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Our Still Angry Earth:

The Asimovian Approach to Cli-Fi

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Abstract

Although cli-fi is generally considered a post-2008 genre, this dissertation will bring to light the relevance of earlier authors such as Isaac Asimov, Frederick Pohl, and Kim Stanley Robinson within a twenty first century climate crisis as well as discussing how realistic scientific topics can be hypothetically scrutinized and solved through science fiction. With a prominent focus on scientific fact and fiction written by Isaac Asimov, this paper acknowledges the significance of Asimov and Pohl's 1991 polemic text *Our Angry Earth* during a modern-day climate crisis due to the fact that the accurate predictions and observations written within the text ring as true today as they did thirty years ago. In addition to Asimov's and Pohl's fictional works, this dissertation also analyses Kim Stanley Robinson's *Science in the Capital* trilogy and the ways in which Robinson humanizes the scientist which in turn allows for the science to be brought down to an understandable level. Through observing fiction from multiple decades, we are able to examine the ways in which climate change and its impact are presented and how this representation has evolved over time.

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This dissertation is dedicated to my partner, Tom, who now knows who Isaac Asimov is. Thank you for everything.

This dissertation was completed largely from home during the COVID-19 pandemic.

Contents

Introduction: Isaac Asimov and Climate Fiction

As we find ourselves in a state of climate emergency, the popularity of climate fiction, or cli-fi for short, increases in tandem with the uptick in global temperature each summer and the resulting surge of climate anxiety and awareness in society. Although cli-fi is generally considered a post-2008 genre, this thesis will bring to light the relevance of earlier authors such as Isaac Asimov, Frederick Pohl, and Kim Stanley Robinson within a twenty-first century climate crisis as well as discussing how realistic scientific topics can be hypothetically scrutinized and solved through science fiction. Furthermore, I will explore how these three authors are connected by their techno-optimistic perspective and the belief that technology, despite its role in contributing to climate crisis, is the solution to ecological destruction. This is an original contribution to the research on climate change and climate fiction as there has been little discussion on Asimov and Pohl's groundbreaking 1991 polemic text *Our Angry Earth* or the applicability and significance of their fiction during a modern-day climate crisis.

Climate change is not a new issue; it has been investigated, considered, and written about throughout the history of human existence as far back as Aristotle. However, it has only become a key topic of conversation in the early twenty first century due to advanced scientific research. Far from a new concept in literature, the issue of climate change within fiction was explored by writers such as Mary Shelley in her lesser-known novel *The Last Man* (1826), which represented the historic relationship between humanity and the environment. Richardson introduces the phrase "eco-historical uncanny" (2019, pg. 1063) which refers to an extra interdisciplinary layer when reading old texts in a contemporary and modern setting. Within her article, Rebecca Richardson states that Shelley's novel has become more uncanny due to her portrayal of floods and rising ocean levels seeming all too realistic now, "in an age when we have become accustomed to record-breaking temperatures, levels of carbon dioxide, and glacier melt" (pg. 1063). The same can be said for the fiction written by my chosen authors and the eerily familiar topics in which they explore in their novels. Although climate change and the environment has been a popular topic to delve into within fiction, the literal term 'cli-fi' was coined in 2008 by climate activist and journalist Dan Bloom, who noted that more science fiction books were addressing the issues of climate change. Bloom has explained that he hopes "that emotional cli-fi

narratives will be far more effective in waking up the public to the need to reverse current trends than the IPCC's string of scientific data projections" (Forthomme, 2014). There has been varying arguments to whether cli-fi is merely a sub-genre of science fiction posing as a "not-so new form of apocalyptic literature" (2014); nonetheless, Bloom has insisted that it is a genre of its own that has influenced writers and readers around the world. Climate fiction allows readers to understand climate change from a more down-to-earth perspective rather than reading jargonistic and data-heavy scientific reports. Climate fiction authors often present accurate scientific knowledge in a more accessible way in order for literature readers to be both entertained and educated on serious matters. Authors such as Asimov are at an advantage due to existing extensive knowledge on such topics and so the realism of their work shines through and is more effective. Furthermore, although some cli-fi authors possess only a rudimentary knowledge of climate sciences, Asimov has more authority and deserves more attention from eco-critics because of his expertise and the fact that he was a legitimate scientist.

Introduced by William Ruecker in 1978, the term 'Ecocriticism' refers to "the study of the relationship between literature and the physical environment" (Glotfelty & Fromm, 1996, pg. xvii). It was developed "out of more traditional scholarship about literary treatments of the natural world" (Gersdorf & Mayer, 2006, pg. 26); however, the environment and the treatment of such was explored and written about long before there was a specific name for this topic. As aforementioned, Shelley heavily featured nature in her literature, as did Shakespeare in the Little Ice Age in such plays as *King Lear* and *The Tempest*. David Gray states that "this new way of reading Shakespeare shares in a long history of critical attention to natural phenomena and the complex relationships between culture and nature in his writing" but is simultaneously "distinguishable from this tradition by way of its increasing awareness of the Anthropocene, or humanity's role as a geological agent affecting the Earth's climate and environment" (2017, pg. 3). Modern day audiences and readers have more of an understanding as to why climate change is happening and so can observe literature with an added advantage to recognise the power that nature has as well as the power that humans wield over nature. Following on from the introduction of the term 'ecocriticism', in the mid-eighties "the field of environmental literary studies was planted and grew in the early nineties" as scholars started to undertake collaborative projects (Glotfelty & Fromm,

1996, pg. xvii). Eco-literature has become more recognised and popular within modern fiction, as noted by Adeline Johns-Putra who stated that "climate change has emerged as a dominant theme in literature and correspondingly, in literary studies. […] The increasing number of ecocritical analyses of climate change literature, particularly novels, is helping to shape a canon of climate change fiction" (Johns-Putra, 2016, pg. 266). Prominently recognised and most notable within this canon is Kim Stanley Robinson who echoes the voice of Isaac Asimov through his own fiction, despite the fact that Asimov has not been properly recognised as part of the cli-fi canon. This thesis aims to illuminate Asimov's contribution to both climate fiction and the scientific understanding of climate change.

There has been much academic discussion about ecocriticism and climate fiction within modern contemporary literature; it appears that cli-fi has given novelists "another platform […] to shift their storytelling from the normal world's heinous crimes to ecological crimes perpetrated by either villainous individuals or corporations" (The Herald, 2017). On top of this, cli-fi enables authors to give their readers a peak at a potential future that has been ravaged by apocalyptic events. For example, JG Ballard's 1962 text *The Drowned World* offers no explanation for how the world of 2145 was inundated; this creates more of a sense of terror due to the fact that it impossible to solve a crisis when there is no knowledge about how the situation came to pass. Although not specified explicitly, "today it is difficult to read Ballard's description of a drowned world without calling to mind the growing evidence for anthropogenic climate change" (Tait, 2014, pg. 3). Similar to Ballard, Cormac McCarthy's 2006 novel *The Road* does not give an explanation for the dystopian predicament of the setting. McCarthy has set his novel after an "ambiguously represented event brings about the ruination of civilisation and the elimination of almost all organic life" (Murphet & Steven, 2012, pg. 45). The ambiguity of the disastrous event allows readers to interpret the cause of the apocalypse for themselves. Often within cli-fi, ecological destruction is brought about by mass consumption and consumerism by an over-populated world; readers are often given descriptions of worlds already torn apart by climate change which enhanced anxieties for future generations. The focus in Ballard and McCarthy is not how climate change happened but whether we will survive it with our humanity intact.

Johns-Putra discusses how climate fiction "frames our climate change concerns as a fear for the future (human) generations and particularly for the most immediate of those – our offspring" (2019, pg. 4). This is something explored by my chosen three authors; collectively, Asimov, Pohl, and Robinson take into account how current environmental damage will have harsh consequences on the future generations of mankind, and explore how this can potentially be avoided and mitigated. Climate fiction offers a simulated reality for authors to explore the worst- and best-case climate scenarios based on real scientific facts and discoveries, allowing for cli-fi to maintain its credibility. However, within academic discussions, scholars disagree with the credibility of cli-fi; Dana Phillips stated that "many [environmentalists] do not want [literature's] help" (1999, pg. 578) due to literary scholars being unable to understand science properly. This makes Asimov the perfect candidate due to his interdisciplinary knowledge of both science and literature; his PhD and expert understanding of biochemistry mixed with his prolific collection of fictional texts makes him the exception.

The popularity of cli-fi has been growing rapidly since even before the coining of the term in 2008. Matthew Schneider-Mayerson explained that "literature focused on climate change has become a major trend in English-language publishing and reading over the last decade" (2018, pg. 473) and is increasing more and more in awareness and fame perhaps due to increasing recognition of the threat of climate change and the visible effects it is now having on the world such as rising temperatures and the melting of the polar ice caps. Climatologist Judith Curry stated in 2013 that while "scientists and other people are trying to get their message across about various aspects of climate change issues […], fiction is an untapped way of doing this – a way of smuggling some serious topics into the consciousness of readers" (qtd. In Schneider-Mayerson, 2018, pg. 475). Climate fiction is a perfect way for readers to enjoy the fictional aspects of the novel, and yet recognise the truths of reality when they lift up their head from the pages and see the story unfolding before them. It is clear to see that "the prevalence of climate change literature has brought about a greater engagement with climate change in literary studies" (Johns-Putra, 2016). Adeline Johns-Putra recognised Kim Stanley[1]

[1] Robinson's *Science in the Capital* trilogy focuses on the topic of global cooling and mass flooding. Andrew Milner explains that "treatments of catastrophic climate change have tended to be organised around three main

Robinson as "science fiction's most important writer to deal explicitly with the problem of climate change" (Trexler & Putra, 2011) who, this thesis argues, took inspiration from Isaac Asimov. When climate change and fiction have been brought up in academic discussion, Asimov is often overlooked and ignored for his contributions to both climate science and fiction, irrespective of the fact that he was one of the initial voices of the twentieth century to begin the dialogue about climate change and the environment.

Recognised for his science fiction that focuses on sentient artificial intelligence, Dr. Isaac Asimov was using both fiction and non-fiction to explore climate change long before it was discussed in mainstream conversations. "In 1972, the iconoclastic […] Asimov offered a lesson in the 'practical politics' of environmentalism that foreshadowed many more painful lessons to come in the following four decades" (Heatherington, 2016, pg. 195); in 1989, he gave a talk on greenhouse gas emissions and deforestation, and in 1991, Asimov collaborated with fellow sci-fi author Frederick Pohl to write *Our Angry Earth,* a non-fiction text that explored the ecological changes that had already taken place as well as the consequential issues that were to come from future climate change. Much alike Asimov, Pohl "was deeply concerned that overuse of planetary resources and overpopulation would have drastic environmental consequences in the future" (Page, 2015, pg. 107). In 2018, cli-fi author Kim Stanley Robinson republished the text with a foreword and afterword that explained just how accurate their predictions were. Regardless of this, *Our Angry Earth* has had little public or academic attention in the midst of a modern-day climate crisis. It is clear that Asimov contributed to our scientific knowledge and understanding in relation to climate change; however, he is often ignored when the topic is referred to. As I shall explore in more depth in Chapter One, it is worth exploring Asimov and his view of fictional and realistic futures due to the fact that it encourages readers to "rethink the role of the environment" (pg. 97) in the sense that humans believe that nature relies on them whereas, in actuality, humans rely on the natural world.

tropes: the drowned world, the freezing world, and the warming or burning world" (Milner & Burgmann, 2018, pg. 6).

