex E. Magnus, Gerald Voigts and Die Fantastischen Vier in Germany. Bragg deserves special mention for producing exactly what Yorke precluded, a 1960s style cli-fi protest song, his 'King Tide and the Sunny Day Flood' from the *Bridges Not Walls* EP (2017). But so too does Grant because his 'Global Warming' from *Grey Tickles, Black Pressure* (2015) is the rare example of a genuinely funny song about climate change.

Our main interest, however, is in concerted expressions of climate fiction across something like the length of an LP, where climate change functions as a kind of novum, in effect an album-length muse. Perhaps the earliest examples of loosely environmentalist LPs were Neil Young's *The Monsanto Years* (2015) and *Earth* (2016), but others have followed that are more explicitly directed at anthropogenic global warming. Chris Baio, of American indie-rock Vampire Weekend, performing solo on his *Man of the World* (2017) album, employs climate change as an intermittent narrative and thematic device. Moreover, the LP contains a cli-fi centrepiece, 'DANGEROUE ANAMAL', around which the entire album appears to hinge:

You can't see rise in temperatures
 With your own two eyes
 It's easy to ignore the cost
 When others pay the price
 ...
 Dangerous animal
 The waste of the world is palpable
 Try as I may, I can't quite seem to change my life
 I'll still eat meat
 And I still fly
 I pass my days
 However I like

Performing under the name Saltland in *A Common Truth* (2017), Rebecca Foon, the Canadian cellist and singer who co-founded Pathway to Paris, develops a song cycle that explores a deep range of emotional responses to climate change. Australian singer-songwriter Missy Higgins also casts an eye on climate change in her *Solastalgia* (2018), which takes its title from an article published in the journal *Australasian Psychiatry* concerning the psychic distress caused by environmental change. American Peter Oren's startlingly beautiful *Anthropocene* (2017) approaches the anthropogenic

end times in distinctly fatalistic terms: ‘So welcome to this record/And goodbye to this world/May a new one soon be unfurled.’ American garage artist King Tuff (Kyle Thomas) focuses on environmental collapse and globalised technophilia in his *The Other* (2018), while in *The Thread That Keeps Us* (2018) Tex-Mex indie-rockers Caalexico reflect on both border politics and environmental tragedies, specifically the catastrophic wildfires in California, where the album was recorded, and in their native Arizona.

The most powerful examples of the cli-fi album to date are almost certainly Kate Tempest’s *Let Them Eat Chaos* and Anohni’s *Hopelessness*, both of which came out in 2016. Tempest is a London poet, playwright, novelist and rapper, the album, which has been reviewed both as fiction and as music, an anthological collection of seven separate characters all awake at 4:18am on the same day. These individual narratives are set against various interlinked backdrops, ranging from the global financial crisis, socio-economic inequality and gentrification to climate change, and taking lyrical aim at capitalism, political corruption, celebrity culture and individualism. The album opens with ‘Picture a Vacuum’, a track that pays tribute to Earth’s beauty before zooming quasi-cinematically into a dystopian London:

Picture a vacuum
 An endless and unmoving blackness
 Peace, or the absence at least, of terror
 I see, and amongst all this space
 That speck of light in the furthest corner
 Gold as a pharaoh’s coffin
 Now follow that light with your tired eye
 Its been a long day, I know, but look
 Watch as it flickers and it roars into fulness and fills the whole
 frame blazing a fire you can’t bear the majesty of
 Here is our Sun
 And look
 See how the planets are dangled around it
 And held in that intricate dance
 There is our Earth
 Our Earth
 ...
 This is a city, let’s call her London
 And these are the only times you have known
 ‘Is this what it’s come to?’ You think
 ‘What am I to make of all this?’

On the album's standout track, 'Europe is Lost', Tempest dives into the grim material reality and systemic social relations that structure the Anthropocene: 'Traffic keep moving, proving there's nothing to do/'Cause it's big business, baby, and its smile is hideous/Top down violence, a structural viciousness ... The water level's rising! The water level's rising!/The animals, the elephants, the polar bears are dying!' Tempest has a keen eye for political injustice and is also a talented storyteller. *Let Them Eat Chaos* is thus a very significant protest album, but its real achievement lies in the way protest is invoked through narrative rather than polemic lyricism. The hopeless conditions of her characters, set against terrifying global realities that are very much our own, elevates this record into something poignantly affecting, not least when she laments in the final track, 'Tunnel Vision', that: '[We are] staring at the screen so we don't have to see the planet die.'

Hopelessness by Anohni, formerly Antony of Antony and the Johnsons and, like Tempest, British, marks a seminal moment in recent climate change music. Reviewing the album for *The Guardian*, Kitty Empire observed that Anohni 'takes the tragedies of our age – ecocide, drone warfare, loss of liberty – and confronts them with the aid of muscular electronic tunes' (Empire, 2016). The album's distinctly Anthropocene texture is drawn from a lyrical penchant for taking those disparate strands and piecing them together by way of their power relations. The United States, patriarchy and heteronormative value systems are thus the central culprits throughout, most emphatically on 'Execution', 'Violent Men' and 'Marrow'. Significantly, this last track, which closes the album, concludes that 'we are all Americans now'. The opening track, 'Drone Bomb Me', narrates the plight of an Afghani girl wishing for death now that her family are all dead, while 'Watch Me' denounces the vicissitudes of the contemporary surveillance state. The album can be fatalistic, yet hopeful by way of counterexample, focussing a keenly eutopian eye on how things could and should be. But that eye turns inward as well as out, deconstructing both our culture's grand narratives and the micronarratives we tell ourselves:

I don't care about me
 I feel the animals and the trees
 They got nowhere to go
 ...
 I've been taking more than I deserve
 Leaving nothing in reserve
 Digging till the bank runs dry
 I've been living a lie.

Anohni has produced an extraordinarily expansive collection of songs, interconnected as chronicles of our time. Climate change provides a constant thread throughout, but is foregrounded most fiercely in '4 Degrees', the refrain to which Anohni bellows angrily:

I wanna see this world, I wanna see it boil
 I wanna see this world, I wanna see it boil
 It's only four degrees, it's only four degrees
 It's only four degrees, it's only four degrees

This is a climate protest song with bite, a musical achievement that clearly trumps Yorke's earlier pessimism. In his review of 'the most profound protest record in decades', Tim Jonze wrote that: 'It would be wrong ... to say that *Hopelessness* is an album solely about climate change. The issues being raised here are multiple, making it exactly the kind of protest record Thom Yorke would say cannot exist in the modern age.' And later: 'It's tempting ... to think what Yorke might make of such a musical statement – as profound a protest record as anyone has made in decades, brimming with anger, and yet, somehow, oddly accessible' (Jonze, 2016).

With this album, cli-fi music might have come closer than cli-fi literature to a defining – or at least central – text, even though the more general participation rate has been much more delayed and much less significant quantitatively. Yorke might have been right, then, to suggest that the cli-fi song lacks the scale and depth commensurate with real-world anthropogenic global warming, that a protest song about climate change would therefore unavoidably be 'merdique', or shitty. The album, by contrast, might prove to be a more deeply effective popular form. What Robinson observed of the novel, that its generous size is best suited to narrating climate change, seems also to hold true for the LP.

3. Audio-visual Media

Cinema has a long history of involvement in SF, dating back to Méliès's *La Voyage dans la lune* in France and Fritz Lang's *Metropolis* (1926) in Germany. For both Méliès and Lang, the genre's appeal was located overwhelmingly around the use of special effects to achieve visual rendition of a novum. Unsurprisingly, then, cinema has been very productive of climate fictions, but these have typically been organised around the use of spectacular special effects. An early example is Kevin

Reynolds's *Waterworld* (1995), produced by and starring Kevin Costner, which was the most expensive movie ever made at the time and also, partly as a result, a short-term financial disaster. Set in the distant future in a world where the polar ice caps have long since melted, leading to rises in sea level that have submerged virtually all land, the remnants of humanity now live on floating artificial atolls. The protagonist played by Costner is a gilled human known only as the 'Mariner', pitted against the piratical 'Smokers' in a struggle both to discover the whereabouts of 'Dryland', located on what was once Mount Everest, and to rescue Enola, played by Tina Majorino, who has a map of its location tattooed on her back. The film introduced a number of key tropes into the Hollywood cli-fi movie: first, elaborately expensive special effects; second, the kind of hybridity in which climate change functions as a central science-fictional novum, but a non-SF element is actually dominant, in this case that of the 'action' movie; and third, ludicrously inaccurate science – there simply is not sufficient water in the icecaps to generate a near universal flood. All three tropes are reproduced in Stephen Spielberg's *A.I. Artificial Intelligence* (2001), where global warming provides the technically spectacular material context – witness the flooded ruins of Manhattan – for a retelling of Brian Aldiss's 'Supertoys Last All Summer Long' (Aldiss, 2001) as a near/far future version of Carlo Collodi's *Pinocchio*; in Roland Emmerich's *The Day After Tomorrow* (2004), where global warming is transformed into global cooling at an improbably rapid rate, leaving climatologist Jack Hall, played by Dennis Quaid, to struggle through the frozen wasteland of America's northern states, in order to rescue his son Sam, played by Jake Gyllenhaal, from the New York Public Library; and in Dean Devlin's *Geostorm* (2017), where the climate crisis is miraculously resolved through the invention of the 'Dutch Boy' system of climate control satellites, only to have this deliberately sabotaged and weaponised by the US secretary of state.

