Cli-Fi – Genre of the Twenty-First Century?
Narrative Strategies in Contemporary Climate Fiction and Film

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[Uncorrected proofs of Chapter 7 from *Green Matters: Ecocultural Functions of Literature*, edited by M. Löschnigg and M. Braunecker, Brill/ Rodopi 2019, pp. 131-153.]

Writers and critics alike have noted the unique challenges of representing climate change. This chapter critically evaluates the strategies adopted to meet these challenges by American and German novelists and film makers. Disaster narratives and thrillers are the most commonly encountered forms of cli-fi. However, these bring with them genre expectations which tend to distort reality. With reference to the blockbuster film The Day After Tomorrow *and Michael Crichton's bestselling novel* State of Fear*, four key problems in telling the story of climate change are illustrated: communicating scientific knowledge, making the spatial and temporal scale of climate change meaningful, doing justice to natural as well as human agency, and avoiding the implication through narrative closure that the problem has been solved. The chapter ends by discussing Franz Friedrich's novel* Die Meisen von Uusimaa singen nicht mehr *(*On Uusimaa the Tits No Longer Sing*), as an example of work taking an alternative, poetic and mythical approach to the subject. It argues that while no single form is without drawbacks, there are ways of mitigating these: narratives and tropes can serve as literary and filmic mechanisms to make climate change real for readers and viewers, and help society adapt to a more sustainable way of life.*

1. Introduction

For the last ten years, additions to our knowledge of climate change, both from new data on rising temperatures, melting polar icecaps, sea level rise, extreme weather events, the loss of species, and the spread of disease, and from refinements of climate models, have continued to corroborate the finding that burning fossil fuels at the current rate will have dire consequences by the end of the twenty-first century. However, the severity of the dangers associated with climate change, the urgency of the measures necessary to avert these dangers, and the extent to which we need to change our way of life have been and remain hotly contested, especially in the United States, where climate change has become a matter of political ideology. In Europe, public concern over climate change has meanwhile been falling rather than rising. (See European Commission 2017.)

It is widely accepted that writers, film makers and artists have a role to play in addressing this striking disjunction between cognitive knowledge and willingness to act, which the Bengali novelist Amitav Ghosh has described as the 'great derangement' of our time (Ghosh 2016). Even doubters of the ability of current artistic forms to meet the challenge of climate change and outspoken critics of the subordination of aesthetics to didactic purpose such as Timothy Clark and Lucy Burnett subscribe to this view in principle. (See Clark 2015 and

Burnett 2018.) Concern about the climate has found expression in high and popular culture, extending across novels and films, poetry and theatre, art, comics and computer games. A substantial body of stories about climate change has emerged, particularly in the Anglophone world, but also to a lesser extent in Germany, the Scandinavian countries, and elsewhere. (For an overview and commentary on 29 key works see Goodbody and Johns-Putra 2019.) Much of this fiction seeks to imagine life in a climate-changed future. It extrapolates from present trends and speculates with varying degrees of realism and fantasy, often conveying a measure of factual information in the process. A smaller number of novels and films which are set in the present or near future explore the political, economic, psychological and cultural reasons for the current impasse.

The stories told about anthropogenic climate change today stand in a long tradition of writing reflecting on our place as humans in the world, and as individuals in society. J.G. Ballard's novels *The Drowned World* (1962) and *The Burning World* (1964) have been described by Jim Clarke as 'proto-climate fiction' (Clarke 2013: 8). Use of the term 'cli-fi' is, however, usually limited to works reflecting scientific knowledge of the effects of fossil fuel consumption and the resulting increase in atmospheric CO_2 concentrations. Ursula LeGuin appears to have been the first to mention the phenomenon (in passing), in her sci-fi tale *The Lathe of Heaven* (1971). It came centre stage in Arthur Herzog's thriller *Heat* (1977), and the Australian George Turner's *The Sea and Summer* (1987), a dystopian portrait of a flooded Melbourne. In the 1990s a trickle of novels followed, David Brin's epic narrative *Earth* being the most ambitious. At the turn of this century, Maggie Gee and T.C. Boyle extended the scope of the genre with increasingly complex and nuanced narratives, and since 2000, major North American authors including Margaret Atwood, Kim Stanley Robinson, Cormac McCarthy and Michael Crichton, and British writers David Mitchell, Will Self and Jeanette Winterson have written about climate change. A burst of literary production around 2010-11 (Barbara Kingsolver, Ian McEwan, Ilija Trojanow, Paolo Bacigalupi) has been succeeded by a steady stream of more recent publications, with Robinson and Bacigalupi emerging as writers specializing in the genre. In the first book-length academic study of climate fiction (Trexler 2015), Adam Trexler estimated that a total of over 150 climate change novels had appeared in English.

The wide general interest in the genre is documented in 'Cli-Fi Report Global' (www.cli-fi.net/index.html), a comprehensive website gathering information for journalists and others on the worldwide rise of climate fiction, which is managed by the Taiwan-based journalist Dan Bloom, who coined the term 'cli-fi' in 2007. Academic interest began in 2008,

with Ursula Heise's *Sense of Place, Sense of Planet*: her lines of enquiry were subsequently taken up and augmented in a plethora of articles, and in books on climate change writing and films by Clark, Kaplan, Rigby, and Trexler (all 2015), Mehnert (2016), Weik von Mossner (2017), Bracke (2018), and Johns-Putra (2019). (The explosion of academic interest in the new genre over the past decade is recorded in Susanne Leikam and Julia Leyda's research bibliography of 'Cli-Fi in American Studies' [2017].)