Whereas cli-fi is considered a contemporary genre, science fiction writers and climate fiction writers are not all that different; Tracey Heatherington states that "Environmentalists are by definition preoccupied with impending futures: the future of nature, the future of culture, the future of an environmental movement that can guide us to the best of both" (pg. 197). This is exactly what Asimov writes about in his *Foundation* series, focusing on a world that can thrive from scientific knowledge so that future generations can correct the failures of their predecessors. This thesis aims to bring attention to the significance of Isaac Asimov's contribution to climate change knowledge and awareness through both his science fiction and fact. Carl Sagan, a scientist and author, described him as "one of the master explainers of the age", stating that "millions of people owe their knowledge of science, their familiarity with some scientific fact, to reading either the fact or fiction of Isaac Asimov" (Qtd. In Gatehouse Media, 1992). Most well-known for his Three Laws of Robotics and fictional works on the positronic brain within robots, Asimov had an expertise in a vast array of subjects and topics but his expert knowledge of biochemistry is especially relevant for predicting the long-term impact of humans on the climate; during a twenty first century climate crisis, it is imperative that his forward-thinking ideas and predictions about climate change are given attention and focus.

Kim Stanley Robinson recognised the importance and relevance of Asimov and Pohl's *Our Angry Earth* and republished their text with his own additions. Beginning in the mid-eighties, Robinson has been writing climate fiction for nearly forty years. The third chapter of this thesis will focus primarily on his *Science in the Capital* Trilogy that consists of *Forty Signs of Rain* (2004), *Fifty Degrees Below* (2005), and *Sixty Days and Counting* (2007). This trilogy explores the relationship between climate change and American politics, whilst presenting a humanisation of the scientific characters; they are people with families who want a better future for their children, instead of anti-social loners who just want to prove their knowledge. In the years between 2004 and 2005, "stories in the Western news media about climate change went from occurring once or twice a month to occurring once or twice a week" (Egan, 2006, pg. 1). On top of this, New Orleans faced the terrible consequences of Hurricane Katrina in 2005; Robinson's novel *Forty Signs of Rain* "anticipates the sequence of natural disasters

and political failures that plagued New Orleans during and after the flood" whilst its sequels "explore how altruistic and utopian strategies might emerge from the ecological, political, and socioeconomic crises triggered by global warming" (Markley, 2012, pg. 8). Robinson's novels differ from the hopeless representation of humanity when faced with ecological downfall; his trilogy acts more as a, as Robinson himself describes 'domestic comedy' (pg. 12) which allows readers to view the mundane everyday life of his characters during a climate emergency whilst simultaneously offering solutions to mitigate climate change. Instead of instilling fear and worry in his readers, Robinson provides hope and a light-hearted view of a serious topic so that his readers can understand that there are ways to prevent the terrible consequences that he presents. This may make his novels easier to read as people are not met with images of terror and despair; instead readers are invited to see "not what is ended, but what is made possible in it" (Cho, 2011, pg. 26). As this thesis will illustrate, Robinson has carried forth Asimov's legacy of finding a positive outcome from societal issues that have filled people with fear and disdain, emphasizing human and environmental resilience.

Through her research of the relationship between literature and the environment, Adeline Johns-Putra has explored intergenerational ethics and the "parental obligations to posterity" (2019, pg. 5) within climate fiction. Johns-Putra's book *Climate Change and The Contemporary Novel* focuses on the emotional impact of climate fiction and how this encourages readers to think about future generations of humanity. She states within her text that "we are not construed as guardians of the environment for the environment's sake but are explicitly called on to steward it for a vastly distant future, even as we are reminded of our debt to those in the past; we are thus placed in a grand historical chain of obligations" (pg. 4). Johns-Putra explores Kim Stanley Robinson's *Science in the Capital* trilogy and its prominent focus on intergenerational ethics and the parental need to protect offspring. As Matthew Schneider-Mayerson discusses in his article, *The Influence of Climate Fiction*, readers of climate fiction are often "younger, more liberal, and more concerned about climate change than non-readers of climate fiction" (2018, pg. 473) as discovered through a qualitative survey of 161 American readers of nineteen works of climate fiction. Although a keen advocate of protecting future generations within his fiction, Isaac Asimov has not been prominent in the scholarly discussion of climate fiction; this thesis aims to

bring awareness to the relevance of his fictional and non-fictional texts during a modern day climate crisis. Not necessarily known for his environmental involvement, Asimov's positive view of technology has an important influence on later cli-fi and has inspired such writers as Kim Stanley Robinson who is one of the most recognisable names within the climate fiction genre.

Chapter One will closely analyse *Our Angry Earth* in the context of late twentieth-century climate science and place *Our Angry Earth* in the tradition of non-fictional eco-writing, exploring why it must be given significance during a modern day climate crisis. Following this, chapter Two will examine the premonitions of climate change in the authors' own fictional works, considering how ideas from their non-fiction text thread through into their own fictional works, charting the emergence of cli-fi from science fiction. In addition to this, the second chapter will analyse how both Asimov and Pohl take a techno-optimistic stance within their fiction whilst simultaneously exploring the anxieties involved in technophobia. The novels that I shall use for this chapter are Asimov's *Foundation* (1951), and *The Caves of Steel* (1954) and Pohl's *The Cool War* (1983), and *Homegoing* (1989). Finally, chapter Three will examine Kim Stanley Robinson's fictional writing and explore his importance when emphasising the significance and legacy of *Our Angry Earth* in the twenty-first century. The final chapter will also examine the ways in which Robinson follows Asimov and Pohl's techno-optimistic perspective, harnessing ecophobia and catastrophobia to subdue technophobic opinions, and to find a scientific solution to climate change within his *Science in the Capital* Trilogy. Chapter Three will, in addition to this, observe how Robinson humanises the scientist within his fiction so that his readers can empathise with them as mothers, fathers, and regular people who want the best for future generations.

The texts that will be discussed within this thesis range from being written in the fifties, through the eighties and to the early twenty first century. This prolonged span of time allows for me to observe and examine how the representation of the environment and climate change have altered and progressed over time. This also shows that climate change is indeed not a modern discussion and, as previously stated, climate fiction has been popular in literature for longer than previously recognised. This original contribution to ecocriticism allows for more attention to be given to Isaac Asimov and Frederick Pohl, and their polemic text that would fit right in with non-fiction written today of the

same nature and content. Their own fictional works show that both these science fiction writers shared similar ideas about what the human race was heading towards and how its fate could be potentially salvaged. Robinson has carried forward the intergenerational ethics that Asimov and Pohl discussed in their fiction and non-fiction in his modern-day novels that look for the solution to mitigating climate change in order to give future generations a chance. This thesis heeds their warnings and recognizes the significance of these three authors during a twenty-first century climate crisis.

Chapter One

The Significance of *Our Angry Earth* in a Modern Day Climate Crisis

Written in 1991 by science fiction writers Dr Isaac Asimov and Fredrik Pohl, *Our Angry Earth* is a non-fiction text that highlighted and explained the environmental and economic impact human beings have had and will have on the planet. It can be read in the twenty first century and still hold accuracy and significance thirty years after its conception. Asimov and Pohl's book is a detailed exploration into the issues of climate change before it was a mainstream concern; from this text we can observe a scientific matter being discussed by two literary voices. This chapter will closely analyse *Our Angry Earth* in the context of late twentieth century climate science and place the text in the tradition of non-fictional eco-writing. I will be re-evaluating this text from a literary perspective to explore how it acts as a steppingstone for modern day climate fiction (often shortened to cli-fi).

Despite being written thirty years ago, *Our Angry Earth* is informative about problems that are still present, and we could follow the instructions given by Asimov and Pohl as if they are being spoken in our own contemporary modern society. Since its conception, *Our Angry Earth* has had little academic attention; it is my aim to make my own original contribution to academic scholarship about Asimov and climate change narratives, showing that literary voices discussing scientific issues makes these issues more accessible and possibly more effective to a wider audience.

I believe that Asimov and Pohl's intended audience of *Our Angry Earth* may have been the people who were already familiar with their science fiction works; the reason I am aware of this text is due to the fact that I have previously read Asimov's fictional works which is what could intrigue fellow existing Asimov or Pohl fans. However, this text was aimed at everybody who would listen because, as Asimov stated in an interview in 1989, it is in the human best interest to solve the problem of climate change through the world coming together sufficiently as a unit (DeGauven, 2017). Whomever the intended audience was, *Our Angry Earth* certainly captured someone's attention; in 2018, Kim Stanley Robinson republished the text with an additional foreword and afterword. Robinson is a science fiction writer who

focuses his novels on the theme of the environment and climate change. His *Science in the Capital* trilogy - *Forty Signs of Rain* (2004), *Fifty Degrees Below* (2005) and *Sixty Days and Counting* (2007) – is a disaster narrative that shows the devastating effects of the melting ice caps that flood the North Atlantic (Cho, 2011, pg. 23). This trilogy and Robinson's own significance in a modern day climate crisis will be explored in more depth in the third chapter of this thesis

Named the "Twentieth Century Renaissance Man" and the "Great Explainer" (Chambers, 1993), Doctor Isaac Asimov was a highly respected science fiction writer, and professor of biochemistry at Boston University in 1949. His short stories deemed him to be one of the most famous science fiction writers and he also popularised science fact amongst his readers (Gatehouse Media, Inc., 1992). Asimov's *Foundation* series (1952) introduced readers to the fictional theory of psychohistory – "a hypothetical science using a combination of history, psychology, and mathematics to make long-term predictions about large groups or populations" (OED, 2020). This, as Roberta Paura explained, had an influence on social scientists and encouraged for more scientific approaches to be used to understand issues within society (2020). It is interesting that a well-known figure in the world of literature prompted change from within the scientific one, which is what this chapter will explore in more depth through analysing *Our Angry Earth*. The method of psychohistory is similar to Asimov using his knowledge of the contemporary climate issues of his time to calculate how these issues will affect the future as he believed that good science fiction had the important function of warning us "about what the future will be *if* we continue in our present practises" (Hutcheon, 1993). The president of the Science Fiction Writers of America, Ben Bova, spoke highly of Asimov, stating that he could explain any subject so that people could understand the fundamental facts (GateHouse Media, Inc., 1992); *Our Angry Earth* is a fine example of this, allowing members of the public to understand a complex topic such as climate change that was not a well-known or understood topic at the time.

Frederick Pohl was an American science fiction writer who had a career spanning more than seventy-five years and was inducted by the Science Fiction and Fantasy Hall of Fame in 1998. Described as a "science fiction author of extraordinary longevity and accomplishment" that "became the sharpest and most precise satirist in the science-fiction world" (Clute, 2013, pg. 1), Pohl was extremely passionate

about Green Politics, stating that "we human beings are committing great acts of folly in the way we are destroying the world we live in" (1997, pg. 10). He incorporated his strong feelings within his own science fiction writing such as his novel *The Cool War* (1981) which begins with the loss of fossil fuels leading to a world reduced by crisis; the children in this world carry a harmful flu-like disease that only affects adults aged between thirty and fifty. His novel maintains the ideology that science fiction gives audiences new and unobtainable perceptions of our world (Pohl, 1997, pg. 13 – 14) due to the fact that it is entertaining whilst simultaneously giving readers an insight into what our world could become. This is not a definitive end result however, Pohl clarifies that "[he is] not really trying to forecast what the future is going to be at all. What [he tries] to do instead is to conjecture what diverse sorts of things *may* happen in the future" (1993, pg. 1). By offering a potential future scenario, both Asimov and Pohl are able to motivate and educate their readers to try and mitigate what could be their reality.