But such tropes are certainly not confined to Hollywood. The science is similarly marginalised and equivalently implausible in the Swiss film *Cargo* (2009), directed by Ivan Engler and Raph Etter, where a German-speaking, climate-ruined Earth has been abandoned in favour of life on orbital satellites and emigration to a supposed colony on the planet Rhea, which turns out to be merely a virtual reality simulation; in the South African film *Elysium* (2013), directed by Neill Blomkamp, in which Max Da Costa, played by Matt Damon, living in an English, French, Spanish and Afrikaans speaking, climate-ruined Earth, leads an unlikely revolution to overthrow the luxurious 'Elysium' space station into which the global ruling classes have retreated; in the Australian *Mad Max: Fury Road* (2015), directed by George Miller, which updates the

Mad Max franchise by injecting it with feminism and substituting scarce water for scarce oil; in the British *Kingsman: The Secret Service* (2015), directed by Matthew Vaughn, an unfunny denialist spoof of the James Bond films, which features Samuel L. Jackson as the environmentalist super villain Richmond Valentine, intent on using a 'neurological wave' to cull the human race; and in the Chinese 流浪地球/Liúlàng Dìqiú (2019) – in English *The Wandering Earth* – directed by Frant Gwo and based on a story by Liu Cixin, which is predicated on the extremely unlikely premise that the sun will die sometime during the twenty-first century and that humanity will respond by attempting to relocate the Earth away from the solar system.

Many of the more interesting films sometimes claimed for cli-fi are arguably not really about climate change at all. So, Andrew Stanton's highly acclaimed computer animation film *Wall-E* (2008) depicts a planet reduced to garbage by the excesses of corporate consumer capitalism, rather than by global warming. And Jeff Nicholls's haunting *Take Shelter* (2011) is as much about paranoia as about climatology. The most strikingly original of these borderline cases is *Interstellar* (2014), a Hollywood movie directed by the English Christopher Nolan, which depicts a future Earth where farming is in near terminal collapse and humanity has few choices but to search for an alternative home through interstellar exploration effected by way of wormholes, black holes and time loops. Cooper, played by Matthew McConaughey, is a retired NASA astronaut turned farmer who eventually pilots the *Endurance* interstellar spacecraft and who insists that 'Mankind was born on Earth. It was never meant to die here.' The compelling core personal relationship at the heart of the film is that between Cooper and his daughter Murph, played at different ages by Mackenzie Foy, Jessica Chastain and Ellen Burstyn, who grows up to be a NASA scientist. The film's science is at first sight improbable, but in fact almost wholly compatible with contemporary particle physics: Kip Thorne, Professor Emeritus of Theoretical Physics at Caltech, who went on to win the Nobel Prize for Physics in 2017, worked closely on the script with Nolan. This is perhaps the twenty-first century's most impressive SF film to date, but nonetheless it is never actually made clear what exactly is destroying terrestrial agriculture. As with *The Road*, it might well be about global warming, but then again it might not.

This takes us, finally, to movies that are definitely cli-fi but which also avoid the more obvious Hollywood clichés. The most striking is perhaps Franny Armstrong's *The Age of Stupid* (2009), a crowdfunding British independent film set in 2055, when London is flooded, Sydney on fire and India destroyed by nuclear war, and an anonymous archivist

alone in the ice-free Arctic, played by Pete Postlethwaite, examines the archive in an attempt to understand how climate change could have been avoided and why it was not. The film's mix of documentary, animation and future fiction is highly original and earned Armstrong inclusion in the *New Statesman's* 'Twenty Green Heroes' for 2009. Jake Paltrow's *Young Ones* (2014) is an independent US film, set in a future America so drought-stricken that people will kill for water. As the opening narration by Jerome Holm, played by Kodi Smit-McPhee, tells us: 'I never saw this land when it was green. My father did. He worked it before the drought came ... He always believed in the land. Even as the fights over water first divided states, then towns and then neighbours.' The three main characters, Jerome's father Ernest, played by Michel Shannon, the villainous Flem Lever, played by Nicholas Hoult, and Jerome himself, thus inhabit a parched landscape and increasingly brutalised society that allows Paltrow to recapitulate many of the tropes of the classic Western movie, especially male violence, murder and revenge. It does for the United States what *Mad Max: Fury Road* did not quite manage for Australia. A Hollywood blockbuster released in the same year as *Young Ones*, Darren Aronofsky's *Noah* (2014), retells the *Bereshith* story in ways that point directly towards the twenty-first century. In rough outline, the film follows the narrative set out in the Hebrew original, but this is elaborated upon in distinctly original fashion. So, the wickedness of the antediluvian human society the Creator determines to punish is represented as industrialised and polluting in ways that resemble our own world, but which no early historical society can ever have been. And the 'Watchers', the fallen angels who help Noah, played by Russell Crowe, to build his ark, and who clearly have no counterparts in any Jewish canonical text, are thoroughly science-fictional stone monsters who could have been at home in *Flash Gordon* or *Galaxy Quest*. As a result, the film has a determinedly timeless quality, which renders it closer to SF than to the more traditional Hollywood Biblical epic. It also makes a radically controversial intervention into contemporary theological debates over the relationship between humankind and the natural world, which have tended to be polarised between those who stress 'dominion', typically right-wing fundamentalist creationists, and those who stress 'stewardship', typically the more liberal ecotheologians. Aronofsky's *Noah* is in effect an ecotheologian, while the argument for dominion is made by the film's chief villain, Cain's descendant Tubal-cain, played by Ray Winstone as a kind of Renaissance cockney gangster.

Like cinema, television has a long history of involvement with SF: the first televised SF programme was the BBC's 35-minute adaptation of Karel Čapek's *R.U.R.* in 1938 (Bussell, 1938). And the television mini-series

certainly holds out the prospect of a form sufficiently expansive to cope adequately with long-run processes of climate change. Nonetheless, there is a surprising paucity of cli-fi in contemporary television. HBO originally expressed interest in a serialisation of Atwood's *MaddAddam* trilogy but abandoned the project in 2016. Trey Parker and Matt Stone's animated satire *South Park* famously subjected Al Gore's then recently released *An Inconvenient Truth* (Guggenheim, 2006) to a denialist spoof in the 2006 episode 'ManBearPig'. But the 2018 episodes 'Time to Get Cereal' and 'Nobody Got Cereal?' effectively reverse the critique, satirising climate change denial through the discovery that Gore's ManBearPig really does exist (Parker, 2006; Parker, 2018a; Parker, 2018b). This might well be the only occasion on which Parker and Stone have come close to retracting a previous satire. Miller and Morano's adaptation of Atwood's *The Handmaid's Tale* occasionally hints at a cli-fi *mise en scène* in ways the original novel did not. But the only extended use of this device to date has been in Jo Nesbø and Erik Skjoldbjærg's *Okkupert*, originally conceived for the Norsk rikskringkasting, the Norwegian public broadcaster, but finally produced and aired in 2015–17 by the commercial TV 2 channel.

The opening titles and first episode of *Okkupert* sketch out the programme's cli-fi context: Norway has been devastated by 'Hurricane Maria', which killed 600–700 people, an effect of anthropogenic global warming fuelled in part by the country's own oil industry; as a result the Green Party, Miljøpartiet De Grønne, has been catapulted into power under the leadership of Prime Minister Jesper Berg, played by Henrik Mestad; the new Green government closes down oil and gas production and throws its weight behind thorium-based nuclear power; this exacerbates an already serious continent-wide energy crisis, prompting the European Union to endorse a 'soft' Russian invasion of Norway disguised as a so-called energy partnership. The scene seems set, then, for a sustained encounter with climate politics. But the title – in English, *Occupied* – and Berg's dramatic helicopter kidnapping by Russian special forces, which occurs in the very first episode, alert us to what will be the programme's central socio-political novum, that is the Russian occupation of Norway. Through the 17 episodes that follow, the series develops as a political thriller with only minimal environmentalist content, as Russia, the EU, Norway and Sweden square off against each other; and the onetime Green pacifist Berg becomes, by turn, head of an interim government, an internal exile in the US embassy, leader of the Fritt Norge (Free Norway) guerillas, an exile in Sweden, Poland and then France, and finally prime minister yet again. The series has been a considerable commercial success, exported to Belgium, Britain,

the Czech Republic, Denmark, Estonia, Finland, France, Germany, Iceland, Luxemburg, the Netherlands, Poland, Portugal, Serbia, Spain and Sweden. But it is difficult to understand why, given that the cli-fi *mise en scène* is virtually the only plausible element in the entire confection. It is perhaps no coincidence that the fictional Government Building, which houses Berg's prime ministerial office, was in reality the headquarters of the Norwegian oil company Statoil.

Like cinema and television, videogames have also long made extensive use of SF tropes and topoi. Stephen Russell, J.M. Graetz, and Wayne Wiitanen's *Spacewar* (1962), the very first such game with an original design – that is, not derived from some other non-electronic game – was loosely based on E.E. 'Doc' Smith's *Lensman* series. The first globally successful commercial videogame, Toshihiro Nishikado's スペースインベーダー / *Supēsu Inbēdā/Space Invaders* (1978), was clearly inspired by both Wells's *War of the Worlds* and Lucas's *Star Wars*. And, if SF has become less central to gaming in the twenty-first century – the best-selling game globally during 2018 was the Western *Red Dead Redemption 2* (Houser, 2018) – it is by no means marginal. Nonetheless, there has been even less in the way of cli-fi gaming than of cli-fi television. There are relevant educational games, such as those on NASA's *Climate Kids* site (NASA, 2010–18), and many entertainment games, Ocean Software's disastrously unsuccessful *Waterworld* spinoff (Woita, 1997) for example, have made use of extreme environments as *mise en scène*, but these rarely connect to any explicitly anthropocene narrative context; and even when they do, this is generally of little consequence to narrative or gameplay progression, which simply occurs in a climate-changed environment available for exploration and play. A recent example of the latter is *Earth Atlantis* (Aribarg, 2017), a 2D side-scrolling shooter by independent Thai developer Pixel Perfix, the opening titles of which tells us:

The 'Great Climate Shift' struck at the end of the twenty-first century. Ninety six percent of the earth surface is underwater. Human civilization has fallen. Machines have adopted the shape and form of marine animals. The ocean is full of creature-machine hybrid monsters.
You are a 'Hunter' and the new journey begins!!