If prose fiction is the primary medium of climate fiction, it is not the only one. Svoboda writes of over 60 cli-fi films in his survey article (Svoboda 2016), excluding documentaries (made-for-TV movies and art house films as well as feature films for general circulation). Noting that these have tended to focus on extreme weather events and, rather than heat waves, the possibility of the Earth slipping into a new Ice Age, he comments that such scenarios, which reflect the imagination of film makers rather than the scientific consensus on the likely effects of climate change, indicate the challenges which cli-fi films pose to science communicators. Roland Emmerich's computer-assisted spectacular *The Day After Tomorrow* (2004), in which Los Angeles is devastated by a cluster of tornados, New York is flooded by a tsunami, and the entire Northern hemisphere is plunged into a new ice age, is the best known cli-fi film. Precursors include *Soylent Green* (1973), in which New York is subject to a multi-year heat wave resulting from greenhouse gas emissions, and Emmerich's first film, *Das Arche Noah Prinzip* (*The Noah's Ark Principle*, 1984). In terms of genre, while the apocalyptic thriller predominates, climate movies include family values films, science fiction, and eco-horror. *The Age of Stupid* (2009) is a drama-documentary-animation hybrid in which a man living alone in the devastated world of 2055 watches archive footage from 2008, and asks "Why didn't we stop climate change when we had the chance?". In animated children's films such as *Frozen* (2013), anthropomorphized animals must deal with dramatic changes in their habitat. Film adaptations of novels include *The Road* (2009, based on Cormac McCarthy's novel) and *Snowpiercer* (2014), which recasts the story of Jean-Marc Rochette and Jacques Lob's graphic novel, *Le Transperceneige* (1984), making the new ice age which befalls the Earth the result of a spectacularly over-effective attempt to counter global warming, rather than of a nuclear winter, and changing the dark ending to one of hope. *Take Shelter* (2011) takes cli-fi film in a different direction, juxtaposing climate science with the protagonist's haunting dreams of losing his family in catastrophic storms. Up to the end we do not know whether he is merely imagining imminent disaster: this opens up a space for the audience to experience and reflect on the unsettling which climate change provokes, and exemplifies the subversive creative possibilities of filmic representation of climate change.

Climate change also features on stage and in other cultural media. *The Contingency Plan* (2009) by Steve Waters, a diptych of plays set in the near future, at a time during which severe tidal surges begin to submerge parts of coastal Britain, was followed by a series of other plays in London theatres. (See Stephen Bottoms's review article on climate change in the theatre [2012] and Johns-Putra 2016.) Video games include *Civilization II* (1996), a strategy game in which the pollution created by industrial production and transportation, if left unchecked, leads to desertification, *Final Fantasy VII* (1997), and the 'global survival' resource-based multiplayer game *Eco* (Strange Loop Games 2015).

Climate fiction has the potential to prompt reflection on the risks associated with climate change and the choices we are called on to make – choices determined by the sort of world we wish to live in and leave behind for our children. Yet it faces unique challenges in doing so. Global warming is a scientific construct, an average figure arrived at on the basis of countless different individual measurements, and of complex hidden decisions about the reliability and use of proxies for periods before today's increasingly accurate records. A temperature increase of a mere half degree over 50 years is significant, and the presence of the greenhouse gases which are contributing to it is measured in parts per million in the atmosphere. Climate change is therefore abstract and inaccessible to the human senses. If climate fiction is to draw it to the attention of a wider public, it must therefore resort to techniques of concretization and dramatization. Literature and film commonly seek to enhance awareness of climate change by making experiences, attitudes and actions *real*, and they do so through stories and images involving threats to people's centres of felt value. (See James 2015; Weik von Mossner 2017.) They make it tangible by rendering it local and immediate, thereby compressing its imperceptibly broad and gradual progression into meaningful units of space and time, and by associating ideas, attitudes and patterns of behaviour with authentic characters, tracing their inner development, and exploring conflicts of interest in fictional experiments.

In this chapter, I note the problems associated with some of the more commonly encountered strategies of representation, which can in the worst case spread disempowering fears, reinforce a mindset anticipating disaster, or encourage readers and viewers through their patent implausibility not to take climate change seriously, and I consider how successful a representative film and two novels have been in avoiding these pitfalls.

2. Representing climate change: strategies, challenges and techniques

Three broad modes of cli-fi writing have been identified in the secondary literature: apocalyptic, pastoral and satirical. The apocalyptic mode, which is associated with a strategy of warning by arousing fear (the cautionary tale), is the most commonly adopted. A flood of dystopic novels set in worlds transformed by climate change, resource scarcity, and population growth show the United States, Britain, and other countries becoming authoritarian regimes, or disintegrating into lawlessness (or both at the same time). Many of the works of what Margaret Atwood has called "speculative future fiction" (Atwood 2004: 513), including her own trilogy, *Oryx and Crake* (2003), *The Year of the Flood* (2009) and *MaddAddam* (2013), and Paolo Bacigalupi's biopunk, *The Windup Girl*, present future dystopian worlds characterised not only by catastrophic climate change and social inequality, but also by sinister use of genetic engineering. The second, pastoral mode seeks to facilitate grieving and motivate resistance by making us aware of the value of what is being lost. Sarah Hall's *The Carhullan Army* and Ilija Trojanow's *The Lamentations of Zeno* are examples of such writing. Further examples are found in the work of George Turner, Maggie Gee, Kim Stanley Robinson, Will Self and Emmi Itäranta.[1] *An Inconvenient Truth* and *The Age of Stupid* are films which evoke absences and mourn losses resulting from climate change. Writing in the third, satirical mode works with humour and irony, exposing contradictions between professed principles and actual behaviour through satirical exaggeration. Authors using satire in this way include T.C. Boyle, Will Self, Christian Kracht, Ian McEwan and Philippe Vasset. The elements of playfulness and provisionality, which environmental educators and science communicators have recognized as central to public engagement, are perhaps most obviously present in such novels and films.