These two science fiction writers have the advantage that they can also explore scientific findings within their fiction, allowing readers to get a glimpse of a potential future. Literary critics have even suggested "going back to Asimov's fictional future because it goads us to rethink the role of environmentalism and its conventional approaches to nature, science and politics" (Heatherington, 2016, pg. 197). I agree with this as through looking at science fiction, we are able to understand realistic scientific issues such as climate change that has been caused by human beings and possibly even find solutions, putting them into practise initially within fiction. In addition to this, science fiction writers often base their stories on current or possible future events that are taking place in reality; for example, Asimov wrote about potential futures that included robot beings due to the worldwide increasing interest in technological advancements during his lifetime. The boundary between non-fiction and fiction is blurry due to the fact both science and science fiction are constantly influencing each other. Brian David Johnson stated that "using science fiction based on science fact to prototype the human, cultural, ethical, and legal implications of early-stage research and technology allows us to envision possible futures, and to explore their effects so that we can then build them" (2013). By reading science fiction, scientists are able to question what is possible and what our world could be like in a potential future; the same principle applies to climate fiction.

By looking at Asimov's *Foundation*, Pohl's *The Cool War,* and Robinson's *Science in the Capital* trilogy, we are able to see a differentiation of climate fiction showing that it is a heterogenous genre.

Asimov's *Foundation*, published in 1942, explores humanity's strive for survival due to their own actions leading to the imminent destruction of their empire; Pohl's *The Cool War*, published in 1981, portrays a warlike affiliation between humanity and the natural environment; and Robinson's *Science in the Capital* trilogy, published from 2004 to 2007, presents politicians as ignorant and oblivious to the threat of climate change, resulting in disastrous consequences such as flooding. Although they share the theme of the environment, each novel is contained within its own strand of cli-fi. Similarly, to science fiction, horror, and fantasy, climate fiction it is own genre that does not have a strict set of rules assigned to it; every cli-fi novel follows its own direction. That being said, cli-fi novels all have an emotional impact on the reader through the notion of truth that runs throughout. The second chapter of this thesis will further discuss Asimov and Pohl's fictional novels.

Our Angry Earth, although it is a non-fiction text, reads almost like a climate fiction novel due to the rhetoric Asimov and Pohl use throughout the text; it is therefore likely to appeal more to their readers, more than a scientific report would do on the same topic. This may be due to the fact that literary voices are more successful at eliciting an emotional response instead of simply giving data and jargonistic explanations of complex themes, as previously suggested by Bloom. This is the reason that *Our Angry Earth* works as a significant text in our modern-day climate crisis due to the fact that its universal message can be read and understood by anyone who read it. As well as this, if someone were to read it in the twenty first century, the message would not have changed.

Although not the first text to discuss climate change, *Our Angry Earth* gave readers an in-depth understanding of the topic. In 1896, first Swedish Nobel laureate, Svante Arrhenius published *On the Influence of Carbonic Acid in the Air Upon the Temperature of the Ground* which first introduced greenhouse effect theory (Perry, 1999, pg. 628). Three years later, Thomas Crowder Chamberlin supported Arrhenius's theory through his paper that "proposed the possibility that changes in climate could result from changes in the concentration of atmospheric carbon dioxide" (Marx, Haunschild, Thor, Bornmann, 2016, pg. 350). During the twentieth century, the number of articles between 1965

and 1995 published per year in atmospheric science journals tripled. On top of this, "climate change science literature grew […] exponentially with a doubling time of eleven years from the period 1951 to 1997. Furthermore, 95% of all the climate change science literature since 1834 was published after 1951" (Le Treut, Somerville, Cubasch, Ding, Mauritzen, Mokssit, Peterson, Prather, 2007, pg. 98). *Our Angry Earth* stands out personally to me due to the fact that in most circumstances, the science would be written by scientists and the science fiction would be written by literary authors; Asimov and Pohl's book, however, is a non-fictional scientific text written by science fiction writers.

When Asimov and Pohls' words were indeed first published, they were not the only ones speaking up about climate change at this time. In Rio de Janeiro, The United Nations Conference on Environment and Development[2] was held from 3-14 June 1992 to discuss the issues that the world was confronted with, such as "disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems…" (United Nations, 1992, pg. 3). In order to discuss and resolve these issues, governments from around the world conceived 'Agenda 21' which addressed the challenges of a 1992 world, aiming to prepare it for a challenging upcoming century (pg. 3). As well as this, the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) was completed in 1990 which gave more information on greenhouse gases, rising global temperature and deforestation (Change, I.P.O.C, 1990). The report then became "a standard work of reference, widely used by policymakers, scientists and other experts, and represented a remarkable co-ordinated effort by hundreds of specialists from all over the world" (Houghton, 1995, pg. vii). An example of such is the report written in 1992, the year after *Our Angry Earth* was published, explaining that "emissions resulting from human activities are substantially increasing the atmosphere concentrate of the greenhouse gases: carbon dioxide, methane, chlorofluorocarbons, and nitrous oxide" (Change, I.P.O.C, pg. 6). It is clear to see that climate change was not a new topic to be explored and debated, but an ongoing one to be shared and discussed. This is still the case today as ecological damage is a prominent source of public anxiety in our modern world.

[2] UNCED

Our Angry Earth is split into four sections, each containing their own subsections: 'The Background', 'The Problems', 'The Technocures', and 'The Way To Go'. 'The Background' discusses 'The Environmental War' (Asimov, Pohl, 1991, pg. 23) and the ideologies behind global warming such as James Lovelock's 'Gaia Paradigm'. On top of this, it attempts to ask the question: 'Where We Go from Here' (pg. 60). Both Asimov and Pohl provide an introduction to the text, explaining their reasoning for writing the polemic. Asimov explains that the book is not a "hopeless cry of doom" (1991, pg. 13), but more of an explanation of what will happen if action is not taken; Pohl follows by stating that if we do not do anything to fight the continuing effects of climate change, "there [will not] be any happy endings" (pg. 20), there will simply just be an ending. These words were powerful when they were first published and ring just as true thirty years later. They are a lot more emotional than if an average scientist were to write them, it is clear they are using their articulate skills to provoke a passionate response from the reader in the hope that this motivates them to cause positive change. Whereas a scientist would choose their data carefully, Asimov and Pohl select their language and wording of phrases with extreme care and precision such as the phrase "the war oil made" (1991, pg. 24), which is entirely too poetic for a scientist to write, to ensure they captivate the reader's attention just as they would if they were writing a piece of fiction.

Our Angry Earth shares similarities with Rachel Carson's *Silent Spring* which presents scientific facts and findings with a "literary flare that dramatizes the appeal of ecological holism as never before" (Palmer & Killingsworth, 1991, pg. 53). Carson wrote her non-fiction environmental text in 1962, documenting the adverse effects on the environment caused by the use of pesticides. The text begins with a prosaic description of a town "where all life seemed to live in harmony with its surroundings" (Carson, 1962, pg. 21). She explains that an "evil spell" (pg. 21) has spread throughout the town, killing everything in sight; Carson ends this desolate scene with the words: "The people had done it to themselves" (pg. 22). This morose beginning sets up the non-fiction text in such a powerful way that the reader is gripped and ready for the message she is about to convey. I believe that this is what Asimov and Pohl have attempted and arguably succeeded to do in their introductions to *Our Angry Earth* through setting up a dramatic urgency that would still be there today when read.

Within the initial pages of their first chapter, Asimov and Pohl explore the third party in every war, the environment, which is attacked by the combative strikes made by both sides, explaining that even if one side gains victory, "the environment always loses" (1991, pg. 23). The literary effect of personifying nature in this sentiment adds another degree of sombreness to the already distressing topic of war. They specifically discuss The Persian Gulf War, that took place simultaneously whilst this text was being written and published, referring to it as a "totally environmental war" (pg. 23) due to the fact it began with conflict over fossil fuels such as oil. When thinking about war and tactical destruction, one tends to forget about the environmental casualties and solely focus attention on the human lives lost; however, Zubair Kasem Kahn states we cannot deny that "environmental annihilation and the armed conflicts are like two sides of the same coin" (2018, pg. 174). We must, nevertheless, remember that Khan wrote this in 2018, an age of environmental concern and worry, whereas the Gulf War took place in the late eighties to early nineties when climate change was not at the height of public anxiety. It is unsurprising then to know that environmental damage was far down on the list of eligibility to receive compensation by the UN Compensation Commission (Payne & Sand, 2011, pg. 1). Perhaps it was due to the lack of public anxiety towards climate change that encouraged Asimov and Pohl to open their polemic on this subject, using the environmental consequences of the Persian Gulf War as an example "of what we are doing to the whole world" (Asimov & Pohl, 1991, pg. 33) to provide an alarming wakeup call to society. The significance of this non-fiction text is even more prevalent in the twenty-first century due to the ever-growing awareness of the ecological devastation that is being caused by humans around the world. On top of this, the fact that it is so eloquently and simply articulated gives no excuse for anyone to ignore the messages that Asimov and Pohl are providing for us and so we are forced to listen for our own sake. Samuel Delany explains that with each sentence of science fiction, we must ask ourselves "what […] would have to be different from our world for such a sentence to be uttered" (2012, pg. 69). Although this text is not necessarily science fiction, we find ourselves doing just that in *Our Angry Earth*; we wonder what can be done differently to prevent the very future they predicted for us.

Asimov and Pohl discuss James Lovelock's 'Gaia Paradigm', a theory that explores how living organisms and their inorganic surroundings have progressed as one living system that affects Earth's

conditions; "some scientists believe that this 'Gaian system' self-regulates global temperature, atmospheric content, ocean salinity, and other factors in an 'automatic' manner" (Entrepreneurial Earth, LLC, 2020). This theory was introduced by Lovelock in journals written by him in 1972 and 1974, as well as his 1979 book – *Gaia: A New Look at Life on Earth*. Asimov and Pohl explain that this theory had a profound effect on scientists, shaking up even the most rational-minded ones "who purely hated so mystical-sounding a concept" (1991, pg. 36). This metaphorical concept would be easier for literary minds such as Asimov and Pohl to understand and accept opposed to that of the mind of a scientist who believes the solid true facts; this could be due to the fact that science fiction authors have the ability to transform a theoretical idea into reality through their fiction, and their readers will accept this as truth. Many scientists were angered by the theory of Gaia, especially John Maynard Smith, a theoretical and mathematical evolutionary biologist and geneticist. Maynard Smith called Gaia an "evil religion" that could not have happened at a worse moment as scientists had spent time and effort on researching and developing vitalism and group selection (Bond, 2013). On top of this, the fact that Lovelock was assisted by British novelist, William Golding, may have added insult to injury as this new 'scientific theory' had been collaborated on by someone who was not a scientist during a time when "science had fallen from grace" after Vietnam and the publishing of Carson's *Silent Spring* (2013).

Asimov and Pohl do not specifically state whether or not they agree with Lovelock's Gaia Paradigm, however they heavily describe the theory and state that whether Gaia exists or not, it is under heavy attack through extinction, deforestation, and hunting. (1991, pg. 40 – 41). This is still a matter of interest and concern to modern-day readers. Asimov and Pohl use the examples of a mountain gorilla, a blue whale and a white rhino as animals under threat of extinction in 1991; in 2020, all three of these animals are on the endangered species list. The greater worry for readers is that we are told that "we ourselves are threatened with the same fate" (pg. 41); they are very straightforward with their meaning of this alarming thought, enabling them to inform their readers of the very real threat of human extinction. This is a far more dramatic way of phrasing the sentiment than if a scientist were to say it; as I have mentioned previously in this chapter, clearly this is done intentionally to grab the reader's attention and alert them enough to promote change for their own good. On the one hand, it may be difficult to believe that we

are facing an imminent threat when reading it from a book published thirty years ago; Asimov and Pohl even state that we will not all die tomorrow (pg. 41), nevertheless, we can already see adverse ecological destruction taking place due to the "destruction of the ozone layer", "the global 'greenhouse warming' (pg. 42), and the melting of the polar ice caps. These were merely a few examples of the events Asimov and Pohl warned would happen if behavioural change was not encouraged.