The medium appears to suffer from a general aversion to the theme of climate change, and perhaps even to politics per se, especially on the part of medium-sized and major publishers with the resources to develop 'triple-A' (AAA) videogames, designed around a story and an extensive open world that could, in principle, be well suited to the

narrative demands of cli-fi. Two notable exceptions are the action role-playing game *Horizon Zero Dawn*, developed by Guerilla Games and published by Sony Interactive Entertainment (de Jonge, 2017), and the turn-based strategy game *Sid Meier's Civilization VI*, developed by Firaxis and published by 2K, the recent expansion pack to which, 'Gathering Storm', features both geogenic and anthropogenic climate change (Beach, 2019). Perhaps the most interesting feature of *Horizon Zero Dawn* is how it eventually explains that we, the 'Old Ones', were indeed responsible for climate catastrophe. The game's backstory of climate breakdown is revealed only slowly and in fragmentary fashion, so that players are already emotionally invested in the young protagonist Aloy well before they come to understand her bleak world and what has brought it about. But the game also has a eutopian impulse and a deep moral core, a belief that radical transformations are still possible and that there is still something worth fighting for, something worth saving. It thus marks a critical step towards foregrounding climate change in the global gaming community and carving out the space for other more explicitly climate-focussed games. To date, it has sold over ten million copies worldwide and is one of the most successful new intellectual properties on PlayStation 4. 'Gathering Storm' is less overtly political. Dennis Shirk, the lead producer on *Sid Meier's Civilization VI*, has insisted that 'I don't think that's about making a political statement ... We just like to have our gameplay reflect current science' (Bratt, 2018). But players are required to adopt various mitigation and adaptation measures in order to progress gameplay. This is by no means revolutionary, but it is suggestive of a movement towards the normalisation of climate change in major, as distinct from 'indie', games.

In a sense, gaming has long been receptive to the aesthetics of climate change, as distinct from the politics, in so far as it favours tropes over substantive discourse. As rich and technically sophisticated as they might sometimes be, videogames currently lack the capacity to engage seriously with climate change. We would hazard the guess that publishers rather than developers have tended to treat cli-fi as too risky an investment, given how aggressively far-right subcultures have attempted to co-opt and influence the wider gaming communities. It is telling that Shirk is the lead producer rather than the director or writer on *Civilization VI*. Hence, Benjamin Abraham and Darshana Jayemanne's dispiriting conclusion that 'If cli-fi literature is an example of growing awareness and concern over climate change, as well as an argument for its increasing cultural centrality, then a missing cli-fi trend in digital games is ... an indictment of the medium's relevance' (Abraham and Jayemanne, 2017: 89). It is significant, albeit disheartening, that television and videogaming, the

two most visible mass cultural forms, are the least engaged with climate change politics and action, despite their longer versions being apparently well suited to cli-fi. As Alfie Brown observed in *The Guardian*, gaming is now in desperate need of formal innovations analogous to those of literary modernism in the early twentieth century: 'Like all art that arises from culture, games are deeply political. They are also often biased ... towards conservative, patriarchal and imperialistic values such as empire, dominion and conquering by force' (Brown, 2018). And this occurs most crucially at the level of form, even when the game attempts to communicate progressive values in its narrative content.

Brown draws an interesting parallel between games and Raymond Williams's account of how the form of the nineteenth century novel reinforced conservative values even when it relayed progressive content. 'It's perhaps impossible to predict what a formally progressive video game might look like', he writes: '... gaming is at the kind of crisis point that literature was at in the early twentieth century: it needs a structural renovation. Without this, video games might sometimes look leftwing, but they cannot be revolutionary.' Until we see such structural, or formal, revolutions in game design we are very unlikely to discover an artistically or politically significant cli-fi videogame.

Reviewing the contents of this chapter, we can register the presence of rhetorically effective instances of cli-fi across a wide range of media: Carol Ann Duffy's 'Keep It in the Ground', Brian Wood's *The Massive*, Anohni's *Hopelessness*, Franny Armstrong's *The Age of Stupid*, Darren Aronofsky's *Noah*. But it is nonetheless in cli-fi novels, especially those that deal with mitigation and negative or positive adaptation, such as Jeschke's *Das Cusanus-Spiel*, Kingsolver's *Flight Behavior* and Bradley's *Clade*, that the major effort to respond to the climate crisis has taken shape. Interestingly, many of the most effective instances are also organised into trilogies: Atwood's *MaddAddam*, Robinson's *Science in the Capital*, Ligny's climate change trilogy, Fleck's *MAEVA!* We can conclude that the longer narrative forms do therefore seem best suited to climate fiction.

Chapter 9

Changing the Climate: Some Provisional Conclusions

The approach we have taken in this study has been fundamentally sociological rather than literary-critical. We have therefore quite deliberately eschewed what Gerry Canavan calls Darko Suvin's 'strategy of hierarchization' (Canavan, 2016: xxvii), or what Suvin himself concedes might be the 'lingering after-effects of monotheism, meaning the belief in one certain set of truths' (Suvin, 2016: xlvi). Hence, the way we considered both supposedly 'literary' and supposedly 'genre' fiction as equally instances of cli-fi. Hence, also our decision to examine the whole range of perspectives on climate change, from denialism through to pessimistic fatalism. We are not, however, indifferent to the value implications of these different perspectives. If we may borrow once again from Max Weber, we make the distinction between 'value relevance' and 'value freedom'. We have tried to approach our various cli-fi texts 'non-evaluatively', that is descriptively rather than prescriptively, but the whole issue of climate change was nonetheless posed for us by 'the value-relevance of the phenomena treated' (Weber, 1949: 21). The value relevance in question derives from our shared, loosely Green, beliefs that: first, the effects of anthropogenic global warming will be at least as bad as the IPCC predicts, that is that denialism is mischievous; second, that as human beings we hope that our species, and more personally our children and grandchildren, will survive and prosper, that is, that Gaian deep ecology is misconceived; and third, that there is still time and opportunity for humankind to prevent the worst-case scenarios, that is that pessimistic fatalism is mistaken. We have therefore been motivated in part, as we explained in Chapter 2, by the search for a cli-fi equivalent to Shute's *On the Beach*.

In 2018 the journal *Science Fiction Studies* hosted a special issue on 'SF and the Climate Crisis' edited by Brent Ryan Bellamy and Veronica Hollinger, which ranged widely across such matters as nuclear fiction, terraforming, weather control and geohistory, but dealt only scantily

with anthropogenic global warming. During the journal's 'Symposium on Science Fiction and the Climate Crisis', Patrick D. Murphy of the University of Central Florida volunteered the observation that: 'We know from the nuclear-threat crises of the Cold War and attendant fictions such as ... Nevil Shute's *On the Beach* (1957) that these fatalistic works do not incite activism' (Murphy, 2018: 426). Actually, we know no such thing. Murphy writes from within a culture that has never produced an activist nuclear disarmament movement: the US anti-nuclear movement has been mainly preoccupied with power stations rather than weapons. But we know from both personal experience and scholarly analysis that cultures that did so, most obviously the British, were in fact strongly influenced by *On the Beach* (Milner and Burgmann, 2018: 5; Baker, 2012: 158–159). The key term in Murphy's sentence is, of course, 'fatalistic', a charge often made against classical dystopias like *On the Beach*. But Shute's novel is not so much fatalistic as an instance of Heinlein's famous 'if this goes on' principle (Heinlein, 1940). It does not actually suggest that nuclear war is inevitable, only that if humanity continues to produce ever more deadly nuclear weapons, and if such weapons continue to proliferate, and if a nuclear arms race continues between great and small powers – Shute's war begins with an Albanian attack on Italy – then humanity will destroy itself. Outside the text the option remains to refuse each of these three ifs and hence also the then that follows. And this is part of why the novel exercised so powerful an influence over real-world nuclear disarmament activists. The conclusion we draw from this experience is exactly the opposite of Murphy's, but much the same as Euan Nisbet's, that is that we need a contemporary cli-fi equivalent to *On the Beach*. We know what this would look like: it would be translated into many languages; it would be adapted into many media; and it would have effective practical influence on both elite leaderships and oppositional activists across the world; we also suspect it more likely to be produced in a peripheral than in a core or semi-peripheral literary economy. When we began writing this book in 2014, we had half hoped that some text might in the meantime emerge that would generate what we dubbed the 'Shute effect'. In retrospect, it is clear that no such text exists as yet. Perhaps, Amitav Ghosh's *Gun Island* will fit the bill; only time will tell. But in the interim we note the operation of what we might term an 'Off-Shute effect', in which the cumulative weight of many different cli-fi texts can have a cumulative effect on real-world behaviour. This leads us to endorse Daniel Bloom's acerbic insistence that the 'one very important thing we can do about climate change is to encourage more and more

novelists to write cli-fi novels and cli-fi movie scripts over the next 100 years, and to nurture these authors ... All the rest is pissing in the wind' (Bloom, 2017).