Cli-fi is not a genre in the scholarly sense, since it lacks the plot formulas and stylistic conventions that define genres such as science fiction and the western. It tends rather to borrow and blend elements of different genres (thriller, post-apocalyptic novel, crime, fantasy, horror). Barbara Kingsolver's novel *Flight Behavior* (2012) is for instance a novel of personal development, telling how a young farmer's wife, trapped in an unhappy marriage, learns the truth about climate change and its consequences, and in the process gains her independence. But its real significance lies rather in its sympathetic exploration of the economic, social and cultural reasons for the prevalence of climate scepticism in America's Bible Belt southern states. The genres on which cli-fi draws appeal to readers not least by conforming to their

[1] See Adam Trexler's discussion of nostalgia and other pastoral elements in novels depicting the impact of climate change on place, and of absences such as species loss, in Chapter 2 of *Anthropocene Fictions* (2015: 75-118).

expectations in terms of situation and character depiction, and following familiar plot patterns. But the obligation to meet such horizons of expectation can dictate a particular interpretation of the causes of social problems and their possible solution, and close down alternatives.

In her book *The Future as Disaster* Eva Horn argues that imagined catastrophes offer intellectual tools that can render a future shadowed with apocalyptic possibilities affectively, epistemologically, and politically accessible. However, cli-fi authors have a job to do in directing public anxieties productively, rather than merely exploiting our fascination with large scale violence and destruction in sensationalist 'disaster porn' (see Recuber 2013; Atkin 2017). As long ago as 1969, Susan Sontag wrote in an essay entitled 'The Imagination of Disaster' that disaster films offered the guilty pleasure of watching compelling spectacles of destruction, while addressing and allaying widespread fears of the time. But she considered the images of disaster in these films as "above all the emblem of an inadequate response", inasmuch as they failed to engage in the sort of social criticism required to confront the problems underlying the public's fears (Sontag 1969: 224).

More general problems with climate change fiction have been outlined by Timothy Clark and Ursula Heise. Clark has pointed out that, while it is the job of the writer to link the 'interesting' with climate change, representations of human temptations and dilemmas, and stories of deception and betrayal serve to distract attention from collective actions, non-human actors and initiatives to mitigate climate change (Clark 2015: 175-194). And Heise notes that climate fiction tends to fall back on dated and formulaic clichés in narratives with one-dimensional characters, far-fetched plots, and black-and-white confrontation between heroes and villains. The exploration of how individuals behave in the face of dilemmas and how personal relationships unfold in a context of social and ecological crisis can be shallow and haphazard. Are there better alternatives, or are we asking too much of climate fiction, she asks. Heise cites George Turner, David Brin and Kim Stanley Robinson as writers who succeed in circumventing the constraints of genre fiction. While they evoke apocalyptic scenarios as templates for envisioning the effects of global warming, they constrain and frame the millennial narrative in different ways. Brin, for instance, displaces the apocalyptic action from global warming to a more fantastic narrative of a black hole destroying the earth's crust from within, and introduces modernist techniques of fragmentation which disrupt the human stories.

The apocalyptic trajectory of the narrative is similarly countered in Trojanow's *Lamentations of Zeno*, in which the author blends apocalypse with elegy (and passages of satirical humour) in a "requiem for the future" (Trojanow 2010). A second German author working with poetic evocation of landscape is Franz Friedrich, whose novel *Die Meisen von*

Uusimaa singen nicht mehr (*On Uusimaa the Tits No Longer Sing*, 2014) depicts an island in Finland as a timeless, mythical place. Before discussing the qualities of this book in greater detail, I shall look at how two highly successful but problematic works, the film *The Day After Tomorrow* and the novel *State of Fear*, fare in addressing four key problems in telling the story of climate change.

Communicating the science

Literature is normally regarded as a de-pragmatised, non-referential form of writing, rather than a medium of science communication. However, cli-fi is commonly perceived as having an obligation to scientific truth, akin to the 'dual accountability' which Lawrence Buell argues that environmental nonfiction has to the object world of matter as well as discursive mentation (Buell 1995: 92). It is then legitimate to ask, without losing sight of the role of imagination and aesthetics in literary writing, if the climate science is sound, what role it plays in the story, and how skilfully it is integrated. Novelists vary in the effort which they put into mediating genuine science and underpinning their scenarios with meaningful predictions. Atwood and Robinson are known for their attempts at making their speculations scientifically plausible, and Kingsolver, who trained as an ecologist, uses her expertise in biology to describe the potential effects of global warming on the migration route of the Monarch butterfly. Many novels introduce scientists and journalists as protagonists: this enables them to integrate scientific information in conversations, correspondence or even scenes in the lab or lecture hall. At the same time, science is humanized through such characters, and its role in combating climate change is better understood.

Making the spatial and temporal scale meaningful

Ursula Heise devoted the final chapter of her study of the spatial imagination of environmental problems, *Sense of Place, Sense of Planet*, to the subject of climate fiction. As she points out, the global reach of planetary warming is a challenge for narrative and lyrical forms, which have conventionally focused on individuals, families and nations. Climate fiction has to imagine how planetary transformation might affect particular places and individuals. One possibility of solving the problem of spatial disjuncture held up by Heise is detailed exploration of a local site that on close inspection turns out to be linked to the global in unexpected ways. This kind

of narrative highlights the imbrication of local places, ecologies and cultural practices in global networks that reconfigure them by deterritorialising them.

Mediating between the timescales of global warming and human life is, as already noted, a further central task of cli-fi. Despite individual tipping points in the climate system and historical instances of 'abrupt climate change', global warming is infinitesimally slow as a general phenomenon. Novels such as *The Sea and Summer*, *A Friend of the Earth*, *The Book of Dave*, *The Possibility of an Island*, *The Bone Clocks*, and *The World According to Anna* use framing mechanisms, different time settings in parallel narratives, telepathic links between different generations and other multi-temporal structures to bridge the gap and make the impact of global warming real.