Regardless of whether or not their predictions were correct, *Our Angry Earth* is not necessarily about how accurate these two science fiction writers are; of course it is worth noting that they were correct about the majority of their predictions. Asimov and Pohl clearly used their knowledge to put forth this information and assess how we will progress into the future; this text's effectiveness comes from the way in which they use their skills in writing fictional work to provoke an emotional response. In the subsection, 'Inventing the Future', Asimov and Pohl explain that "predictions do not exist, not even in theory" (pg. 49). This indicates that predictions about the future are more likely to be well-researched facts that we can project into the future due to what we know in the present. Asimov and Pohl tend to do this frequently within their fictional works; Asimov often portrays humans living in a technologically advanced world, and Pohl's representation of a virulent flu-like disease seems all too close to home during a global pandemic in 2020. It is often easy to accept the futures that we are presented with within fiction as we can take it with a spoonful of sugar and wonder the possibilities; however, when the future is 'predicted' in a non-fiction text, it can cause anxiety and concern, especially when the future we are given is so full of potential catastrophic destruction.

Asimov and Pohl reference Dennis Gabor, who was "one of the founding fathers of the discipline of futurology" (pg. 49). Gabor states that "you can [not] actually predict the future at all. All you can do is invent it" (pg. 49) which is an interesting notion with this text in mind. Asimov and Pohl use the example of World War Two, explaining that it could have happened even without the involvement of Adolf Hitler; it would have happened in a different way and produced a different spectrum of later events (pg. 49). I agree with their inclusion of Gabor in their argument to a certain extent; each individual creates their own future through their decisions and actions. On top of this, when told what could possibly happen in our future, it is our own choice whether or not we allow that to happen as

these predictions are worthless if they do not have an effect on your actions (pg. 48). Similarly, with *Our Angry Earth*, Asimov and Pohl are giving us their predictions in order for us to make our own choices of whether or not we allow these environmental events to take place; this fact in itself should incite an emotional response for the reader due to the fact that we have in fact chosen to allow the consequences of climate change to take place.

We must ask ourselves if our own awareness of climate change has encouraged it to happen at a faster rate. For example, during the Extinction Rebellion protests at Oxford Circus in 2019, Emma Thompson made her way to join them from the United States in an aeroplane, causing an uproar amongst the public and press about the fossil fuels used to make her journey. Arguably, the growing awareness of climatological catastrophe has become more of a social media trend than a mission; human intervention, even through good intentions, can have a negative impact. Is it the case that we are trapped in a paradoxical loop of worsening the situation whilst trying to make it better? As Asimov and Pohl state, "Like it or not, all of us are 'inventing the future' every day, with all of our actions" (pg. 51). They also use the paradox "the more complete and exact a prediction is, the less it is worth" (pg. 48) which is an interesting statement written in a book that accurately predicts future ecological events. We could argue that they did not know that their predictions were correct at the time that the book was written, although they explain that certain events in the future can be calculated simply because they had already begun to happen (pg. 50). Nonetheless, their statement supports the idea that their forecasts for the future are not as effective as their use of emotive language and blurring of scientific and fictional rhetoric to provoke an emotional response from the reader.

In the final section of the text, Asimov and Pohl ask us how far we are willing to go to save ourselves. Before they even begin giving solutions, this question in itself has significance universally through time and around the world; climate change has always been a terrifying thought that would affect everyone in the world, regardless of race, gender, or class and so it is not a problem just one person can solve. The growing popularity of cli-fi is suggested to have a positive impact on the reading population; it has "exploded over the last decade and is often assumed to have ecopolitical influence by enabling readers to imagine potential climate futures and persuading them of the gravity and urgency of climate change"

(Schneider – Mayerson, 2018, pg. 473). This was clearly the aim of Our *Angry Earth* during a time in which there was little to no public concern or anxiety about climate change. Milner and Burgmann observe that climate fiction is a matter for public commentary in both scholarly and popular circles (2018, pg. 1); Asimov and Pohl, through *Our Angry Earth*, blur the boundaries between the scholarly and the popular by combining their well-researched knowledge of a scientific issue with a literary flare to keep their readers interested and emotionally responsive.

Within this final section, Asimov and Pohl ask the poignant question of "How far are you willing to go beyond the usual daily activities of your life for the sake of trying to preserve a decent world for your grandchildren?" (1991, pg. 353). The use of a rhetorical question is a powerful choice for contemporary readers of the time, suggesting that they are the ones responsible for future generations, hitting harder than it would if the reader was simply informed of quantitative data from a scientific report. For twenty-first century readers, this not only focuses on the selfish notion of self-preservation and the need to survive but is prominent due to the fact that we and our children are the 'grandchildren' that they were referring to. The significance of *Our Angry Earth* comes from the fact that solutions offered thirty years ago are yet to be tried, questions are yet to be answered and the clock on this time bomb is unfortunately ticking; as Asimov and Pohl state "we [have] come to decision time" (pg. 353). Considering that decision time was thirty years ago, where does that put us in 2020? On a positive note, small changes have been taking place in the last decade or so such as turning lights off to preserve energy, recycling waste correctly, and using recyclable bags at the supermarket; all of which were suggestions within *Our Angry Earth* (pg. 354). Asimov and Pohl were not the first or only ones to recommend these solutions, however it makes no difference who said it first, what matters is that we listened.

The final subsection of *Our Angry Earth* begins with the statement "if we want [the planet] saved, we [have] still got the whole job to do" (pg. 421). Their inclusion of themselves within this statement provides a comforting sentiment that they also have to contribute to the saving of the planet. Arguably, they influenced an entire genre through the creation of this text that combined the worlds of science and science fiction to generate a powerful and emotive response. Fiction is recognised as a powerful tool to help contextualise the world around us and "by approaching the topic in the realm of fiction, we can

perhaps humanise and illuminate the issue in ways that are [not] as easy to do with only science and cold equations" (Adams, 2015, pg. xii). This is the advantage we are given through Asimov and Pohl explaining climate change and the issues that follow; they are able to see ecological disaster as issues that concern everyone, not just scientists.

According to Kenneth R. Fleischmann, "studying how past futures, or futures envisioned in the past through the visionary eyes of science fiction writers has shaped the present can help us to improve the future" (2008, pg. 1); likewise eyes of science fiction writers observing a realistic future within a non-fiction text is bound to have a powerful effect on the reader as this future cannot be closed up in a book and ignored. It is a trembling thought that thirty years on, very little has been done to prevent the issues that Asimov and Pohl brought to our attention; they describe a golden future that still seems far off into the distance. They end their text in a rather 'Carsonic' way, stating that "If it continues to become that way, it is only because we do it ourselves" (1991, pg. 423), similarly to *Silent Springs* in which Carson begins her book by blaming the sudden adverse effects on human beings' own actions. This is arguably a very poignant way in which to capture the attention of the reader; in fiction the reader is an innocent bystander to the action of the plot, whereas in non-fiction, we are all the main protagonist in our conflict against global climate change.

One year after *Our Angry Earth* was written, Frederik Pohl analysed his and Asimov's predictions to see what had changed since they had started writing their polemic. Unfortunately, this is something that Pohl had to do by himself as Isaac Asimov passed away on 6th April 1992, at the age of 72. Pohl stated that "the environment had [not] happened at the time when this book was first written, and it has [not] all happened even yet, a year later" (1992, pg. 439). To my understanding, Pohl is referring to the lack of awareness of environmental change and so there was very little change in how people behaved towards the way in which they lived their lives. Through Pohl's 'One Year Later' addition, readers are able to see certain events that have occurred in the environment, such as frozen corpses being found in Swiss Alps due to the ice melting; he also suggests that people were starting to have a more conscientious attitude and were "putting their principles into practise" (pg. 465). We could argue that this was because of Asimov and Pohl's text having an emotional impression on its readers, causing

them to enact positive change. It could equally be The UNCED conference that took place in June of 1992 that instigated a global anxiety towards the threat of climate change. Overall, in just over a year, Pohl observed that little change had taken place since he and Asimov wrote their non-fiction text. Clearly, the same cannot be said for the observations made by Kim Stanley Robinson in his afterword.

As aforementioned in the introduction of this chapter, Robinson provides a foreword and an afterword in an edited edition of *Our Angry Earth* that was published in 2018. Robinson is recognised as "one of the foremost living writers of science fiction" (Gwinn, 2020) and has received many awards from the science fiction field for his work (The University of Texas, 2020). He focuses the themes of his fiction on the environment and climate change; he has a "reality-based approach in the spirit of Isaac Asimov that has made him a social thinker speaking for the future and from the future" (2020). Kim Stanley Robinson's importance in the world of climate and science fiction is recognised globally, this is reflected in the fact that his work has been translated into twenty-three languages so that people around the world can read it (2020). It is significant, then, that this notable figure within the domain of cli-fi felt that *Our Angry Earth* should be republished in 2018 with an additional foreword and afterword from Robinson so that his modern-day readers could be introduced to it.

Within his introduction to the text, Robinson expresses his admiration to both Asimov and Pohl, and the text itself, stating that the result of two science fiction writers creating a book on climate change is very impressive (2018, pg. 9). He notes that both Asimov and Pohl were advocates of the scientific community and were concerned with the ecological issues arising during the nineties; this led them to do the only thing as writers they could do, they wrote a book. A book that, according to Robinson, "is about as careful in its predictions as the Intergovernmental Panel on Climate Change's first assessment" (pg. 476). It is easy for anyone to agree with this text and observe that Asimov and Pohl were correct in their predictions, however it is of great significance that Kim Stanley Robinson made this observation due to his notoriety within the cli-fi genre. He explains that "science fiction itself serves a clear and present need as a way of building scenarios and modelling exercises and considering which futures we want to avoid and which to try for" (pg. 477). This statement serves as the very purpose of the creation of *Our Angry Earth*; science fiction writers can imagine a future scenario and allow their readers to

ponder the possibilities of these visions, therefore when two science fiction writers provide their readers with a realistic future within a non-fiction text, we no longer have to wonder. This emphasises the blurring of boundaries between science and science fiction as "science fiction is not about the future; it uses the future as a narrative convention to present significant distortions of the present" (Delany, 2012, pg. 26). *Our Angry Earth* does this by presenting its readers with predictions of a possible future to reveal the truth of the current world in 1991. Similarly, science as a whole analyses past and future events to calculate present queries and possibilities.

Robinson suggests that it will take an extreme political effort to make any kind of impactful change; this has started to be seen in such governments as the United Kingdom that is beginning to take actions against climate change. This was not a result of *Our Angry Earth*, nevertheless it is worth noting that the general public is more aware of the urgency that surrounds climate change issues which could encourage more readers to pick up a cli-fi novel. If readers were to be introduced to Asimov and Pohl's text, it would not be outdated and could be mistaken for a book written in the recent decade; "it [is] a book that describes an existential threat to a planetary civilization" (2018, pg. 479), the polemic seems extremely relevant during the dawn of an ecological crisis. Robinson indicates that this description is not dissimilar to that of a science fiction novel, a factor that could in fact draw readers in and motivate them to emotionally respond to this very real threat, as opposed to using non-sensical data and jargon.

Interestingly, *Our Angry Earth* was not the only piece of Asimov's work that Robinson reviewed; he also examined Asimov's predictions for the World's Fair of 2014 that he wrote for an article in *The New York Times* in August 1964. From 3D movies and skype to rising in equality and emphasis on birth control (SciFiNow, 2020), Robinson observed that Asimov clearly understood his own contemporary present to envisage a potential future so accurately. It is, in fact the job of a science fiction writer to offer a future that seems impressive and more advanced than the current present world the reader lives in; it is plausible that Asimov had the knowledge and capability to present a future to his readers through non-fiction that could be achieved or avoided, such as the one he posed in *Our Angry Earth*.