Yet, the non-appearance of a cli-fi version of *On the Beach* remains troubling. Collectively, we seem to be missing out on something. In Chapter 5 we noted Robinson's description of science as 'the one great power' capable of opposing a capitalist future, a view that clearly drives his fiction. No doubt, the content of scientific research does indeed often operate thus and will tend increasingly to do so as late capitalism proves terminally destructive of the preconditions for organic life. But research findings are not in themselves a social force or 'power'. To become such, they need to be socially organised, as for example in the April 2017 Marches for Science in the United States and elsewhere, in opposition to the Trump administration's 'War on Science'. These marches were organised by professional associations, community groups and trade unions. The involvement of professional associations and trade unions serves to remind us that the vast majority of scientific researchers are in fact employees, or what Marx would have termed proletarians; which, in turn, reminds us that historically organised labour has actually been the one great social power to resist capital. One of our more striking findings, which we had not at all anticipated, was that not one of our climate fictions, not even those by avowed socialists like Robinson, would depict the organised working class as the social force most likely to prevent anthropogenic global warming. Our guess is that this is an effect of the persistence into the twenty-first century of ideological residues of postmodernism, one of the twin hegemonic belief systems of twentieth century late capitalism, the other being neo-liberal economics. Certainly, there is nothing in empirically observable social reality to suggest the irrelevance of either class in general or organised labour in particular.

No doubt, labour has been overwhelmingly on the defensive since the early 1980s across much of the Western world. Sociologists increasingly identify two distinct systems of hegemony operating during the post-Second World War period: the Keynesian or social democratic system, which lasted from the late 1940s until the late 1970s, characterised by nationalisation of key industries, an extensive welfare state sustained by progressive taxation, and strong trade unions; and the Friedmanite or neo-liberal system, which lasted from the early 1980s until the global financial crisis of 2007–8, characterised by looting of the public purse through so-called privatisation schemes, redistribution of wealth and income from labour to capital, and from the poor to the rich, through increasingly regressive taxation policies, and the weakening of trade unions through the imposition of legal restraints on their capacity

to organise and act.¹ The central achievement of neo-liberalism is thus, as Thomas Piketty has shown, that early twenty-first century levels of global inequality are returning to the historical high attained in Europe during the period immediately prior to the First World War (Piketty 2014: 438). But this does not mean that organised labour has somehow been definitively beaten, as both neo-liberal economists and postmodern cultural critics are inclined to suggest. The truth is that organised labour cannot be definitively beaten precisely because the operation of labour on nature is the source of all value. This is not Marxist dogmatism; it is a truism of classical political economy that would have secured the assent of both Adam Smith and David Ricardo. And if the truism is true it follows that capital needs labour in a way that labour does not need capital.

We have described our own values as loosely 'Green'. But whence exactly does this political signifier derive? The oldest and most successful Green party, in electoral terms at least, are the German Die Grünen, founded in 1980 by among others the ecofeminist activist Petra Kelly. But, according to Senator Bob Brown, parliamentary leader of the Australian Greens, speaking to the Australian Senate on 21 March 1997, Kelly first witnessed this use of 'Green' during her visit to Sydney in 1977, when she observed the so-called 'green bans' imposed on environmentally destructive construction projects by the New South Wales branch of the Builders Labourers' Federation (NSWBLF), under the leadership of Jack Munday² (Burgmann and Burgmann, 2017: 9–10). The Green politics to which we and Robinson subscribe thus have their origins in organised labour. And the trade union movement is still itself a key actor in the collective effort to avoid climate catastrophe. So, at its founding congress in 2006 the International Trade Union Confederation adopted the Canadian Labour Congress's 'Just Transition' policy of 'developing alternative employment in a sustainable economy' (Canadian Labour Congress, 2000; International Trade Union Confederation, 2006). This programme has been endorsed by a number of national labour congresses, including the British (Trades Union Congress, 2008). In

¹ Since 2008 there has been no clear hegemonic order. Hence, the rise of populisms on the Right and on the Left.

² Munday was secretary of the NSWBLF from 1968 to 1975. He went on to be elected Green alderman for the city of Sydney, awarded life membership of the Australian Conservation Foundation and an honorary doctorate of science from the University of Western Sydney. He probably provided the model for the character of Terry Legge in Patrick White's 1977 play *Big Toys*. Other key figures in the union leadership included Bob Pringle, who served as president, and Joe Owens, assistant state secretary.

2012, 64 trade union bodies from 24 countries came together to found the much more radical Trade Unions for Energy Democracy, organised around the slogan 'Resist, Reclaim, Restructure' and supported financially by the New York office of the German Rosa Luxemburg Stiftung (Trade Unions for Energy Democracy, 2012). These are not quite the 'reforms so numerous and systemic that ultimately they will add up to revolution' which Robinson hopes for (Robinson, 2016: 15), but they certainly point in that direction. It seems odd, then, that his novels should make so little effort to represent fictional movements analogous to these in the real world. This is not a merely political disagreement. As we observed in Chapter 7, one of the key weaknesses in Robinson's attempts at eutopia, as in Fleck's, is the absence of plausible mechanisms by which to effect the transition to a Green future. Both authors, we surmise, could have learnt from Morris's *News from Nowhere*, where working-class resistance provides exactly such a mechanism.

We are not Builders Labourers and are thus in no position to impose green bans of our own. Our environmental activism is sadly petty-bourgeois in character: we recycle our glass, plastic and cardboard waste; our domestic electricity is generated mainly by roof-top solar panels; whenever possible, we travel on public transport or bicycle; we try to buy local, not out of nationalism, but so as to cut down on food miles; we vote and canvass for the Greens at election times. It all seems strikingly ineffective when set against the scale of the problem: President Trump of the United States, the largest economy in the G20, is a climate change denier bent on promoting coal mining; Australia, where we both live, is the largest exporter of coal in the world; and President Xi of the PRC, the second largest economy in the G20, presides over the country that buys most of this coal. During the six years we spent researching and writing this book, climate disasters – global drought, floods, fires, heat and cold waves, hurricanes, earthquakes and tsunamis – repeatedly moved from the pages of fiction on to those of our newspapers. We had hoped that the book could make some positive difference, but it seems oddly incommensurate to the scale of the task. And yet Antonio Gramsci's borrowing from Romain Rolland, pessimism of the intellect, optimism of the will, remains the only practical note on which to conclude. For these fictions are warnings, rather than predictions or prophecies, and warnings are there to be heeded and acted upon.

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Index

- Abbott, Jane 72
 Watershed 72
- Abbott, Sally 72
 Closing Down 72
- Abbs, Peter 175
 Earth Songs: A Resurgence
 Anthology of Contemporary
 Eco-poetry 175
- Abe, Kōbō 12, 13, 14, 21, 61
 第四間氷期/*Dai-Yon Kamyōki/*
 Inter Ice Age 4 12
- Abraham, Benjamin 188
- Action Comics* 18
- Adamson, Andrew 47
 The Chronicles of Narnia (film)
 47
- Adorno, Theodor 29
- Albarn, Damon 178
- Aldiss, Brian W. 5, 10, 17, 21, 25,
 26, 44, 115, 116, 117, 118, 121,
 134, 157, 183
 Helliconia Spring 115, 116
 Helliconia Summer 115
 Helliconia trilogy 21, 44, 115,
 116, 117
 Helliconia Winter 115, 117, 118,
 157
- All Star Comics* 18
- Allen, Irwin 52
 The Swarm (film) 52
- Allen, Myles 147, 148
- Altov, Genrikh 59
- Amis, Kingsley 81
- Amsterdam, Steven 72
 Things We Didn't See Coming 72
- Anderson, Porter 172
 Warmer: The Climate Changes Us
 All 172
- Angus, Ian 32, 33
- Anno, Hideaki 61
- Anohni 180, 181, 182, 189
 Antony and the Johnsons 181
 Hopelessness 180, 181, 182, 189
- Anthropocene 21, 28, 30, 31, 32,
 33, 34, 94, 174, 176, 179, 181
- anti-utopia 42, 75, 77
- Apokalypsis* 27, 28
- Apted, Michael 47
 The Chronicles of Narnia (film) 47
- Aribarg, Anucha 187
 Earth Atlantis 187
- Aridjis, Homero 72
 Le leyenda de lose soles 72
 ¿*En quién piensas cuando haces el*
 amor? 72
- Armstrong, Franny 64, 184, 185,
 189
 The Age of Stupid 184, 189
- Arnaud, G.-J. 58
- Arnold, Matthew 28
- Aronofsky, Darren 45, 64, 71, 185,
 189
 Noah 45, 185, 189
- Arrhenius, Svante 14
 On the Influence of Carbonic Acid
 in the Air upon the Temperature
 of the Ground 14
- Asimov, Isaac 60
- Astley, Neil 175
 Earth Shattering: Ecopoems 175