Doing justice to the interaction of human and natural agency

To depict climate change and its causes, novels must depart from the traditional near-exclusive focus on human characters and their actions, either by depicting the limits of human agency, or by conveying nature's agency. Familiar tropes in cli-fi which perform this function include silent, overgrown cities whose streets are lined with rusting cars, invaded by animals. However, bucolic images and fantasies of a world cleansed of human defilement can inculcate the unhelpful notion that there is a 'natural' state of the Earth to which we can return.

Avoiding distortion through narrative closure

Finally, narratives can be evaluated on the basis of whether they succeed in avoiding the impression that the problem of climate change is solved through the resolution of dilemmas and conflicts relating to individual protagonists. Clark accuses Kingsolver of unwittingly misleading her readers in *Flight Behavior*, by implying progress has been made in addressing climate change though the tale of her heroine Dellarobia Turnbow's achievement of freedom and emancipation: "Because the monarch butterflies acquire so many personal associations for Dellarobia at a crucial point in her life, their final fate becomes increasingly impossible not to be read as symbolic of her personal trajectory." (Clark 2015: 177) Given the expectation of narrative closure, it is hard for novels to avoid such implication, but some do better than others, either by leaving the human drama open-ended, or by distinguishing explicitly between it and the ongoing problem of climate change. In the following I consider whether *The Day After*

Tomorrow and *State of Fear* succeed in mastering the first of these challenges, and comment briefly on their performance in the other three respects.

3. *The Day After Tomorrow* and *State of Fear*

Roland Emmerich's Hollywood blockbuster, *The Day After Tomorrow,* was first screened in 2004, but it remains the best-known climate change film, against which subsequent movies have been measured. It is a disaster movie, using the cinematically virtuoso digital techniques for which Emmerich had already made a name for himself in his previous films *Independence Day* and *Godzilla*, to heap riveting scenes of destruction one on the other and instil shock, fear and relief. At the same time it is a sentimental father-son family drama, a coming of age story, and a love story, and it incorporates moments of dramatic irony and tongue in cheek humour. The question is whether these borrowings from different genres merely entertain, or serve as hooks to draw in a global audience to learn about climate change.

State of Fear, one of the best-selling cli-fi novels to date, is one of the few which dispute the reality of anthropogenic climate change. In terms of genre, it is an action thriller which embraces elements of the detective story and novel of personal development. While the book works with stock characters and situations, it builds tension skilfully, withholding information and springing surprises, and it includes ironic and humorous episodes. The plot unfolds with the central characters gradually uncovering a sinister world-wide conspiracy. Seemingly natural catastrophes which are presumed to be the consequences of climate change are revealed as the work of a network of eco-terrorists, who are seeking to put politicians under pressure to fund climate research and adopt radical green policies. The scales gradually fall from the eyes of the main protagonist, the environmentally committed liberal, Peter Evans, as he learns the truth about what is presented by Crichton as the lie of climate change.

4.1. The communication of science

Climate science is at the heart of *The Day After Tomorrow*. Jack Hall, a palaeo-climatologist who works at the 'National Oceanographic Atmospheric Office' in Washington, is a central figure. Hall, who believes the planet is on the brink of a catastrophic deterioration of the climate, is a familiar figure from sci-fi: the dissident scientist battling against the odds to

persuade politicians (including a sinister, corporate-friendly US Vice-President) to take his data seriously. The film draws a simple black-and-white contrast between good scientists, saviours of the planet who are timely warners of the consequences of global warming, and bad politicians. Large parts of it are, however, devoted to the story of Jack's son Sam's experiences. Sam is in New York, representing his school in a scholastic decathlon, when he becomes trapped there by a sudden ice storm. Jack, his egotistical father, has neglected him to pursue his work. He now feels compelled to make good in a heroic trek through the snow and ice from Washington to New York to save Sam. The underlying narrative of the film can therefore be described as one of personal redemption and renewal of the bonds of family.

Key scientific facts about climate change are integrated in the first part of the film, in a scene at an international conference, in conversations between scientists, and in a briefing for the President. However, it is the sensational special effect scenes of disaster in Los Angeles and New York which remain uppermost in viewers' minds. The science is also problematic in several ways. Like all science fiction, the film extracts and magnifies fragments of scientific truth. However, it exaggerates the immediate consequences of global warming, conflates different possibilities in highly improbable fashion, and above all shows the climate changing with implausible speed. The film speeds up the pace of change quite ludicrously (we are told of a 25 foot rise in sea level within hours), and it repeatedly breaks the laws of physics. For instance, supercooled air is drawn down from the troposphere, dropping the temperature to minus 150 degrees within minutes (and freezing the fuel lines of helicopters, which crash into the Scottish mountainside). This is impossible. Giant waves also swamp New York, allegedly resulting from storms: such tsunamis are in reality only caused by earthquakes, subterranean landslides, or meteorite strikes. The initial uncertainty of Hall's scientific predictions also soon yields to wholly implausible 100% confidence.

Veteran environmental journalist and climate activist George Monbiot called *The Day After Tomorrow* "a great movie and lousy science" (Monbiot 2004). It bore so little relation to scientific fact that it ran the risk of encouraging people to dismiss the entire climate change story as fantasy – or alternatively, to keep waiting for the effects they have seen in the film before they accept climate change is really happening. However, he concluded on a positive note: audiences, thank goodness, know the difference between movies and scientific papers. They watch such films not because they expect to learn something about climate science, but

"because they love to see treasured places smashed to bits while heroes struggle against impossible odds".[2]

Stefan Rahmstorf, Professor of Physics of the Oceans at the Potsdam Institute for Climate Impact Research, took a different tack, praising the film for what he saw as its surprisingly sound climate science (Rahmstorf no date). Stressing the amount of research which went into it, he noted the essential factual correctness of the opening scene of the film, which depicts the breaking off and disintegration of the Larsen B ice shelf in the Antarctic (an event which took place in 2002, while Emmerich was writing the film script). Rahmstorf commented that Jack Hall's prediction, at the international climate conference in New Delhi in the next scene, that global warming was likely to shut down the circulation of water in the Earth's oceans and push parts of the planet into a new ice age "maybe in a hundred years, maybe in a thousand", corresponded to assertions he had himself made at such conferences, using similar visuals. Rahmstorf wrote, like Monbiot, that viewers would be familiar with the genre characteristics of disaster movies, and able to distinguish where the science stopped and the fiction began.