Furthermore, *Our Angry Earth* should be re-evaluated within the argument of climate science due to its contribution from a literary sense in order to passionately motivate its readers through simple and

emotive language as opposed to scientific language that may be too complicated for the general public to understand. Pohl and Asimov organise their text in a comprehensible and straightforward manner to allow anyone who reads their text to recognize what they are discussing and how they can make a difference. Already, around the world, people are willing to learn about and deepen their awareness of climate change and the consequences that follow. On top of this, Asimov's and Pohl's text was the perfect stepping-stone for combining literature and science that lead to the establishment and popularisation of cli-fi.

Chapter Two

The Complex Causality of Technology and Climate Change in Asimov and Pohls' Fictional Works

The relationship between technology and nature is complex due to the many ways in which advancements in technology have been targeted to solve the countless issues of climate change in recent years; - however, it has been and remains a poignant factor in the cause of ecological devastation. Although Isaac Asimov is most recognizable for his pro-tech stance within his fiction that embraces technology as a solution to human issues, his novels *Foundation* (1951) and *The Caves of Steel* (1954) reveal the complex and problematic environmental consequences of humanity becoming more technogenic. Fellow science fiction writer, Frederik Pohl, equally presented a more technophobic ideology within his novels: *The Cool War* (1982) and *Homegoing* (1989). Within their fictional works, Asimov and Pohl enhance the disconnect between humans and the natural world to explore the apprehensions that surround technological evolution; this chapter will explore the complexity of the causality between technology and the environment within these novels to reveal that technology has the capability to cause and solve the issues of climate change, and therefore must be used responsibly and efficiently.

Initially, this chapter will discuss Asimov's *Foundation* and explore the techno ethics involved with the progression of technological advances, such as physically surrounding humanity with metal and technology that separates humans away from the natural world. To contrast this, I will also examine the ways in which science and technology is often the salvation within science fiction. Asimov poses a moderate solution to the issues of technophobia and alludes to a more responsible way to use technology with scientific knowledge and understanding. This chapter shall then move on to *The Caves of Steel* which equally emphasises the physical disconnect between humanity and nature as well as exposing attitudes comparable to the Neo-Luddite movement, before going on to examine the technophobia displayed on Earth versus the technophilia that is exhibited on the outer 'Spacer Worlds'. Although these novels are inherently negative towards technological progression, Asimov appears to have a pro-

tech stance, using his novels to make a statement on how technology can be managed responsibly and efficiently. On the other hand, Pohl is more of a techno-pessimist and shows the negative impacts of mishandled energy and technology. I will evaluate, through *The Cool War*, how energy is used as a transactional power, which is similarly shown within *Foundation.* The final novel, *Homegoing* will be used to show the examples of the consequences of war over energy and how the negative use of technological advancements speed up the process of climate change. Overall, I shall use Asimov's fiction to explore a technophilic approach, contrasting this with the technophobias that Pohl divulges throughout his texts. Emma Rawlings Smith explains that Mark Lynas, author of *The God Species*, believed that "the world's worst environmental problems can be solved with existing technological solutions including nuclear power and genetic engineering – two areas normally off limits to traditional environmentalists" (2020, pg. 105). This is something that sparks public anxiety due to the naturally destructive nature of humanity, for example the discovery of the atom led us straight towards the atomic bomb; similarly in my chosen texts, nuclear power was seen as something that could be used to gain authoritative power and destroy. I believe that Asimov and Pohl would agree with Lynas; their novels do not altogether despise technology, but rather seek control and knowledge over technology and the energy that it runs on.

Although these texts were written in the years ranging from the 1950s to the 1980s, they are extraordinarily poignant in the world of 2020. At the dawn of a climate crisis when ecological destruction is at the forefront of public consciousness, reading these texts as a stepping-stone into climate fiction is rather thought provoking. In an essay challenging the dominant historicist paradigm of literary studies, Rita Felski noted that "History is not a box" (2011, pg. 575) which means that we as readers cannot hold a text solidly in the time it was written. She poses the question - "how do texts that are inert in one historical moment become newly revealing, eye-opening, even life-transforming, in another?" (pg. 575). In the circumstance of my chosen texts, they were written during a time in which climate change was not a well-known issue, however in 2021 at the dawn of an environmental catastrophe, they become more relevant and impactful on the reader's reality.

During the years amid 1951 and 1953, Asimov wrote seven stories that were compiled into a collection called *The Foundation Trilogy*, three books that would become Asimov's most recognised and popular science fiction (Dirda, 2010, pg. viii). The first novel of the series, simply called *Foundation*, follows the premise of a strong yet decaying twelve-thousand-year-old Galactic Empire called Trantor. A young man named Gaal Dornick arrives on Trantor in order to assist Hari Seldon who, through the science of psychohistory[3], has predicted that "Trantor will lie in ruins within the next three centuries" (Asimov, 1951, pg. 25). As Gaal has never been to Trantor, he is introduced to this world simultaneously alongside the reader; he notes that "all the planet seemed to live beneath metal" (pg. 12), hinting to the reader already that this world is more technogenic than what is familiar. This is not surprising when reading a novel written by Asimov; a common theme within his fiction is viewing the world of the future and how we might evolve to live amongst technology; "his vast bibliography includes numerous short essays in popular science many offering predictions of technological and environmental change and their links to society and population," (Population Council, 2014, pg. 553), showing that this was a topic he had a lot of familiarity and interest in. It is evident that his expertise are significant in our modern twenty-first century world. To live beneath the metal implies that, not only is the planet physically covered in metal, but that human beings are socially under the metal in terms of priority of importance and hierarchy; the authorities of Trantor care more for how they can better their technology than for the people that may be endangering themselves through their actions. This is similar to the technophobia faced at the outset of the industrial revolution; "early sociologists recognised that improvements in technology would disrupt and perhaps permanently alter economic relations" (McClure, 2018, pg. 141). In the case of the world of Trantor, human life is altered through the progression of technology to the point where members of the population are "born in a cubicle" (Asimov, 1951, pg. 15) and spend their lives away from the outside world.

Before Gaal or the reader has met the salvation of the novel, the third person narrative voice provides a description of Trantor, explaining that "there was no green to be seen; no green, no soil, no life other

[3] As explored in Chapter One, psychohistory uses historical, sociological, mathematical, and scientific knowledge to predict the future.

than man" (Asimov, 1951, pg. 14)[4]. Although not written to be specifically a novel about climate change, Asimov presents a world that is completely void of nature that is doomed to destroy itself due to the fixation of technological progress. This is an interesting direction that diverts from Asimov's usual pro-tech stance within is fiction, however as seen with his Three laws of Robotics that were first introduced in his 1942 short story 'Runaround', fear of the loss of control can be eased when rules and reliability are applied.[5] This same fear and anxiety that surrounded the unpredictability of robots and artificial intelligence is a topic in which Asimov explores in great detail, particularly in *The Caves of Steel*. It is clear that Asimov had a techno-optimistic view if technology could be harnessed by knowledge; a point made clear by *Foundation.*

Upon meeting Hari Seldon, Gaal and the reader learn that Trantor has become more specialised, leading it to becoming, in turn, more vulnerable and less able to defend itself. This is an issue that we immediately project onto our own 21st century modern world as humanity has become more attached to the technological advancements we have made, whilst neglecting the ways in which nature needs to be protected. Seldon notes that social responsibility has disappeared following the assuring certainty of imperial succession (pg. 19). Paul Wapner associates climate change with the "empirical and conceptual end of nature" (2010, pg. 169) which is similar to what Asimov represents within *Foundation* as, through human activity, the environment has crumbled to the point that it cannot support itself or human life, leading to its destruction of both nature itself and the Empire in which humanity has built. Seldon describes the oncoming devastation as "an intricate drama which was begun centuries ago, and which is accelerating in pace continuously" (Asimov, 1951, pg. 27); he has calculated that there is not enough time to prevent the consequences of such an event.

The authorities of Trantor that are later told of this information cannot comprehend what Seldon has warned, similarly to the way in which humans of the twenty-first century cannot grasp that we are at

[4] This is something that can be regularly seen within the twenty-first century through the constant industrialisation of society.

[5] Asimov believed that if robots were to become commonplace in society, there would be a constant risk that they could overpower their creators, much alike Frankenstein's own creation overpowering him in Mary Shelley's classic sci-fi novel. An additional law was created in Asimov's later career called the Zeroth Law which declared that robots should protect humanity at all costs.

the dawn of a climate crisis. Timothy Morton labels climate change as a 'hyperobject' and explains that it has "already had a significant impact on human, social and psychic space" (2013, pg. 10). These impacts have yet to alert the higher authorities of our modern world and the same thoughts are had by many of the current generation of the twenty first century as to why they should concern themselves with events that may not even affect them. Within the novel, Seldon explains that they should concern themselves with "events of the three centuries' distance" (Asimov, 1951, pg. 30) due to the certain affect it will have on future generations to come; "call it idealism. Call it an identification of myself with the mystical generation to which we refer by the term 'humanity'" (pg. 31). This is something made poignant by Asimov and Pohl in *Our Angry Earth* in which they make the point that people must have their future children and grandchildren in mind as this is who will face the brunt of climate change.[6] Stephen Gardiner explains that an issue of climate change is the 'fragmentation of agency' (2006, pg. 399), meaning that climate change is not instigated by a lone agent, but by a variety of individuals and institutions that are not united by a comprehensive structure of agency. Gardiner explains that this is important as it poses a challenge to humanity's ability to respond (pg. 400); this challenge is emphasised when the population has a disconnect to the very thing they must save.

Asimov clearly envisioned a technogenic future in which humans are born and live their life cocooned away from the environment which would inevitably lead to a "nervous breakdown" when "coming up into the open with nothing but sky over you" (Asimov, 1951, pg. 15). Although this is more of a view from a techno-pessimist, it is apparent that Asimov saw the negative effects of technological progression as the consequences of ill-informed human error. Both *Foundation* and *Our Angry Earth* call in to question who has the agency to aid people of the future. Due to the progression of science creating an awareness of possible risks to them (Solum, 2001, pg. 167), there is now an additional responsibility to the unborn generations that will suffer with the consequences of current ignorance. According to Kristian Skagen Ekeli, "ignorance reduces our responsibility in temporal dimensions

[6] On top of this, at the 1992 Rio Summit, a twelve-year-old girl named Severn Cullis-Suzuki made a powerful speech about "generations to come" who will suffer for the actions of their predecessors. Similarly to this, at the 2019 UN New York summit, Greta Thunberg made an emotional speech about the future that has been taken from her due to the ignorance towards climate science and mass extinction.

because in most areas it is impossible to foresee the interested and resource needs of future generations" (2004, pg. 442). Contrary to Ekeli's argument, there is no excuse for ignorance within *Foundation* due to the fact that the Emperor of the Galaxy was told precisely what would happen in three centuries and that there was no effective way to escape the disastrous events. Likewise, in *Our Angry Earth*, Asimov and Pohl accurately spell out how climate change will continue to affect the reader and their future offspring, appealing to the emotional need to protect the innocent and their 'humanity'. Early on within the novel, the reader is able to see negative consequences of a world both enhanced and dominated by technology as human beings are naturally inclined to be around nature; this is a repeated theme in Asimov's novels as in *The Caves of Steel*, the main protagonist struggles to be in an environment where the air is fresh and open away from the crowds of the city.