- Atallah, Marc 83
Atra-Hasis (Epic of) 4
- Atwood, Margaret 2, 26, 27, 37, 42, 44, 48, 61, 70, 71, 72, 76, 110, 111, 112, 123, 158, 166, 167, 168, 169, 172, 186, 189
The Blind Assassin 71, 72
The Handmaid's Tale 70, 76, 186
The Heart Goes Last 71
MaddAddam 2, 44, 71, 112, 158, 166, 167, 168, 189
MaddAddam trilogy 2, 48, 71, 110, 169, 186
Oryx and Crake 44, 71, 110, 123, 166
The Testaments 71
The Year of the Flood 71, 110, 111, 112, 166
- Ayre, Thornton 10
- Baccolini, Raffaella 76, 77, 99, 169
- Bacigalupi, Paolo 27, 44, 60, 64, 87, 90, 91, 113, 172, 173
The Water Knife 44, 27, 87, 90, 91, 113, 173
The Windup Girl 44, 90, 158
- Bad Religion 179
- Baio, Chris 179
Man of the World 179
- Baker, Brian 50, 191
- Ballard, J.G. 2, 11, 12, 13, 17, 20, 58, 82, 116
The Burning World 20
The Drowned World 11, 20
- Balzac, Honoré de 49
- Banks, Iain M. 58
Barbarella 18
- Barnaby, Paul 59
- Bastian, Till 66
Tödliches Klima 66
- Baxter, Stephen 12
Flood, 12
- Beach, Ed 188
Sid Meier's Civilization VI: Gathering Storm 188
- Beastie Boys 179
- Beckett, Chris 64
America City 64
- Beecroft, Alexander 57
- Bellamy, Brent Ryan 190
- Bellamy, Edward 32, 168
Looking Backward, 2000–1997 168
- Belli, Gioconda 72
Waslala: memorial del futuro 72
- Belyaev, Alexander 59
- Benioff, David 47
Game of Thrones 47
- Bentley, Richard 139, 140
Bereshith 3, 4, 5, 7, 11, 12, 21, 185
- Berg, Sybil 66
Ende gut 66
- Bertagna, Julie 45
Exodus trilogy 45
- Besson, Bernard 44, 64, 87, 88, 89
Groenland 44, 87, 90, 91
Le Partage des terres 87
- Bihl, Eric 162
- Biko, Steve 156
- Bilenkin, Dmitri 59
- Binder, Eando 15
- Bindoff, N.L. 1
- Birch, Tony 135
- Birse, Shelley 72
The Commons 72
- Bisson, Terry 161
- Björk 178, 179
- Blackie, Sharon 175
Entanglements 175
- Blair, Tony 100, 123
- Blomkamp, Neill 45, 72, 73, 183
District 9, 73
Elysium 45, 49, 183
- Bloom, Daniel 23, 26, 50, 191, 192
- Blur 178
- Bocquet, Olivier 19, 64, 177
Terminus 177
- Boeckl, Manfred 66
Die Einöder. Leben im bayerischen Wald nach der Klimakatastrophe 66
- Bogdanov, Alexander 59

- Bohrmann, Gerhard 119
- Bong, Joon-Ho 18, 19, 45, 72
*설국열차/Seolgungnyeolcha/
 Snowpiercer* 18, 45, 176
- Booker Prize 70, 100, 107
- Borges, Jorge Luis 61
- Böttcher, Sven 44, 66, 99
Prophezeiung 44, 99
- Boulle, Pierre 58
- Bourdieu, Pierre 35, 36, 37, 38, 52
- Bowd, Gavin 83
- Bowie, David 178
- Boyle, T.C. 2, 48, 63, 172, 173
A Friend of the Earth 2, 48
- Boysen, Margret 66
Alice, der Klimawandel und die Katze Zeta 66
- Bracke, Astrid 104
- Bradley, James 44, 72, 129, 135, 136, 137, 143, 189
Clade 44, 129, 135, 136, 189
The Deep Field 135
The Silent Invasion 135
- Bragg, Billy 179
Bridges Not Walls 179
- Brin, David 63
Earth 63
- Brooker, Charlie 175
Black Mirror 175
- Brown, Alfie 189
- Brown, Bob 193
- Bruce, Alastair 72
Wall of Days 72
- Brussolo, Serge 58
- Bryant, Dorothy 41
The Kin of Ata are Waiting for You 41
- Budakov, V.M. 41
- Buell, Lawrence 30
- Buergel, Bruno H. 15
- Builders Labourers' Federation (New South Wales) 193
- Bulgakov, Mikhail 59
- Bullough, Tom 174
- Bulwer-Lytton, Edward 39
- Bulychev, Kir 59
- Burdekin, Katharine 76
Swastika Night 76
- Burgess, Anthony 85
A Clockwork Orange 85
- Burgmann, J.R. 191
- Burgmann, Meredith 193
- Burgmann, Verity 193
- Burkett, Paul 32
- Burks, Arthur J. 15
- Burstyn, Ellen 184
- Burton, Tim 60
- Burt, J. Lewis 10
- Bush, George W. 68
- Butler, Octavia 60, 76, 116
The Parable of the Sower 76
The Parable of the Talents 76
Xenogenesis trilogy 116
- Calexico 180
The Thread That Keeps Us 180
- Callenbach, Ernest 41, 158, 165
Ecotopia 41, 158, 165
- Calof, Grant 45, 64, 177
H2O 45, 177
- Calvin, Jean 157
 Calvinism 156
- Calvino, Italo 61
- Cameron, James 60
- Campbell, John W. 10, 60
Astounding Stories, Astounding Science-Fiction 10, 11, 14, 15
 John W. Campbell Award 65, 90, 116
- Canavan, Gerry 175, 190
- Čapek, Karel 37, 59, 185
R.U.R. 185
- Capitalocene 32, 33, 34
- Captain America Comics* 18
- Carey, Peter 72
Amnesia 72
- Carson, Rachel 78, 112
Silent Spring 78
- Carter, Chris 60, 61
The X-Files 61
- Cascio, Jamais 177

- Charnas, Suzy McKee 41
Motherlines 41
- Chastain, Jessica 184
- Chen, Jianhua 62
- Christoff, Peter 50
- Christopher, John 14, 15, 16
The World in Winter 14, 15
- Chthulucene 33, 34
- Clarke, Arthur C. 58
 Arthur C. Clarke Award 21, 52, 130
- classical dystopia 41, 75, 77, 92, 98, 110, 122, 127, 137, 169
- cli-fi 23, 26, 35, 50, 51, 63, 64, 65, 66, 70, 72, 73, 74, 75, 76, 77, 80, 81, 82, 83, 92, 99, 103, 105, 107, 108, 115, 116, 120, 124, 129, 132, 135, 136, 138, 145, 147, 149, 154, 158, 162, 164, 166, 169, 170, 171, 172, 174, 175, 176, 177, 178, 179, 180, 182, 183, 184, 186, 187, 188, 189, 190, 191, 192
- Climate Outreach Information Network 50
- Clooney, George 149
- Clute, John 5, 40
The Encyclopedia of Science Fiction 40, 56, 138
- Colebrook, Claire 30, 31
- Colladay, Morrison 10, 11
- Collodi, Carlo 183
Pinocchio 183
- Corbett, Chan 15
- Corporaal, Margu rite 104
- Costner, Kevin 183
- Crichton, Michael 44, 63, 77, 147, 148, 149, 150, 152
The Andromeda Strain 147
Jurassic Park 147
Looker 147
Next 147
Prey 147
Runaway 147
Sphere 147
State of Fear 44, 77, 147, 148
- The Terminal Man* 147
Timeline 147
Westworld 147
- critical dystopia 41, 42, 45, 75, 76, 81, 92, 99, 101, 104, 106, 110, 115, 122, 126, 129, 169
- critical utopia 41, 42, 161
- Croll, James 14
Climate and Time, in Their Geological Relations 14
- Cronenberg, David 61
- Crowe, Russell 185
- Crutzen, Paul J. 21, 30, 31, 32, 33
- cultural materialism 35, 38
- Damasio, Alain 58
- Damasus I (Pope) 28
- Damon, Matt 149, 183
- Dantec, Maurice 58
- Davies, Russell T. 64
Years and Years 64
- De Jonge, Mathijs 188
Horizon Zero Dawn 188
- De Laurentis, Dino 67
- De Manuel, Jordi 49, 72
L'olor de la pluja 49
- Dean, Cornelia 147
- Deckard, Sharae 39
- Delany, Samuel R. 41, 60
Triton 41
Der Orchideengarten 10
- Descartes, Ren  164
- Detective Comics* 18
- Deutscher Science Fiction Preis 26, 66, 67, 140, 162
- Devlin, Dean 45, 64, 183
Geostorm 45, 183
- Dick, Philip K. 20, 60
- Dickens, Charles 39
- Dickerson, Matthew 47
- Die Fantastischen Vier 179
- Dirks, Liane 66
Falsche Himmel 66
- Dooley, Maura 176
- Doyle, Briohny 72
The Island Will Sink 72

- Dudman, Clare 174
 Duffy, Carol Ann 175, 176, 189
 Dumas, Alexandre 39
 Dürbeck, Gabriele 165
- Earth First! 148
 Earth Liberation Front 148
 Edwards, Malcolm 138
 Eisner, Eric 45, 64, 177
 H2O 45, 177
 El Akkad, Omar 70
 American War: A Novel 70
 Elliger, Karl 4
 Ellison, Harlan 60
 Elton, Ben 64, 138, 139, 140
 Blackadder 138
 Gridlock 138
 Stark 138
 This Other Eden 138
 Time and Time Again 138, 140, 143
 Emmerich, Roland 12, 45, 49, 64, 183
 2012 12
 The Day After Tomorrow 45, 49, 183
 Emtsev, Mikhail Tikhonovich 59
 Endesby, Victor 10
 Engels, Friedrich 29
 The Communist Manifesto 29
 Engler, Ivan 45, 72, 183
 Cargo 45, 49, 183
 Erasmus (of Rotterdam) 142
 Erdrich, Louise 64
 Future Home of the Living God 64
 Eschrich, Joey 172
 Everything Change: An Anthology of Climate Fiction 172
 Eshbach, Lloyd Arthur 10, 11
 Etter, Ralph 45, 72, 183
 Cargo 45, 49, 183
 Evans, Jonathan 47
- Faber, Michel 64
 The Book of Strange New Things 64
 Fantax 18
- Faunce, Tom 72, 158
 Split by Sun: The Tragic History of the Sustainocene 158
 Fawcett, John 61
 Feffer, John 64
 Splinterlands 64
 Feist, Felix E. 10
 Deluge 10
 Fernandes, Fábio 158
 Fialkowski, Konrad 59
 Finn, Ed 172
 Flash Gordon 185
 Fleck, Dirk C. 25, 26, 44, 48, 59, 66, 158, 162, 163, 164, 165, 168, 189, 194
 Das Südsee-Virus 162
 Das Tahiti-Projekt 162
 Feuer am Fuss 162, 164, 165
 GO! Die Ökodiktatur 162
 MAEVA! 162, 164, 189
 MAEVA! trilogy 44, 48, 158, 162, 168
 Flynn, Adam 158
 Foon, Rebecca (Saltland) 179
 A Common Truth 179
 Foreman, Dave 172
 Ecodefense: A Field Guide to Monkeywrenching 172
 Forry, Steven Earl 9
 Fossey, Dian 112
 Foster, John Bellamy 32
 Foucault, Michel 30, 31
 Foy, Mackenzie 184
 France, Anatole 58
 Francis of Assisi 112
 Franco, James 176
 Freystedt, Volker 162
 Fuchslin, Tobias 43
- Gaarder, Jostein 45, 72
 Anna. En fabel om klodens klima og miljø 45
 Gaia 21, 44, 68, 92, 93, 94, 97, 115, 116, 117, 118, 121, 146, 147, 157, 166, 170, 190
 Gail, Otto Willi 59