As consumers of fiction, we are indeed used to suspending disbelief in the face of implausibilities, and the film signals from the start that it will expect this of us. In the opening scene, Jack Hall miraculously escapes death when the ice he is standing on collapses into a chasm, by embedding an ice pick (which he does not appear to have been carrying previously) in the side of the crevasse, and hauling himself up with it. The film also prepares us for the departure from real-world science in the flash-freezing scenes. In an earlier sequence in the New York Natural History Museum, Sam and his friends see a stuffed woolly mammoth which supposedly froze instantly while grazing: we are told it has food in its mouth. So the answer to the question whether the film does justice to the scientific facts of climate change is less one-sidedly obvious than would appear at first glance.

Whereas the science in *The Day After Tomorrow* is potentially misleading, but this has probably not prevented the film from arousing interest in climate change, *State of Fear* spoke to readers' misunderstandings of climate science, denial of climate change, and rejection of climate protection policies. Although the novel was marketed (on the back cover of the paperback edition) as a "potent blend of scientific fact and pulse-pounding action", it openly

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[2] An audience response study by Anthony Leiserowitz (2004) found higher levels of concern and a greater willingness to act after seeing the film on the part of American audiences. A study of the film's impact on cinema-goers in the UK (Lowe 2006) confirmed that the film increased anxiety about environmental risks, but viewers had difficulties in distinguishing fact from fiction. Also, while they were motivated to act on climate change, they lacked information on what action they could take.

adopts a position of literal climate scepticism. We learn from a climatologist whose integrity is not in doubt: "The threat of global warming […] is essentially nonexistent. Even if it were a real phenomenon, it would probably result in a net benefit to most of the world." (Crichton 2004: 483) This may be the view of Donald Trump and a majority in the Republican Party, but it runs counter to the overwhelming consensus of scientific opinion. Crichton was a sci-fi novelist, and sci-fi novels since Mary Shelley's *Frankenstein* (1818) have used fiction to present recent scientific discoveries. The genre, defined by Hugo Gernsback as "charming romance combined with scientific fact and prophetic vision" (Gernsback 1926: 1), has been characterised more recently as aspiring to be compatible with current scientific knowledge, and to communicate this knowledge to readers (McLeod 2010: 171). Sci-fi has of course the right to take liberties with science, but it is normally expected that it should not make outright mistakes. Trexler and Johns-Putra have argued similarly that cli-fi is distinguished from other forms of writing by its combination of meteorological *fact* with fictional plots, speculation on the future, and reflection on the human-nature relationship (Trexler and Johns-Putra 2011). Crichton graduated from Harvard Medical School, and this scientific training fed into his novels *The Andromeda Strain*, *Congo*, *Jurassic Park* and *Prey*. But he became increasingly cavalier in his blend of fact with fiction. Although his books contain references to real science, technology and theories, these are not easily distinguishable from the false scientific information which he presents. In particular, Crichton tended to stretch the truth to fit storylines which critiqued the commercialisation of scientific practice (see Lawrence 2017).

State of Fear conveys a number of valid messages about climate change, pointing out quite rightly that the climate has always been subject to change (Crichton 2004: 538), that there is considerable variation in temperature change between different regions of the planet, and that climate modelling is never free of a degree of uncertainty (294-6, 674). Crichton's attacks on the "romantic mythology" (481) of "untouched wilderness" (577) behind much American conservationism, and the misguidedness of climate alarmism, are also not without justification. The fatherly figure John Kenner, MIT professor of environmental science (and at the same time mountain climber and James Bond-like intelligence agent), is the mouthpiece of the author: he demolishes one by one the naïve environmentalist Ted Bradley's popular assumptions that there is already incontestable scientific evidence that crop failure, desertification, the spread of diseases, species extinction, extreme weather, and melting ice in Antarctica are the results of global warming (499f.). However, *State of Fear* throws the baby out with the bathwater.

Crichton is not taking artistic licence, or being mischievous. There is nothing tongue in cheek about his position in the book, which has been described as a "novelization" of a speech

which the author gave in 2003, entitled 'Environmentalism as Religion' (Powell 2011: 79). He seeks to give his novel the appearance of factuality by providing copious references to peer-reviewed scientific articles, but he has either sourced these selectively from the tiny minority of scientists who doubt or dispute climate change, or taken findings out of context. The action is framed with an Introduction purportedly alluding to real events which the novel will explain. In case it may have escaped the reader, the 'climate denialist' position is spelled out in an 'Author's Message' at the end of the story, and again in an appendix entitled 'Why Politicized Science Is Dangerous' (Crichton 2004: 676-87). Like the 'sceptical environmentalist' Bjørn Lomborg, Crichton argues that combating poverty and education are more urgent calls on our resources. However, he leaves the ground of rational argument in his polemical comparison between climate activism and the eugenics movement in the 1930s. While Crichton mounts a broadside against mainstream climate science, he claims to respect the authority of 'true' science. Misleading as it was in terms of information content, the book appealed to the George W. Bush administration, and may even have influenced US climate politics: Crichton was invited to a tête-à-tête with the President in the White House in 2005, and *State of Fear* was made required reading for members of the Senate Committee on Environment and Public Works (Powell 2011: 81).