Another environmental theme Asimov explores within his fiction is the negative impacts of overpopulation. To the authorities of Trantor, Seldon states that the population is a factor that has caused the impact of the destruction of their Empire. This is due to the fact that the resources provided by advancing technologies are used by every member of civilisation not only in Trantor, but around the Empire as a whole that contains nearly "a quintillion human beings" (pg. 27). Bruno Latour's actor network theory focuses on the agency of a human or non-human actor that catalyses certain events; in this case, the agency is unclear as everybody plays their part in causing certain aspects of ruin to happen. Similarly, in the context of climate change, every person around the world is culpable for the consequences of the ecological devastation that can be observed all of over the globe. Because of this, we have recycling and energy efficient substitutes; however, Asimov takes the educational route to better insure the survival of future generations. Seldon reveals to the authorities that they do not have the time to reverse their actions, even with three hundred years forewarning. Instead, he suggests that "by saving the knowledge of the race" (pg. 29), future generations have a chance to recreate the universe knowing what humanity had already discovered. Although overpopulation does not necessitate new technological solutions, it does in fact require recognition and awareness as one of the causes for climate change so that a potential solution could be explored to counteract the acts performed by the overpopulated masses.

Arguably, Asimov channels his voice through the character of Hari Seldon, acting as a messenger of oncoming destruction. Kylo-Patrick Hart and Annette Holba's book, *Media and the Apocalypse,* examines the fascination with apocalyptic narratives and films that portray the end of the world such as 'The Core', and 'The Day After Tomorrow'. They suggest that "zealous scientific pursuit is a moral responsibility because, in the end, there is no other way to save humanity than through scientific creations of technology" (2009, pg. 160). This has similarities to Asimov's presentation of the end of the world in *Foundation* as Seldon urges the authoritative powers of Trantor to collect and preserve scientific knowledge in one Galactic Encyclopaedia so that returning generations can save themselves, stating that "the sum of human knowledge is beyond any one man; any thousand men" (Asimov, 1951, pg. 29). There are elements of Asimov's novel that are reminiscent within Walter Miller Jr's *A Canticle for Leibowitz* such as the collection and preservation of knowledge by an individual whereas the use of knowledge is scorned by the rest of society. Additionally, Seldon becomes legendized similarly to Leibowitz who became a candidate for sainthood through his devotion to knowledge and science. Through the creation of the Galactic Encyclopaedia, "Seldon establishes a research colony called Foundation on the planet Terminus, situated on the outer rims of the Empire" (Mišik & Kijundžić, 2020, pg. 153) which later becomes the galactic powerhouse that can provide other planets with energy; this will be explored within this chapter when compared with Pohl's *The Cool War* which also presents energy as power in both a literal and transactional sense. In contrast to some novels in which a postapocalyptic society seeks to destroy all knowledge of the past that brought about the collapse, Asimov wishes to preserve it, albeit with restrictions on access.

Apocalyptic and sci-fi narratives often present a "complete devotion to scientific rationalism" (Hart & Holba, 2009, pg. 164); science and technology is the only saviour for human redemption. In this sense, Seldon has agency within *Foundation* due to the responsibility science has to be the salvation. Equally, Asimov presents himself as a salvation and voice of intellectual power; he has agency within *Our Angry Earth,* compiling his knowledge and research in order to inform and educate a wide variety of readers. This complicates the view of technology being the cause of environmental destruction due to the fact that it is often relied upon to be the salvation. M. Keith Booker and Anne-Marie Thomas stated that

"the [*Foundation*] novels ultimately show faith in the beneficial effects of science and technology in expanding the possibilities of humankind" (2009, pg. 139); I agree with this statement in the sense that science and technology is beneficial, but only when harnessed in the correct way by the right people, as Seldon believed that if future generations had the knowledge of the Galactic Encyclopaedia, they would know the mistakes of the past and attempt to correct them. Asimov often used his fiction to educate and pass on his understanding of technological progression and the consequences this progression would have on human society; *Foundation* connotes the sense of knowledge and understanding as the key to techno-optimism.

This techno-optimism is challenged within Asimov's 1954 detective science fiction novel *The Caves of Steel* that parodies an anti-technology attitude. There is a clear divide between humans and robots, a common trait within Asimov's fiction; the robot beings are mistreated by humans and are often seen as inferior which is interesting due to the fact that these robot creations are intellectually and physically more advanced than humans. Within the novel, robots tend to have closer relationship to nature, gathering natural resources and water from the outer realms whereas humans find comfort and safety within the confines of their steel cities. It is clear that Asimov wanted to represent a world in which humans, technology and nature could reside and co-exist peacefully alongside each other; he displayed the opposite to this idea in an almost farcical manner to show the absurd distain humans had for both the natural world outside the city and the robots integrated within society in a neo-luddite manner.

Todd Frobish explains that Neo-Luddites "attempt to resist technologies progress" (2002, pg. 207) and "oppose nuclear, electromagnetic, chemical, computer, television, and genetic engineering technologies that promote a centralised power structure" (pg. 213). Within the novel, human society detests the robot civilisation, much alike the Neo-Luddites; the reader is able to get a closer view of this perspective through the eyes of Detective Elijah Baley who is forced to work with a robot, R. Olivaw Daneel, to uncover the truth behind the death of a spacerman. Through presenting a radical anti-technology stance, Asimov satirises the human fears and anxieties directed at technological evolution, calling people who crave a time before roboticism "Medievalists" (Asimov, 1954, pg. 18); this term emphasises the outdatedness of this kind of negative thinking.

In the opening pages of the novel, the reader is given initial clues that humanity is detached away from the environment. Detective Baley and Commissioner of Police, Julius Enderby, are shocked that it is raining outside. The omniscient third person narrator informs the reader that is has been forty-two years since Baley had seen rain or "any of the phenomenon of nature" (Asimov, 1954, pg. 4). Already, it is understood that, in Asimov's perspective of the future, humanity has been "divorced from nature" (pg. 4); this is potentially relatable for a reader in a modern twenty-first century perspective due to the lack of a relationship people have with nature because of advancements in technology removing attention away from the natural world. This disconnect from nature is emphasised again when the reader learns that cities had become "a steel cave, a tremendous, self-contained cave of steel and concrete" (pg. 19). Arguably, our attachment to nature now lies with climate fiction, literature forms and strengthens our connection and motivates us to save it. Scientific reports, although strive for the same results, may come across too cold and unattached, focussing too much on the technical facts, rather than the emotional connection between humans and nature. This was originally apparent in Rachel Carson's *Silent Spring* which was able to "create a new image of science" (Killingsworth & Palmer, 1991, pg. 65) that captured a more emotional response from the readership rather than stating cold, hard, scientific facts.

Similarly to *Foundation,* the reader gets the sense that human beings are shielded by technology and metal not only physically, but socially as well. To conserve energy and space, people must share washrooms and personal hygiene resources, unless they have special privileges. Detective Baley, for example has a room "large enough to contain a shower, a small laundry, and other necessities" (Asimov, 1954, pg. 47), showing that a certain amount of priority was given to keeping technological and energy resources over the conditions in which human beings live in. The same argument stands in the modern world of 2021 in which people are more desperate for the newest technological gadget rather than basic necessities. Philip Cafaro and Eileen Crist state that "overpopulation has always been regarded as the plight of the poor" as they "consume in ecologically unsustainable ways" (2012, pg. 5) which is controlled within Asimov's novel through limitations of space and use for the lower classes. We shall see this again within Pohl's *The Cool War*. Through *The Caves of Steel*, Asimov presents a city that is "the culmination of man's mastery over the environment" (pg. 20); - however, the reader gets the

impression that is not an entirely positive achievement due to overall claustrophobic and uncomfortable feeling that derives from overpopulation and metal surroundings[7]. As a self-diagnosed agoraphobe and claustrophile, Asimov admits in his memoirs that "it was no accident, perhaps, that […] I pictured underground cities on Earth, the ultimate in windowless enclosure" (1994, pg. 130); the characters in his novel found comfort and security in the same setting as he would.

The feeling of confinement commences in the second chapter of the novel when the reader receives a description of the expressway in which humanity trickles through (pg. 14). The narrative gives us access to Baley's inner thought process which is delving into the history of New York which helpfully clarifies to the reader what happened to achieve this future. The reader learns that the population on Earth is now eight billion and "semistarvation" (pg. 19) has become a genuine result of overpopulation. In reality, in 2011, the "global population rocketed past [seven] billion" which "more than tripl[ed] the world's population in our own lifetimes" (Cafaro & Crist, 2012, pg. xiii); in Asimov's 1954 novel, the population of eight billion was spread across eight hundred cities on Earth, each containing ten million people. Whilst on the expressway, the reader is told of the "infinite lights" that are on the "luminous walls and ceilings that seemed to drip cool, even phosphorescence, the flashing advertisements screaming for attention…" (Asimov, 1954, pg. 14). There is a sense of irony in the fact that these people would be uncomfortable when faced with natural sunlight, but the fluorescent lights of the expressway do not seem to have any effect, once again emphasising the complete separation from the natural world, and devotion to technology.

Asimov appears to confront the negative aspects of technology overtaking the importance of the natural world within the novel, and yet defends technological advancements simultaneously. Through Julius Enderby, the commissioner of Police that assigns Detective Baley the case at the beginning of the novel, Asimov declares that "back in the coal century, people moaned about the invention of the steam engine. In one of Shakespeare's plays, a character moaned about the invention of gunpowder. A thousand years in the future, they [would] be moaning about the invention of the positronic brain" (pg. 4). In this

[7] William Leiss explained in his book *Under Technology's Thumb* that "the conquest of nature has become part of the system of values that express our most cherished aspirations" (1990, pg. 74); these aspirations hoped that the conquest of nature would break the cycle of successive civilisations deteriorating.

moment, Asimov is making a statement about the way in which society constantly has an issue with something new and unfamiliar due to the fact that humanity momentarily loses control and knowledge as they cannot know where the newest invention could take them. Emma Rawlings Smith explains that "human activity is now the main driver of global environmental change and [it is believed that] environmentalists must embrace technological advances including an expansion of the nuclear industry" (2020, pg. 105). This is something that humans cannot accept within *The Caves of Steel* shown through the confrontational manner in which they act towards robot beings and the ways in which the Spacers worlds run their society; arguably, Asimov is emphasising the absurdity of rejecting technology from society through his novel due to the fact that technology is a necessity in the modern world and must be seen through a techno-optimistic perspective.

Within both *Foundation* and *The Caves of Steel*, Asimov drives a wedge between humanity and the natural world; this wedge is technology as it is the very thing that separates humans from the environment, both physically and mentally. Asimov implies that humans are scared of nature, preferring to linger in the dark comfort of steel cities and let the robot civilisation perform the work necessary in the outer realms as they "did the work better and required less"[8]. (Asimov, 1954, pg. 20); this is parallel to Asimov's own feelings of agoraphobia There is an ironic notion that the humans in his novel would prefer to live in the caves of steel and keep the robots in the world surrounded by the open air as it has been emphasised by literature for centuries that human beings find comfort with nature. This resembles the modern world that currently exists more than sixty years after Asimov published *The Caves of Steel* in which human beings find comfort surrounded by technology rather than outside in natural surroundings which "may be contributing to our planet's destruction" (Nisbet, Zelenski, & Murphy, 2009, pg. 715). This disconnect from nature strengthens the anxieties around the loss of control over nature. Simon Estok explains that the "fear of loss of agency and the loss of predictability are what form

[8] Aimee van Wynsberghe and Justin Donhauser explore the concept of "eco-bots" (2018, pg. 1787), ecologically functional robots that are intended to perform specified environmental jobs. This is a techno optimistic solution to the anxieties surrounded by technological evolution.

the core of ecophobia (2018, pg. 36), a term that indicates the persistent anxieties and discomfort held towards nature and the environment. The same fear of loss of predictability that leads to ecophobia also forms technophobia; humans fear what they cannot control such as both the natural world and technological progression. Asimov pushes for a more technophilic stance through the idea that ecophobia drives technophilia; technology will grant humans the control of nature. There are notable comparisons between Trantor in *Foundation* and New York City in *The Caves of Steel*; it is clear that overpopulation has been the catalyst in both novels due to the excessive use of technological resources leading to damage on the environment and society. This is also a concern within *Our Angry Earth*; Asimov, in his introduction to the non-fiction text, states that "Humanity is being threatened by its own deeds" (1991, pg. 12) which is a constant theme that is heavily emphasised in his fictional works, alongside the strained relationship between humans and robots as discussed in this chapter.