- Galaxy Quest* 185
Galaxy Science Fiction 10, 15
 Gearhart, Sally 41
 The Wanderground 41
 Gee, Maggie 48, 64, 92, 93, 94,
 122, 123, 124
 The Flood 48, 64, 94, 122, 129
 The Ice People 48, 92, 93, 94
 The White Family 122
 George, A.R. 4
 Gernsback, Hugo 10, 25, 26, 45,
 60
 Amazing Stories 10, 15, 20, 25,
 26
 Hugo Award 25, 27, 58, 62, 65,
 90, 116
 Ghosh, Amitav 2, 28, 29, 44, 169,
 191
 The Great Derangement 28
 Gun Island 44, 191
 Giblin, Pam 157
 Nemeton 157
 Gibson, William 60, 61, 64, 83
 Neuromancer 173
 Gillespie, Bruce 72
 Gilliam, Terry 5
 12 Monkeys 5
 Glass, Rodge 174
 *Beacons: Stories For Our Not So
 Distant Future* 172, 173, 174
 Glen, Iain 176
 Glukhovskiy, Dimitri 59
 Goethe, Johann Wolfgang von 38
 Golding, William 92
 Goodbody, Alex 28
 Cli-Fi: A Companion 28
 Goodell, Jeff 1
 Gore, Al 66, 151, 154, 160, 186
 An Inconvenient Truth 186
 Gorillaz 178
 Graetz, J.M. 187
 Spacewar 187
 Gramsci, Antonio 194
 Grant, John 45, 64, 177, 179
 Grey Tickles, Black Pressure 179
 Gray, Alasdair 173, 174
 Gribbin, John 14, 15, 16
 The Sixth Winter 14, 15, 16
 Groff, Lauren 172
The Guardian 103, 175, 176, 181,
 189
 Guggenheim, Davis 186
 An Inconvenient Truth 186
 Guha, Anton-Andreas 66
 Der Planet schlägt zurück 66
 Gunter, Miles 177
 Dark Fang 177
 Gwo, Frant 45, 184
 流浪地球/Liúlàng Dìqiú 184
 Gyllenhaal, Jake 183

 Han, Sung 62
 Haraway, Donna J. 33, 34
 Companion Species Manifesto 34
 Cyborg Manifesto 34
 Harper, Ben 179
 Harper, Stephen 8
 Harris, Clare Winger 10
 Harris, Joanne 173
 Harris, Joe 177
 Great Pacific 177
 Hawkwind 178
 Hefner, Ulrich 66
 Die dritte Ebene 66
 Hegel, Georg Wilhelm Friedrich
 164
 Heinlein, Robert A. 60, 129, 191
 Hergé (Georges Prosper Remi) 18
 Les Aventures de Tintin 18
 Herzog, Arthur 21, 22, 44, 48, 50,
 51, 52, 53, 54, 55, 70, 81, 82,
 169
 The Church Trap 51
 Earthsound 51
 Heat 21, 44, 48, 50, 51, 52, 54,
 55, 81, 169
 The Swarm 51, 52
 The War Peace Establishment 51
 Hewelcke, Geoffrey 10
 Hibberd, James 47
 Hicklenton, John 45, 64
 100 Months 45

- Hickling, Alfred 122
 Hine, Donald W. 43
 Hoban, Russell 85
 Riddley Walker 85
 Hollinger, Veronica 190
 Hortle, Luke 30, 31
 Hoshi, Shinichi 61
 Houellebecq, Michel 37, 44, 48,
 59, 64, 82, 83, 84, 85, 86
 La carte et le territoire 83
 La Possibilité d'une île 44, 48, 82,
 83, 84, 85, 86
 Les particules élémentaires 83
 Soumission 83
 Houghton, J.T. 21
 Hoult, Nicholas 185
 Houser, Dan 187
 Red Dead Redemption 2 187
 Howitt, Holly 174
 Hoyle, Fred 58
 Hughes, C.S. 47
 Hugo, Victor 39
 Hunter, Megan 64
 The End We Start From 64
 Huxley, Aldous 58, 158
 Island 158
- Inhofe, Jim 147
 Intergovernmental Panel on
 Climate Change (IPCC) 1, 21,
 87, 147, 190
 First Assessment Report 21
 International Council of Scientific
 Unions 30
 International Geological Congress
 31
 International Geosphere-Biosphere
 Programme (IGBP) 30, 31
 Internet Speculative Fiction
 Database 40
 Irons, Jeremy 176
 Isomäki, Risto 72
 Sarasvatin hiekka 72
 Itäranta, Emmi 72, 129, 130, 131,
 132
 Teemestarin kirja 129, 136
- Jackson, Peter 46
 The Lord of the Rings (film) 46,
 47
 Jackson, Samuel L. 184
 James, M.F. 11
 Jameson, Fredric 20, 29, 40, 46,
 49, 54, 65, 71, 72, 129
 Janofsky, Michael K. 147
 Jayemanne, Darshana 188
 Jefferies, Richard 5, 6
 After London or Wild England 5,
 6, 7
 Jefferson Starship 178
 Jemisin, N.K. 116
 Broken Earth trilogy 116
 Jensen, Liz 64, 173
 The Rapture 64
 Jeschke, Wolfgang 44, 48, 59, 66,
 138, 140, 141, 142, 143, 189
 Das Cusanus-Spiel 44, 48, 143
 *Midas oder Die Auferstehung des
 Fleisches* 140
 Jesus of Nazareth 112
 Johns-Putra, Adeline 28, 175
 Cli-Fi: A Companion 28
 Jonze, Tim 182
 Juszczuk, Andrzej 60
- K.I.Z. 179
 Kay, Jackie 176
 科幻世界 *Kehuan Shijie* / *Science Fiction
 World* 62
 Kelly, Petra 193
 Kennedy, A.L. 173, 174
 Khama, Seretse 156
 King Tuff 180
 The Other 180
 The Thread That Keeps Us 180
 Kingsolver, Barbara 2, 44, 48, 64,
 147, 150, 151, 152, 189
 Flight Behavior 2, 44, 48, 147,
 150, 189
 Prodigal Summer 150
 Kitty Empire 181
 Knowles, David 175
 Entanglements: New Ecopoetry 175

- Komatsu, Sakyō 61
 Köster, Patricia 41
 Kostkos, Henry J. 15
 Kraftwerk 178
 Kramer, Stanley 50
 Kubrick, Stanley 60
 Kurd-Laßwitz-Preis 140
- Lanchester, John 64
The Wall 64
- Lang, Fritz 59, 182
Metropolis 182
- Larney, Seth 45
 2067 45
- Ledgard, J.M. 64
Submergence 64
- Lee, Chang-Rae 48, 64
On Such a Full Sea 48, 64
- Lee, Stan 176
- Le Guin, Ursula K. 16, 20, 21, 37, 41, 60, 71, 79, 124, 158
The Dispossessed 41
The Left Hand of Darkness 16
The Word for World is Forest 158
- Legrand, Benjamin 19, 64
- Lehner, Klaus Peter 66
Natürlich grausam 66
- Leiber, Fritz 138
- Leiserowitz, Anthony 43
- Lem, Stanisław 20, 59
- Lepucki, Edan 64
California, 64
- Lerner, Ben 64
 10:04 64
- Lessing, Doris 2
- Levi, Primo 61
- Lewis, C.S. 40, 47, 58
The Chronicles of Narnia 47
- Li, Hua 69
- Liebkecht, Karl 139
- Ligny, Jean-Marc 25, 44, 48, 58, 64, 92, 94, 95, 96, 97, 98, 105, 106, 107, 118, 134, 189
AquaTM 44, 92, 95, 105, 106, 118
Cyberkiller 105
- Exodes* 44, 92, 94, 95, 96, 97, 98
Inner City 105
Les Chants des IA au fond des réseaux 105
Semences 44, 92, 95, 96, 97, 98, 106
- Lister, Umoya 44, 72, 147, 155, 156, 157
Planetquake 44, 147, 155
- Litt, Toby 172, 173, 174
- Liu, Cixin 44, 62, 69, 70, 77, 78, 79, 80, 150, 169, 184
 黑暗森林/*The Dark Forest* 77, 79
 死神永生/*Death's End* 77, 80
 地球往事/*Remembrance of Earth's Past* trilogy 77
 三体/*Three-Body/The Three Body Problem* 44, 62, 69, 77, 78, 80, 169
- Lloyd, Saci 45
The Carbon Diaries 45
- Lob, Jacques 14, 17, 18, 19, 44, 176
Le Transperceneige 14, 17, 18, 19, 44, 176
- Locke, John 164
- Lodi-Ribeiro, Gerson 158
Solarpunk: Histórias ecológicas e fantásticas em um mundo sustentável 158
- London, Jack 5
The Scarlet Plague 5
- Lovelock, James 44, 92, 93, 94, 95, 112, 117, 118, 121
- Lovering, Paul H. 15
- Lucas, George 3, 60, 187
Star Wars 3, 177, 187
- Lucian of Samosata 7, 25
- Lumière, Auguste 10
- Lumière, Louis 10
- Luxemburg, Rosa 139, 194
- Määttä, Jerry 39
- McAuley, Paul 64
Austral 64