If the self-serving manipulation of members of the political and scientific establishment is the principal target of criticism in *State of Fear*, fear-mongering is a secondary one (Crichton 2004: 534). In this respect, *State of Fear* reads like a response to *The Day After Tomorrow*. What Crichton sees as the efforts of the authorities to exert social control through fear is introduced as the rant of a crazed emeritus professor of sociology (540-1). But we are clearly intended to take seriously the gist of the man's arguments that environmental crises have taken the place of the Cold War since 1989, that we are living in an age of domination by the 'politico-legal-media complex', which has replaced the former domination of the military-industrial complex (542), and that climate 'warmism' fulfils the function performed by belief in witchcraft in the Early Modern period.

4.2. Spatial and temporal scale

There is little to add to what has already been said about the representation of the spatial scale of climate change in either *The Day After Tomorrow* or *State of Fear*. In the film, the action takes place almost entirely in the United States (New York and Washington), but America stands for the rest of the world: it is made clear the climate change is a universal problem which

is only amenable to a global solution. The consequences of climate change are visited on the Northern hemisphere, and especially on countries which have been responsible for the bulk of carbon emissions. But we are also taken to other parts of the world in the opening quarter of an hour, and the rebalancing of political and economic power which is implied at the end forms the basis on which a united humanity will address the problem, as suggested in a scene where Russian, Japanese and American astronauts look down on Earth from the International Space Station, and speak of a new beginning. *State of Fear* is as America-centric as *The Day After Tomorrow*, the action being focused mainly on California, but it ranges across the globe, moving initially from Paris to London, Tokyo, Vancouver and Iceland, and later to the Antarctic and Papua New Guinea. Crichton does not believe in climate change, but he suggests all these places are networked, by a web of conspirators, and a global network of law enforcers trying to thwart them.

As already noted, the pace of climate change is accelerated in *The Day After Tomorrow* to match the temporal scale of human life: what might in reality take place over a hundred years is telescoped into a week to ten days. Jack Hall has found an explanation why, towards the end of the last Ice Age, the gradual warming of the Earth experienced a reversal which lasted two centuries: an interruption of the thermohaline ocean currents triggered a sudden drop in global temperature. The abrupt climate change which takes place in the film is attributed to the same cause. Emmerich engages in sleight of hand with the science here: the shutdown of the North Atlantic Drift ten thousand years ago is actually believed to have been caused by melting glaciers in the centre of the North American continent breaching an ice dam and rapidly flooding the ocean with enormous quantities of fresh water. It is extremely unlikely that today's gradual ice melt could do more than slow the currents bringing warm water from the equator into the North Atlantic. Of a different order is the implausibility of the flash freezing in the eye of the superstorm, which rapidly descends high-rise buildings, and sends people scurrying indoors. This is surely calculated to make audiences chuckle – much as the moments where scenes of subcontinents sliding into destruction are comically juxtaposed with Sam's agonising over whether to tell Laura he is in love with her. *State of Fear* can also be read as playing with the idea of small changes (including man-made ones) being tipping points triggering abrupt climate change, inasmuch as it reveals that the storms and tsunamis described are not natural events, but staged by ecoterrorists.

4.3. Human and natural agency

From the opening panorama showing the majestic icy landscape in Antarctica, and zooming in on the tiny group of scientists working there, to later scenes of tiny aircraft flying into vast banks of storm cloud, *The Day After Tomorrow* suggests the limits of human agency, and the overwhelming scale and power of nature. The flooded city scenes in New York reference the trope of the Biblical Deluge, the archetypal existential threat, and the film abounds in symbolic scenes marking the end of modern urban carbon-driven civilisation, such as the ruined high rise buildings of Los Angeles and New York, the destruction of the Hollywood sign, the giant waves embattling the Statue of Liberty, upended ships tossed ashore by the power of the storm, and the freezing Stars and Stripes. America is punished by nature for its capitalist consumerism. The new President, who as Vice President had led resistance to climate action, announces that events "have left us all with a profound sense of humility in the face of nature's destructive power". "We believed we could continue consuming our planet's natural resources without consequence." He expresses his gratefulness to Mexico for opening its borders to Americans fleeing South, in return for the remission of Third World debt. Monbiot was led to remark that the film is "curiously subversive", with its plot revolving around the climate change which much of the American establishment has tried so hard to deny, and the reluctance of the powerful to respond to the needs of the people.

However, this is only one side of the picture. *The Day After Tomorrow* also celebrates the actions of individuals unashamedly. From the outset, the characters demonstrate qualities of innocence, trust, loyalty and dedication to the pursuit of knowledge, conveying a sense of human ingenuity and resilience. We find this not only in Jack Hall's bravery, but also in Laura's kindness to the foreign strangers trapped in their taxi, and in Frank's self-sacrifice cutting the rope connecting him with Jack and Jason, when the glass roof they are on starts cracking under the weight of the three men. It is no accident that Sam and others find refuge in New York's Central Library, a symbolic repository of human knowledge, and we are told explicitly, when they are burning books from the shelves to keep themselves alive, that a copy of the Gutenberg Bible must be preserved, because it represents the dawn of the Age of Reason. The images of nature red in tooth and claw as an enemy to be defeated are stronger than the assertion at one point in the narrative of humanity's co-dependence with the natural world.