Asimov presents a reliance that human beings have on robots through *The Caves of Steel*. Due to the fact that humans did not feel comfortable leaving the cities for resources found in the outer worlds, it was down to the job of the robots which emphasises the alienation humans now feel towards the environment[9]. Asimov's narrative voice states "That was the huge one irony. It was on Earth that the positronic brain was invented and on Earth that robots had first been put to productive use" (pg. 20). Clearly, Asimov was making a point on Earth's inventions being put to minimal and simple work due to the technophobic fears and anxieties of being overpowered and losing control; in actuality, these humans have already lost control as they need the resources that the environment provides but will not go out to collect it and so they are forced to rely on the robots that they do not trust. Similarly, in the twenty first century, advancements of technological progression in society has "aided human beings to improve on the food supply, clean water, and comfortable houses and has boosted and bettered the health, transport, communication and other sectors of the human economy" (Bisong & Apologun, 2020,

[9] Paul Wapner makes the statement that "there is no such thing as nature separate form humanity anymore" (2010, pg. 170) which, although the people are physically distant from nature, rings true in *The Caves of Steel* due to the need for resources provided by the environment. For example, "it held the water that men must have, the coal and the wood that were the ultimate raw materials for plastics and for the eternally growing yeast […] The land between the Cities still held the mines and was still used to a larger extent than most men realised for growing food and grazing stock" (Asimov, 1954, pg. 20).

pg. 12); it is evident that twenty first century society has become dependent on technological advancements.

Overall, Asimov's view of a technogenic world is complex due to the techno pessimistic attitude observed in *The Caves of Steel*. However, I believe that he was attempting to satirise technophobia as a way to show that, although people are afraid of it, technology is necessary to ensure human survival. Through *Foundation*, Asimov suggests that technology is something to be understood rather than feared and only through scientific reasoning and knowledge can humanity avoid ultimate destruction. In my opinion, Asimov had a pro-tech attitude and knew that humans would have to accept it as part of society in order to prevent losing control to it. On the other hand, Fredrik Pohl appears to take a more anti-tech approach, presenting the negative consequences of the inefficient use of the energy that technology both demands and produces.

Published in 1981, Fredrik Pohl's *The Cool War* sets the sense of a world reduced by crisis: the crisis of the loss of fossil fuels. "To protect their embattled sovereignty, the Israelis have destroyed Arab oil" (Page, 2015, pg. 132) which has led to electricity being metred and forcefully shut off in the home if it exceeds the maximum allowed amount of usage per day; the extravagant and wasteful use of electricity is called 'power piggery' and is a crime[10]. On top of this, children carry and spread a dangerous flu-like disease that only harms people aged between thirty and fifty, the very individuals who tend to run businesses and governments in industrialised countries[11]. This disease has in fact been created by a group known as 'The Team', composed of former CIA agents and other organisations. We follow Reverend H. Hornswell Hake, referred to throughout the novel as Horny, who has been enlisted by 'The Team' for an unknown purpose, leading him and a counselee of his, Alys Brant, to travel around Europe with a group of children, unknowingly spreading disease everywhere they go. Although not directly focused on the theme of the environment, the waste of ecological resources and the weather is a constant backdrop that is constantly commentated on throughout the novel; the ecophobia and apprehensive relationship between humans and nature that Asimov explores in *The Caves of Steel* can be observed

[10] This phrase is repeated by Pohl in *Our Angry Earth* when he and Asimov label Americans as "power pigs" (1991, pg. 237).
[11] This is prophetic of the age of COVID-19 in which we find ourselves in 2020 – 2021.

within Pohl's texts. In addition to this, the use and, oftentimes, overuse of energy is extremely poignant throughout the plot. For instance, in the first chapter, it is explained through Hake's narrative that "the power rationing made life difficult when winter hung on to the end of March, as it was this year" (Pohl, 1981, pg. 7), making it clear that this was going to be a repeated issue throughout the novel. The idea of rationing is commonly associated with wartime struggles which is what Pohl presents within his novel; the world is falling apart and so Governmental control over energy is the best solution to ensure humans can survive.

Pohl presents a world already affected by environmental damage and suffering. The past is regularly discussed within the novel, referring back to the "high-energy days" (Pohl, 1981, pg. 73); a woman Hake encounters on a bus reminisces about oil tanks "with the flames coming out of the top of them where they were burning the waste gas" (pg. 13). Coupled with the notion of 'power-piggery', *The Cool War* is making a statement about energy efficiency and the energy needed to power a technogenic society. Through *The Cool war*, Pohl presented his readers with a potential future as observed from 1981, a time in which global warming was not yet a central issue. It is evident that Pohl was inspired by global events taking place around him; Horny is recruited to spy on various organisations and spread a dangerous flu against a backdrop of conflict between countries, and constant anxiety about wasting resources. The name is clearly a reference to The Cold War that took place from 1945 to 1991 (History on the Net, 2000) that involved spying and constant conflict around the world. It is evident that, much alike Asimov, Pohl showed his anxiety about the degradation of the natural world through political conflict over energy-related power through his fiction. David Brin has explained that, through his novel, Pohl created a "chillingly plausible failure mode for human civilization" (qtd. In Page, 2015, pg. 132). Within Pohl's novel, the energy used to power technology is the true culprit that has led to ecological issues and poses the idea that instead of halting the use of technology altogether, people should be responsible and efficient with the energy used in their households[12], for example turning electrical items

[12] Although no one is arrested for the overuse of energy, it is commonplace in the twenty first century to measure how much energy they use in order to prevent irresponsible usage.

off when they are not being used instead of not giving up technology altogether; this shows that Asimov and Pohl share common ground within their fictional and not diametrical opposites in their perspectives.

The Cool War explicitly shows issues such as overuse of planetary resources and overpopulation, topics that Michael Page explained to be deep concerns had by Fredrik Pohl (Page, 2015, pg. 107). Through the treatment of overuse of energy as a crime, energy is seen as a limited luxury and therefore is given power and value. Similarly to *Foundation*, *The Cool War* portrays technology as a fought-over prize; whoever has the most energy literally has the most power which allows human beings to feel like they have control and authority over an unattainable concept. On top of this, it enforces the theme of war and conflict within both novels through the need to have the most energy, and therefore, the most power. This, in turn, has negative effects on the environment as I will explore through Pohl's 1989 novel *Homegoing*; Pohl's novels, enables readers to understand the complexities of technology having the potential to solve the issues of climate change; however, it has the capability to worsen the ecological issues of a climate crisis. Although "energy in its many forms has always been an important part of human development and progress" (Mišík, 2020, pg. 149), it is the cause of moral downfall within *The Cool War* and the catalyst of war.

The concerns of the irresponsible use of energy may arguably derive from anxieties of newly popularised nuclear power. When nuclear power first began to be used, it was considered to be "a vast new source of energy for the people of the world" (Asimov, 1982, pg. 18); there was hope that there could be a possibility to surrender control to technology to allow it to solve the issues of climate change. This hope for technology to be our salvation bleeds from science fiction into our reality, implying that science and science fiction are influenced by one another; science fiction is a useful way to "effectively communicate uncertainty in a trustworthy way" (Gross, 2013, pg. 811). It is evident that technology has the capacity and the ability to save humanity from the effects of climate change; however, it will take human agency to ensure that this happens. Scott Barrett states that CO_2 emissions and greenhouse gases could be reduced significantly through the use of technology however it will need a 'technological revolution' as it will "require fundamental change, achieved within a relatively short period of time" (2009, pg. 53). Within my chosen texts, Asimov has shown human beings to be lacking in responsibility

when it comes to the environment; the people of Trantor in *Foundation* do not care for their future generations, and the Earthmen within *The Caves of Steel* have a neo-luddite attitude to the technological advancements in their society, but also refuse to leave their enclosed homes out of fear and discomfort of the outside world. Pohl, on the other hand, focuses on the energy that technology uses and alludes to the irresponsible overuse of power.

Matúš Mišík's article explores the ways in which Foundation "depicts the role and use of nuclear energy, particularly its utilisation as a foreign policy tool" (2020, pg. 150). Interestingly, Mišík explains that Asimov's novel is more focused on politics rather than "spectacular battles featuring all sorts of fantastic weapons" (pg. 154); energy is used as a way of asserting political dominance and assuming control of other planets. Equally, in The Cool War, nations are constantly in conflict over complete control over resources. Additionally, there is a commentary through the narrative voice of Hake about how much energy is being used in certain scenarios. For example, when in Italy, Hake has not realised how much money or energy there is in the world: "He had become calloused to power-piggery […]. The illuminated sign outside the restaurant alone would have kept his heater going for weeks" (Pohl, 1981, pg. 116). The use of energy being used shows the status of the restaurant owner, especially when compared to Hake who, at the beginning of the novel, is on his fifth offense of power-piggery due to over-using his limited amount. The ideology of Governmentally allocated amounts of energy makes sense in theory in order to preserve resources and prevent ongoing ecological issues however this has the potential to lead to discrimination and a hierarchy as seen in The Caves of Steel such as special rights for the privileged few.

Through Pohl's 1989 novel, the outcomes of nuclear war and conflict are revealed; published two years prior to writing *Our Angry Earth*, Pohl's *Homegoing* is concerned with the ecological consequences of war. One of Pohl's most compelling books of his later career, *Homegoing* works in conjunction with Asimov and Pohl's non-fiction text "to illustrate the environmental crisis facing the planet" (Page, 2015, pg. 160). The novel allows readers to observe a futuristic Earth that climate change has left ravaged and underwater from the perspective of alien life. The Hakh'hli arrive on Earth seemingly to provide aid for the struggling planet and bring home John William Washington, a human whom the Hakh'hli saved

from the Star War and raised who is referred to as Lysander[13] throughout the text. The third person narrative leads us through the novel, revealing that, not only do the Hakh'hli want to use an abandoned Africa to inhabit their millions of fertilised eggs, but Lysander also (Sandy for Short) is not actually a human being; he was put together by the aliens that raised him from left over processed food that was fertilised and grown, manipulated, and used by the Hakh'hli as a pawn to infiltrate Earth.

As soon as Lysander and the Hakh'hli arrive on Earth, it is obvious that ecological damage has already taken place due to the fact that Miami Beach, New York City, and a vast majority of once populated cities are underwater. Each chapter begins with an omniscient third person narrator who gives more information to the reader throughout the novel; chapter eight informs us that "every time [human beings] burn fuel to run their engines and heat their homes (which is always) they make more [carbon dioxide]" which leads to the warming of Earth and the melting of ice (Pohl, 1989, pg. 64). It is rather similar to the way in which Carson begins her non-fiction text, describing a world that slowly decayed due to the actions of the humans that lived there. Killingsworth and Palmer explain that "Fear can cause readers to open their eyes wide or shut them tightly" (1991, pg. 71), which is the risk taken by Carson and both Asimov and Pohl. All three combine science fact and fiction, intwining the two for the reader to be educated and enjoy literature, which acts as the motivation needed for action to be done.