- McCarthy, Cormac 2, 63, 103, 104, 177
The Road 2, 103, 104, 105, 177, 184
- McConaughey, Matthew 184
- MacDonald, Hamish 64
Finitude 64
- McDonald, Ian 64
River of Gods 64
- McEwan, Ian 2, 44, 64, 99, 100, 101, 103, 150
Solar 2, 44, 99, 100
- McKibben, Bill 172
- Macleod, Ken 58
- Magnus, Alex E. 179
- Maibach, Edward 43
- Majorino, Tina 183
- Malm, Andreas 33
Fossil Capital: The Rise of Steam Power and the Roots of Global Warming 33
- Mandela, Nelson 156
- Manson, Charles 113
- Margot, Jean-Michel 9
- Marshall, George 49
- Martin, George R.R. 47
A Song of Ice and Fire 47
- Martin, Mark 108, 172
I'm With the Bears 108, 172
- Martinez, Meredith 172
Marvel Comics 18
- Marx, Karl 29, 74, 139, 164, 192
The Communist Manifesto 29
- Matheson, Richard 5
I am Legend 5
- Mayakovsky, Vladimir 59
- Mbeki, Govan 156
- Mehnert, Antonia 28, 29
Climate Change Fictions: Representations of Global Warming in American Literature 28
- Méliès, Georges 10, 182
La Voyage dans la lune 10, 182
- Merchant, Brian 23
- Merle, Robert 58
- Merril, Judith 61
- Mestad, Henrik 186
- Metag, Julia 43
Métal Hurlant 18, 83
- Meteor 18
- Meyah Don 179
- Miéville, China 26, 27, 37, 47, 48, 58
Railsea 47
- Milkoreit, Manjana 172
- Mill, John Stuart 40, 41
- Miller, Bruce 64, 186
The Handmaid's Tale (television) 64, 186
- Miller, George 72, 183
Mad Max: Fury Road 183, 184, 185
- Miller, James 174
Sunshine State 174
- Miller, Walter M. 85
A Canticle for Leibowitz 85
- Mills, Jennifer 72, 138, 143, 144, 145
Dyschronia 138, 143
- Milner, Andrew 34, 36, 37, 39, 52, 191
Locating Science Fiction 34
- Missy Higgins 179
Solastalgia 179
- Mitchell, David 30, 48, 49, 64, 105, 107, 108, 109, 110, 172, 173
Black Swan Green 108
The Bone Clocks 48, 49, 105, 108, 110, 173
Cloud Atlas 30, 49, 108
The Thousand Autumns of Jacob de Zoet 108, 109
- Miyazaki, Hayao 44, 45, 64
 風の谷のナウシカ/*Kaze no Tani no Naushika* 44, 45
- Modest Mouse 179
- Monbiot, George 103, 104, 178
- Monroe, Jazz 90, 178
- Moorcock, Michael 14, 17, 19, 58, 116, 178
The Ice Schooner 14, 17, 19

- Moore, Jason W. 32, 33
Capitalism in the Web of Life: Ecology and the Accumulation of Capital 32
- Moore, Ronald D. 175
Philip K. Dick's Electric Dreams 175
- Morano, Reed 64, 186
The Handmaid's Tale (television) 64, 186
- Morazzo, Martin 177
- More, Thomas 25, 40, 142
- Moretti, Franco 35, 38, 39, 40, 50, 55, 59, 73, 74
Atlas of the European Novel 1800–1900 38
Distant Reading 38
- Morin, J.L. 45
Nature's Confession 45
- Morris, William 7, 158, 165, 168, 194
News from Nowhere 7, 158, 165, 168, 194
- Morrow, Lowell Howard 20
- Morton, Oliver 65
- Motoda, Hisaharu 171
Artworks 171
- Moylan, Tom 41, 42, 43, 75, 76, 77, 79, 81, 82, 99, 112, 115, 126, 129, 161, 169
Demand the Impossible: Science Fiction and the Utopian Imagination 42
- Mugabe, Robert 156
- Muir, John 172
- Munday, Jack 193
- Murakami, Haruki 13, 61
- Murphy, Patrick D. 191
- National Aeronautics and Space Administration (NASA) 184, 187
Climate Kids 187
- National Oceanic and Atmospheric Association 1, 152
- National Science Foundation 152
- Nebula Award 52, 65, 90, 116
- Nesbø, Jo 72, 186
Okkupert 186
- Neufeld, Josh 44, 64, 176
A.D.: New Orleans after the Deluge 44, 64, 176
- Neuhaus, Nele 44, 66
Wer Wind sät 44
New Statesman 185
New Worlds 17
- Newton, Isaac 138, 139, 140, 164
- Nicholls, Jeff 64, 184
Take Shelter 184
- Nicholls, Peter 5
The Encyclopedia of Science Fiction 40, 56, 138
- Nisbet, Euan 50, 191
- Nishikado, Toshihiro 187
スペースインベーダー/Supēsu Inbēdā/Space Invaders 187
- Nolan, Christopher 45, 49, 64, 184
Inception 49
Interstellar 45, 49, 184
- Norfolk, Lawrence 174
- Norminton, Gregory 172, 173
- O'Connor, James 32
- O'Hara, David 47
- Obama, Barack 66, 165
- Oesterwind, Dieter 66
Steinerne Glut 66
- Oppermann, Serpil 30
- Oren, Peter 179
- Orgill, Douglas 14, 15, 16
The Sixth Winter 14, 15, 16
- Orwell, George 58, 129
Nineteen Eighty-Four 129
- Oshii, Mamoru 61
- Oshikawa, Shunrō 60
海島冒険奇譚 海底軍艦/ Kaitō Bōken Kidan: Kaitei gunkan 60
- Owens, Joe 193
- Pak, Chris 28, 29, 101
Terraforming: Ecopolitical Transformations and Environmentalism in Science Fiction 28

- Paltrow, Jake 64, 185
Young Ones 185
- Parker, Trey 186
South Park 186
- Parnov, Eremey 59
- Parrinder, Patrick 59
- Paterson, Don 176
- Peake, Maxine 176
- Penny, Laurie 64
Everything Belongs to the Future 64
- Piercy, Marge 41, 60, 76
He, She and It 76
Woman on the Edge of Time 41
- Piketty, Thomas 160, 193
- Pink Floyd 178
- Platonov, Andrey Platonovich 59
- Poe, Edgar Allan 25
- Pohl, Frederick 15
- Postlethwaite, Pete 185
- Powers, Richard 64
The Overstory 64
- Pringle, Bob 193
- Project Gutenberg 8
- Prynne, William 157
- Pullman, Philip 47
His Dark Materials trilogy 47
- Putin, Vladimir 8
- Quaid, Dennis 183
- Quero, Yann 64, 172
L'Avenir ne sera plus ce qu'il était 64
Le Procès de l'Homme Blanc 64
Le Réchauffement climatique et après... 64, 172
- Radiohead 178, 179
- Rawson, Jane 72
A Wrong Turn at the Office of Unmade Lists 72
- Reilly, Meg Little 64
We Are Unprepared 64
- Reisner, Mark 90
Cadillac Desert 90
- Renard, Maurice 58
- ReS Futurae 83
- Reynolds, Kevin 45, 64, 183
Waterworld 45, 183
- Rheon, Iwan 176
- Ricardo, David 193
- Rich, Nathaniel 48, 64, 172, 173
Odds Against Tomorrow 48, 49
- Rieder, John 23, 169
- Rigby, Kate 28
- Roberts, Keith 17
- Robinson, Alice 72
Anchor Point 72
- Robinson, Kim Stanley 25, 26, 27, 44, 48, 60, 63, 65, 66, 69, 70, 76, 101, 102, 103, 107, 146, 147, 152, 153, 154, 155, 158, 159, 160, 161, 162, 165, 168, 169, 172, 173, 175, 176, 182, 189, 192, 193, 194
Antarctica 158, 161
Aurora 44, 69, 101, 102, 103, 107, 158, 169
Blue Mars 65
Fifty Degrees Below 65, 153
Forty Signs of Rain 65, 152, 161
The Gold Coast 76
Green Earth 44, 66, 147, 152, 154, 155, 158, 159, 160, 161
Green Mars 65
Mars trilogy 101, 103, 158
New York 2140 44, 158, 159, 161, 165, 168, 169
Pacific Edge 65, 158, 161
Red Mars 65, 161
Red Moon 162
Science in the Capital trilogy 26, 44, 48, 65, 103, 152, 158, 189
Sixty Days and Counting 65, 153, 155, 173
The Years of Rice and Salt 158, 161
2312 44, 101, 103, 107, 176
- Rochette, Jean-Marc 14, 17, 18, 19, 44, 64, 176, 177
Le Transperceneige 14, 17, 18, 19, 44, 176
Terminus 177