State of Fear is more open to the idea of humanity's dependence on nature, but only inasmuch as it supports the author's views on climate politics. Towards the end of the book, Crichton writes of the insignificance of human actions in the context of geological deep time, only to arrive at a provocative conclusion. Far from facing global warming, Kenner says, we are on the brink of a new Ice Age: "No one is entirely sure why, but ice now covers the planet

every hundred thousand years, with smaller advances every twenty thousand or so. The last advance was twenty thousand years ago, so we're due for the next one." (Crichton 2004: 670) Kenner is a proponent of rational management of the environment where the benefits of a given action outweigh the harm (because "there is always harm" [581]). But in practice he is deeply sceptical about human understanding of and ability to control natural processes, citing "a history of ignorant, incompetent, and disastrously intrusive intervention, followed by attempts to repair the intervention, followed by attempts to repair the damage caused by the repairs, as dramatic as any oil spill or toxic dump" (578). He recognises the limits of human agency, but uses this to justify not taking action to limit climate change: "The nasty little apes that call themselves human beings can do nothing except run and hide. For these same human apes to imagine they can stabilize this atmosphere is arrogant beyond belief. They can't control the climate." (670)

4.4. Narrative closure

By personalising the predicament of climate change, and depicting its course and impact through the experiences of a small group of people who are happily reunified at the end, *The Day After Tomorrow* implies that the problem of climate change can be solved through resolution of individual human dilemmas and conflicts. The triumph of human fortitude and the ascendency of the human spirit are also celebrated through the images of groups of survivors on top of New York skyscrapers and a defiant Statue of Liberty, waist-high in the ice but holding its torch aloft. This happy ending airbrushes the deaths of hundreds of millions of unseen people out of the picture. The final scene returns us to one of the oldest myths of all. Astronauts look down on Earth from the Space Station after the storm has subsided. "Have you ever seen the air so clear?", one asks. As after the Flood, God has punished sinful humanity, but the survivors can now make a fresh start in a pristine world.

Despite its climate denialism, *State of Fear* might again be seen to come off better in terms of avoiding the implication through narrative closure that environmental problems have been solved. The book ends with the dastardly plot of the ecoterrorists exposed and averted, but not with any sense of a solution to the world's environmental difficulties. Flying back to Los Angeles, Kenner and Evans are met with a brown haze over the ocean half an hour before reaching land. The city "looks a bit like hell", we are told, and "we have a lot of work to do" (Crichton 2004: 675).

Bearing these mixed findings on the merits of *The Day After Tomorrow* and *State of Fear* in mind as popular fictional representations of climate change, I now examine a less well-known, more literary work which addresses many of the same issues, albeit more obliquely.

5. A Poetic Alternative: *Die Meisen von Uusimaa singen nicht mehr*

Franz Friedrich's *Die Meisen von Uusimaa singen nicht mehr* exemplifies a poetic, non-realist form of writing, one which is experiential rather than speculative, and combines realism with myth and symbolism in a kind of magic realism. Climate science plays no part in this novel, in which global warming is decentred, only featuring in one of three main narratives. (The narrative in question is set in Berlin, as the city experiences "the hottest February in living memory" – Friedrich 2014: 203).

The book opens with the story of an unnamed German nature documentary film maker, who leaves his home in Brussels on a trip to the Finnish island of Uusimaa. The year is 2017. His journey is triggered by fascination with a documentary made there twenty years before by a film maker called Susanne Sendler, investigating why a species of bird on the island (the Siberian Tit) has suddenly stopped singing. This first narrative breaks off when the plane which the protagonist has taken from Brussels to Helsinki crash-lands in Northern Germany, but is returned to later. The second narrative strand consists of entries from a diary which Susanne Sendler kept during her stay on Uusimaa. We learn that the island had just been evacuated, leaving behind only a team of naturalists in an ornithological research station. Life and work of the ornithologists are described, and Susanne's ramblings around the deserted island. The third narrative, which is set in Berlin between 2015 and 2017, is focused on Monika, an American graduate student whose life is in crisis because she is having difficulties in writing her thesis and her German visa is about to expire. We then turn back to the male documentary filmer in the first narrative, but at a time a few years before we first met him, before returning to Monika in Berlin. In the last ten pages of the book the three narratives converge. After twenty years of silence, the birds have started singing again on Uusimaa. The film maker from Brussels arrives at the port where the ferry leaves for Uusimaa. He finds himself joined by crowds of people who used to live on the island, and have been given permission to return. The members of a Finnish choir from Berlin which has played an important role in Monika's life (see below) are among them, as is Susanne Sendler.

Friedrich’s novel could be accused of trying to do too much, with its complex interweaving of narratives set in different places and times: in further passages, the development of European politics in the post-carbon era is hinted at, as are space travel and an encounter with aliens. While global warming is the driving force in the sweeping social and political changes which Europe and America are experiencing, the main focus of the book is the mysterious environmental crisis which befalls Uusimaa and its resolution. The strengths of the novel lie not in conveying information or imagining life in a climate changed future world, but in exploring experiences of intimacy with nature and of its loss, in poetic images which continue to resonate in the reader’s mind long after they have put it down.

‘Uusimaa’ is described as situated in the north of the Gulf of Bothnia, near the Arctic Circle. Its location approximates to that of the (real) island of Hailuoto, home to nature tourism, and summer festivals of theatre, classical and folk music. The island is described in minute detail: the villages, streets and even individual abandoned shops are given names; its area is given as 46 square kilometres, and its population as 3872. Yet no island of this name exists (Uusimaa is in reality a province in the south-west of Finland). The word means ‘New Land’, and the island, which is shaped like a tadpole, is described at one point as having emerged from the sea as a result of volcanic activity a thousand years ago. The effect is one of hyperrealism, fusing authenticity with symbolic meaning.