- Roddenberry, Gene 60
Star Trek 61, 79
- Rolland, Romain 194
- Roser-Renouf, Connie 43
- Rosny, J.H. 58
- Rowson, Martin 86
- Rudolph, Wilhelm 4
- Russ, Joanna 41, 60
The Female Man 41
- Russell, Craig 49, 70, 168
Fragment 49, 168
- Russell, Stephen 187
Spacewar 187
- Saint Jerome, 112
- Saito, Kohei 32
- Sanders, Bernie 160
- Sargent, Lyman Tower 41, 42, 43, 75, 76, 77, 99
- Schäfer, Mike S. 43
- Schätzing, Frank 44, 48, 59, 66, 67, 68, 70, 115, 118, 119, 120, 121, 134
Der Schwarm 44, 48, 66, 67, 68, 115, 118, 121
- Schmeink, Lars 166
- Schwarz, Roberto 74
Science Fantasy/Impulse 17
Science Fiction Studies 61, 190
- Scott, Ridley 60, 83
- Scott, Walter 39, 49
- Seed, David 7
- 世界/*Sekai*/World 13
- selective tradition 24, 25, 26, 35, 37, 59, 60, 71
- Self, Will 64, 82, 85, 86, 87
The Book of Dave 82, 85, 86
Grey Area 85
- Sergeant, David 176
- SF World Conventions 58
- Sha naqba īmuru* 3, 4, 5, 11, 21
- Shannon, Kelsey 177
- Shannon, Michael 185
- Sharpe, Tom 100
- Shatner, William 61
- Sheen, Michael 176
- Shelley, Mary 5, 6, 7, 9, 25, 26, 37, 46, 58
Frankenstein 5, 9, 25, 26
The Last Man 5, 6
- Shirk, Dennis 188
- Shuster, Joe 18
- Shute, Nevil 50, 190, 191
On the Beach 50, 190, 191, 192
- Sieber, Renée 49
- Siegel, Jerry 18
- Silverberg, Robert 15
The New Atlantis and Other Novellas of Science Fiction 21
Time of the Great Freeze 15
- Skinner, Jonathan 175
Ecopoetics 175
- Skjoldbjærg, Erik 72, 186
Okkupert 186
- Słonimski, Antoni 60
Torpeda Czasu 60
- Smiley, Jane 172
- Smith, Adam 164, 193
- Smith, E.E. 'Doc' 187
Lensman 187
- Smit-McPhee, Kodi 185
- Snow, C.P. 32
- solarpunk 158
- Sorokin, Vladimir 59, 69, 70
Den' oprichnika 69
- Sparks, Cat 72
Lotus Blue 72
- Spencer, Sally-Ann 67
- Spielberg, David H. 64
On Vestige Way: A World Federation Novel 64
- Spielberg, Steven 45, 60, 64, 183
A.I. Artificial Intelligence 45, 183
- Spinrad, Norman 60
- Spitz, Jacques 58
- Stableford, Brian M. 138
- Stahlberger 179
- Stanton, Andrew 45, 64, 184
Wall-E 45, 64, 184
- Stapledon, Olaf 80
- Starzl, R.F. 14

- Steenkamp, Elzette 73
 Steffen, Will 31, 32
Stella 10
 Sterling, Bruce 5, 60, 63
 The Caryatids 63
 Heavy Weather 63
 Stoermer, Eugene F. 21, 30, 31, 33
 Stone, Matt 44, 186
 South Park 186
 Stott, P.A. 1
 Straczynski, J. Michael 60
 Strugatsky, Arkady 20, 59
 Strugatsky, Boris 20, 59
 Sue, Eugene 39
 Superflex 171
 Flooded McDonald's 171
 Suvin, Darko 7, 25, 26, 27, 46, 48, 62, 77, 99, 100, 152, 190
- Tambo, Oliver 156
 Tarkovsky, Andrei 59
 Tarter, Jill 120
 Telotte, J.P. 49
 Tempest, Kate 180, 181
 Let Them Eat Chaos 180, 181
 Test Ban Treaty (1963) 50
 Tezuka, Osamu 61
 Theodosius I (Flavius Theodosius Augustus) 28
 Theroux, Marcel 64
 Far North 64
 Thomas, Sheree Renée 50
 Thorne, Kip 184
 Thorpe, Adam 173
Thrilling Wonder Stories 10, 15
 Tiptree Jr, James 60
 Tobler, Ray 134
 Tolkien, J.R.R. 46, 47
 The Hobbit 46
 The Lord of the Rings 46
 Tolstoy, Alexei 59
 Touzot, Pierre-Yves 64
 Terre lointaine 64
 Traviss, Karen 116
 Wess'har Wars 116
- Trexler, Adam 28, 29
 Trojanow, Ilija 48, 66
 Eis Tau 48
 Troska, J.M. 59
 Trotsky, Leon 39
 Trudel, Jean-Louis 70, 172
 Les Marées à venir 172
 Trump, Donald 147, 150, 192, 194
 Tuomainen, Antii 49, 72, 73, 122, 126, 127, 128, 129
 Parantaja 49, 73, 122, 126, 128, 129
 Turner, George 21, 22, 27, 28, 44, 48, 50, 51, 52, 53, 54, 55, 67, 70, 72
 Ethical Culture trilogy 51
 The Sea and Summer 21, 44, 48, 50, 51, 52, 53, 54, 55
 Turner, Noel 40
 Tuschel, Karl-Heinz 66
 Der Mann von IDEA 66
 Tutu, Desmond 156
 Tykwer, Tom 49
 Cloud Atlas (film) 49
- Union of Concerned Scientists 148
 United Nations Climate Change Conference 1, 70, 178
 Kyoto 70
 Paris 70, 178
 United Nations Educational, Scientific and Cultural Organization (UNESCO) 40, 56, 57, 59
 Index Translationum 40, 56, 57, 59
 Statistical Yearbook 40, 56, 59
 United Nations Environmental Programme 21
- Vampire Weekend 179
 Van Lorne, Warner 14
 Van Neerven, Ellen 72
 Heat and Light 72

- Van Vogt, A.E. 61
- Vaughn, Matthew 64, 184
Kingsman: The Secret Service
 184
- Verhoeven, Paul 60
- Verill, A. Hyatt 10
- Verne, Jules 7, 8, 9, 10, 25, 26, 37, 46, 58, 59, 62
Autour de la lune 7
De la terre à la lune 7, 10, 62
L'An 2000 18
L'île mystérieuse 7
Le Tour du monde en 80 jours 9, 59
The Purchase of the North Pole 10
Sans dessus dessous 7, 10, 11
Vingt mille lieues sous les mers 7, 60
- Vidal, Gore 161
- Voigts, Gerald 179
- Voller, Jack G. 117, 118, 121
- Von Hanstein, Otfried 59
- Von Harbou, Thea 59
- Vonarburg, Élisabeth 70
Chroniques du Pays des Mères 70
- Vonnegut, Kurt 2
- Wachowski, Andy 49
Cloud Atlas (film) 49
- Wachowski, Lana 49
Cloud Atlas (film) 49
- Wadhams, Peter 1
- Wallace-Wells, David 83
- Wallerstein, Immanuel 38, 39, 40
- Walsh, J.M. 10, 11
- Walter, Jess 172
- Walther, Daniel 58
- Wang, Jinkang 62
- Warwick Research Collective 39
- Watkins, Claire Vaye 64, 110, 112, 113, 114, 115
Gold Fame Citrus 110, 112, 115
- Watkins, Paul 113
- Weber, Max 43, 44, 190
- Weinbaum 10
- Weinstein, Alexander 172
Children of the New World 172
- Weiss, D.B. 47
Game of Thrones 47
- Weithz, Jesper 72
Det som inte växer är döende 72
- Wells, H.G. 25, 26, 37, 46, 58, 59, 60, 187
The Time Machine 59, 60
War of the Worlds 59, 60, 187
- West, Jack 15
The Westminster Confession of Faith
 157
- Whale, James 60
- Whedon, Joss 60
- White, Patrick 193
- Wiitanen, Wayne 187
Spacewar 187
- Williams, Raymond 24, 25, 35, 37, 38, 129, 189
- Williamson, Jack 15
- Wilson, Rohan 72
- Wilson, Ruth 176
- Winawer, Bruno 60
Doktor Przybram 60
- Winstone, Ray 185
- Winterson, Jeanette 26, 44, 48, 64, 116, 122, 124, 125, 126, 128, 169
The Stone Gods 44, 48, 122, 124, 125, 128, 129, 169
- Wisniewski-Snerg, Adam 59
- Woita, Steve 187
Waterworld (game) 187
- Wonder Stories* 10, 15
- Wood, Brian 45, 64, 177, 189
DMZ 177
The Massive 45, 177, 189
Northlanders 177
X-Men 177
- Working Group on the Anthropocene 33
- World Meteorological Organization 21
- World Science Fiction Convention 49, 61, 73, 140

- world systems theory 35, 38
Wright, Alexis 44, 49, 72, 129,
132, 133, 134, 135, 143
 Carpentaria 132
 The Swan Book 44, 49, 129, 132,
 135
Wyndham, John 11, 12, 16, 58
 The Kraken Wakes 11, 16
Xi, Jinping 194
Yorke, Thom 178, 179, 182
Young, Neil 179
 Earth 179
 The Monsanto Years 179
Younge, Henry Lewis 40
Zamyatin, Yevgeny 37, 59
Zeh, Juli 66
 Corpus Delicti 66
Zelazny, Roger 60
Żulawski, Jerzy 60