The island is described as “beautiful and pure” (Friedrich 2014: 18) – it is the Other of modern civilisation. Susanne Sendler refers to it as ‘Thule’, that is, the region believed by ancient geographers to be the northernmost land in the inhabited world, and likens it to Atlantis. However, it is also a site of absolute environmental defilement. The population has been evacuated because of toxic contamination. One interviewee of Susanne Sendler’s claims that NATO experiments with biochemical weapons were to blame, but, as in Cormac McCarthy’s *The Road*, we never learn the cause of the disaster. The island is referred to as a “forbidden zone” (19), echoing Tarkovsky’s film *Stalker* and hinting at a parallel with Chernobyl. This points rather to the deep repository for spent nuclear fuel which the Finnish government is building in Onkalo as a possible inspiration for the book. Before their forced evacuation, the islanders had formed a close-knit, independent, egalitarian community, living in harmonious unity with the animals and plants of the region (119), characterised by a unique spirit (‘Sisu’). The fate of Uusimaa, the essence of an imaginary mythical Scandinavia, symbolises the global impact of environmental change in the Anthropocene: it stands for a lost utopia and the dream of regaining it.

The song of the native birds, and its absence, which echoes Rachel Carson's *Silent Spring*, is a second central trope, which constitutes a thread linking the disparate places and times in the novel, and functions as a reminder of the imbrication of human agency in the greater whole of nature. We are not told in so many words why they stopped singing, why it is important, or why they have started again. When Susanne Sendler asks researchers at the ornithological station, she receives widely differing answers. However, most assume it has something to do with pollution, and see the birds' silence is a warning of the impending end of the world (Friedrich 2014: 18).

In her diary, Sendler describes a strangely moving performance of an ancient folksong by a choir on the island. Their singing is ecstatic and trance-like, and the song, which is likened with the ancient keening songs of the Sami, is described as an incantation, bringing something into existence rather than merely depicting it (Friedrich 2014: 143). The same song reappears later in a performance by a Finnish choir in Berlin: hearing it triggers a burst of creativity in the American student Monika, and her life takes a turn for the better. In a *mise en abîme*, the song tells the story of an island whose birds leave for the stars. They are deprived of their song, and the island sinks beneath the waves. The song is referred to as both human and natural. A human vocalisation of the singing of the birds, it is described as continuing music which began tens of thousands of years ago (102), and as uniting the living with the dead and the whole of creation. The words of the song are an allegory of man's technological hubris and destruction of the environment. But it is also the song of the earth, and a magical incantation capable of healing the wounds inflicted on the planet, evoking and making possible a utopian future. At one point (96), the silence of the tits is interpreted as an act of protest against the contamination of the island, rather than a result of damage to the birds' health. This echoes the presentation of the islanders as an independently-minded, non-hierarchical, and inherently resilient community. The song reassures its singers and listeners that the birds will return to earth from the stars one day, the sea will open, the island will re-emerge, and they will all be reunited (257). Described as more a "political song" than a folksong or a hymn (227f.), it suggests that poetry and literature can play an important role by inspiring confidence, motivating action, and cultivating hope in the face of loss and despair. It is a poetic condensation of the message of the novel, which evokes myth to overcome loss, and seeks to bring about political rebirth and a new relationship with the natural environment.

6. Conclusion

The success of *The Day After Tomorrow* and *State of Fear* is down at least in part to their adherence to familiar conventions of genre fiction. Although we have noticed respects in which they avoid the limitations of their respective genres, both have serious shortcomings. The question was therefore whether climate change can be made palpable without such distortion and over-simplification – whether, if readers and audiences are to be informed about climate change and motivated to act, there are viable alternatives to the flawed genres of the disaster movie and the action thriller. Ursula Heise and others have called for a multiplicity of conventional and alternative narrative strategies. Are there then other narrative structures and tropes which are more capable of encompassing the contradictions and complexities relating to the subject?

Cli-fi is, as Trexler has written, a medium to explain, predict, implore and lament climate change (Trexler 2015: 9). With its refusal to distinguish not only between real and imagined places, but also between action, recollected action, what characters are imagining, and the content of myths, folk tales and literature, which give voice to the non-human and speak of an alternative relationship with nature to that of the scientist, one based on intimacy and animism, Friedrich's book is one of a number of works written in German which only address the issue of climate change indirectly, but which prompt reflection on its impact and significance. Others include novels by Peter Handke, Ilija Trojanow and Erwin Uhrmann, and W.G. Sebald's *The Rings of Saturn*, a melancholy lament over human cruelty, violence and destruction, in which environmental damage is set in a context of unstoppable natural decline and disintegration – what Sebald has elsewhere called the "natural history of destruction" (Sebald 2003).

Associated with a mythical past through references to the Eddas, the Kalevala and Sami folk songs and tales, Uusimaa is an idealised sphere of attunement to nature and harmonious inhabitation, which is simultaneously localised and deterritorialised, hence universal. Keeping alive the dream of freedom, fulfilment and hope, the song of the birds and the Finnish folksong are models for a form of art which seeks to unite humanity and bring about a reconciliation with nature. *Die Meisen auf Uusimaa singen nicht mehr* subscribes to a non-mimetic aesthetic for art in the Anthropocene, one seeking to inspire readers to work towards alternatives to the present by mourning loss and imagining recovery. Bringing readers and viewers to face and mourn the future losses associated with climate change might be the first stage in a psychoanalytic treatment of the dissociation at the root of climate anxiety (see Kaplan 2015).

As Mike Hulme has commented (2017: Chapter 8), representations of climate do not just communicate science, nor do they always seek to alter readers' and viewers' behaviour directly, or to bring them to atone for or alleviate climate change. They can also perform an important function by provoking viewers and readers to reflect on their understanding of climate change, and their self-understanding.[3] Ci-fi humanizes climate. It has the power to draw readers into new imaginative worlds in which they learn more about themselves and their emotional, intellectual, philosophical and spiritual capacities. As a medium of the contemporary social climate imaginary, it participates in determining the aims, alternatives and self-understandings which underpin climate debates and policies.

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[3] This is also the nub of Lucy Burnett's "literary critique of the genre of climate change" (Burnett 2018).

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