Pohl's *Homegoing*, alike climate fiction overall, presents a worst-case scenario such as flooding and the destruction of the ozone layer, which in turn leads to damage to humans and the natural landscapes. By being able to envision ecological damage in literature, the reader gets a glimpse of the future whilst still having a chance to prevent these events from taking place. Reading Pohl's novels in the twenty first century at the dawn of a climate crisis exposes uncanny resemblances between fiction and reality; in chapter sixteen of the novel, the narrative voice explains that "the Rockies may tumble, Gibraltar may crumble, but a plastic container will never die. Like diamonds, plastics are forever" (Pohl, 1989, pg. 146). As well as this, the narrative informs the reader throughout the novel of the destruction of the ozone layer, rising levels of carbon dioxide, and the flooding of major cities. Pohl was able to capture

[13] Also referred to as Sandy, Lysander was given this human name due to the fact that the Hakh'hli used *A Midsummer Night's Dream* to learn and practise the English language. Many of the aliens use the character names from the play as human names such as Hippolyta and Oberon.

a very realistic, as we know now in modern society, glimpse of the forthcoming world humans would live in. Pohl and Asimov were able to use and deliver their own knowledge that they embedded within their fiction that could encourage readers and the general public to understand the seriousness of their predictions.

When Lysander asks his human guide, Marguery Darp, "How did you human beings let is get so bad?" (Pohl, 1989, pg. 98). She responds with "They had a little war, only they got to using what they called 'tactical nukes.' And then people outside that part of the world got involved, and then the big countries began using the big nuclear missiles. On each other" (Pohl. 1989, pg. 99). Marguery explains that, although it was not a big nuclear war, (pg. 99) the repercussions led to illnesses, the annihilation of Africa, and the death of five billion people. On top of this, the environment suffered, leading to uninhabitable land across the world. Zubair Kasem Khan states that "the environment is always […] the immediate casualty of every kinds of armed conflicts" (2018, pg. 175); this has been evident in wars throughout history, however it is only in recent times that the environment is being recognised as a casualty, as I explored in my first chapter. *Homegoing* presents a world negatively affected by nuclear power, however it is through the misuse of such power that has led to these consequences.

Within this chapter, I have explored the complexities of technology acting as the role of both cause and salvation of ecological devastation. In many ways, technology has advanced human knowledge and enabled an eco-friendlier lifestyle. In *Foundation*, science and technology was the way forward in order to improve the ways in which humans existed; in *The Caves of Steel* humans found comfort and contentment living in cities that were focussed on how technology could benefit them. However, in both novels, Asimov presented human beings as incomplete and unhealthy without a connection to the natural world and emphasised the fear of losing control to artificial intelligence; he counteracts this fear through showing that technology can be humanity's solution, only if the correct understanding and responsibility is acknowledged. Frederik Pohl presented a way in which energy resources could be rationed to prevent over-usage; however this was shown to have a have negative effect on humanity as nations fought for dominance over these resources. The events of *Homegoing* acts as an example of the potential annihilation we could expect if nuclear power was misused, as well as the worst case scenario

of the impact of climate change. It is clear that Asimov and Pohl were at the forefront of inspiration for climate fiction that is now an ever-growing popular genre within literature. Asimov and Pohls' novels both contain themes of environmental destruction caused by the actions of human beings. These novels were written during a time when climate change was not common knowledge or particularly high on the list of concerns amongst the general public; several decades later, they can and should be revisited to understand the growing popularity of climate fiction during the verge of a climate crisis when the use of technology for our betterment is being queried.

Chapter Three

Techno-Optimism and Technofixes in Kim Stanley Robinson's *Science in the Capital* Trilogy

Isaac Asimov and Frederick Pohl's text *Our Angry Earth*, although written in 1991, was brought to the forefront of public awareness in 2018 by Kim Stanley Robinson; he had the book republished with his own additional foreword and afterword that highlighted the accuracy of Asimov and Pohl's predictions made in a time when climate change was not at the forefront of public concern. Often meeting devastating environmental changes with excitement rather than despair (Cho, 2011, pg. 25), Robinson's novels all share an ecological component. His themes often focus on the sustainability of humanity, the imminent catastrophe of global warming, and the need to limit greenhouse gas emissions in our twenty-first century. Andrew Rose explains that "this trilogy is an experiment in possible futures in which the dominant assumptions of science, politics, and consumer culture are radically challenged" (2016, pg. 260); this follows on from the ways in which Asimov and Pohl used their fiction to simulate possible futures in order to find a way to prevent their own disastrous reality. Climate fiction is an extremely useful method to evaluate potential futures especially during a climate crisis in which the future in uncertain and frightening. This chapter will examine Robinson's fictional writing and explore his importance when emphasising the significance and legacy of *Our Angry Earth* during a modern day climate crisis when there is more public anxiety about environmental collapse than when the text was originally published. Additionally, I will consider Robinson's inclusion of a scientific solution to climate change and the Asimov-inspired techno-optimistic stance of his novels as opposed to the techno-phobic perspective that technology led us to ecological disaster in the first place and is something that we cannot control.

Initially, this chapter will introduce Robinson and his importance within science and climate fiction. On top of this, I will offer a brief summary of the *Science in the Capital* trilogy, which was written from 2004 to 2007, in the context of increasing public concern over global warming. Part three will discuss the parallel ideas of ecophobia and catastrophobia and how Robinson harnesses these two concepts to overcome techno-phobia. Following this, I will explore how disaster narrative movies such as *The Day*

After Tomorrow compare to that of reading about environmental catastrophe within novels. This thesis will then go on to explore the argument that Robinson presents within his novels: the idea that technology is the solution against the impacts of climate change, followed by the way in which Robinson humanises the scientists in his novels, making them more attainable and relatable; this in turn humanises the science that will, in the end, be our salvation.

Robinson's significance in climate fiction is as strong and impactful as Asimov's presence within science fiction overall. As explored previously in the first chapter of this thesis, climate fiction has been a subject of debate between scholars of whether it is a sub-genre of science fiction or a genre of its own; although the two genres overlap, cli-fi is arguably a genre of its own standing and focuses entirely on environmental themes whereas sci-fi has a wider range of themes. Asimov and Pohl were writing cli-fi before they or the general public knew of such a term and Robinson is carrying on the message that Asimov and Pohl delivered through their fiction; through the works of these three authors, we can see a progression of awareness and knowledge of climate change over time, beginning in the fifties, with *Foundation* and *The Caves of Steel* following through to the eighties and nineties with Pohl's *The Cool War* and *Homegoing*, including their collaborative text, *Our Angry Earth.*

Robinson has since carried the torch for environmental awareness within climate fiction from the early eighties to the modern twenty-first century, his approach having been compared to Asimov's spirit that has allowed him to become a voice for and from the future. Adeline Johns-Putra explains that Robinson has explicitly identified himself as a utopian science fiction writer and his *Science in the Capital* trilogy "combines science with the teachings of Buddhism to create a utopian project to mitigate against and even reverse some of the worst effects of global warming" (Johns-Putra, Parham & Squire, 2017, pg. 139). Readers have been able to witness literature as a technique of climate activism throughout the history of science and climate fiction; Robinson is writing about the same future that Asimov and Pohl wrote about in the fifties and the eighties with little alteration in the consequences of human actions or the severity of oncoming climate change.

Within his trilogy, Robinson offers insight into the "ethical and social ramifications of […] unparalleled environmental crisis [and] reflects on current political conditions that impede action on climate change"

(Schneider-Mayerson, 2018, pg. 474); this is the purpose of environmentally-focused literature as ecocritic Antonia Mehnert notes that Robinson's literature focuses on the significance of recognising "our intergenerational legacy" (pg. 148) and understanding that climate change is a burden of future generations unless something can be done to mitigate the violent effects of global warming and cooling. Robinson's most recent novel *The Ministry for the Future* published in 2020 focuses on the plight of future generations who will have to deal with the devastating consequences of climate change if nothing is done in our current historical moment. This is something I have explored in this thesis's previous chapter and is a factor that was of high importance to both Asimov and Pohl. Within their 1991 polemic text Isaac Asimov and Pohl ask their readers the question: "How far are you willing to go beyond the usual daily activities of your life for the sake of trying to preserve a decent world for your grandchildren?" (1991, pg. 353). These three science fiction authors highlight the magnitude of the effects of climate change and their fictional works remind readers that they have a duty to their future loved ones to acknowledge environmental devastation as a real and oncoming threat. Set in 2025, *The Ministry for the Future* brings the future closer to home than readers are comfortable with; the novel has been described as "likely the grimmest book he has written to date" (Canavan, 2020) but is simultaneously his most ambitious due to calling on his readers to imagine living through the nightmares of ecological destruction in the here and now. Robinson's *Science in the Capital* Trilogy consists of *Forty Signs of Rain* (2004), *Fifty Degrees Below* (2005), and *Sixty Days and Counting* (2007); the trilogy has a practical focus on American environmental policy and "explores new concepts of scientific practise and political efficacy in a nearfuture moment: [the trilogy] invites action while simultaneously appearing, for all practical purposes, unknowable by traditional empirical means" (Rose, 2016, pg. 260). The trilogy follows a range of characters during environmental collapse due to climate change, including Anna Quibler, the Director of the Bioinformatics Division at the National Science Foundation, and her husband Charlie who is a stay-at-home dad to their toddler Joe whilst working as Environmental policy advisor to Senator Phil Chase. Additionally to these two, the reader also follows Frank Vanderwal who is a Bio-mathematics expert who is coming to the end of his one-year visit to the National Science Foundation; Phil Chase who is running and eventually elected US Senator; Diane Chang, the Head of the National Science Foundation; Caroline Churchland, an Ex-

surveillance agent of a department associated with Homeland Security; and the Khembalis who are from the mythical Khembalung, also known to many as The Hidden Valley, whose island is threatened by rising sea levels due to climate change. With many scenes set in D.C, the trilogy "dramatizes how climate change profoundly unsettles traditional understandings of ecology and politics" (Markley, 2012, pg. 7); Robinson brings climate change to his readers through the unforgiving and uncontrollable forces of nature in the form of a catastrophic flood in Washington D.C. and the coldest winter in recorded history; his trilogy brings awareness to less talked about issues within climate change such as global cooling. Robinson explains global cooling through the character of Charlie, stating that "the world's climate can shift very rapidly. There are scenarios in which the general warming causes parts of the northern hemisphere to get quite cold, especially in Europe" (2004, pg. 143). When people discuss matters associated with climate change, it is often referred to as global warming which leads us to think about the polar ice caps melting, and the global temperature rising; however temperatures dropping and winters becoming colder is very seldom mentioned within these discussions. Robert Markley explains that Robinson's own description of his trilogy being a 'domestic comedy' is telling "because the day-to-day experience of 'global catastrophe' is played out as much in the scenes of the Quibler family huddled together by the fire in their Washington home during winter blackouts as it is in the corridors of the NSF building" (2012, pg. 12). This reminds the reader that climate change affects everyone with no consideration of who you are or how much knowledge and power you have. The comedic direction in which Robinson takes to explore the impending outcomes of climate change allows for readers to have a potentially less daunting experience when reading the trilogy, ensuring that they do not feel overwhelmed with doom and gloom. Robinson allows his readers to relate and empathise with the characters and scenarios that he describes within his novels; this, in turn, makes the reader feel like they are huddled up alongside the Quibler family in their home and ready to face the same challenges that Robinson showcases in his trilogy.

The *Science in the Capital* trilogy presents a variety of environmental-based issues on top of the major impacts of climate change such as being homeless through harsh weather conditions, climate scepticism, and the desperate search for a solution to prevent further ecological destruction. The denial

of climate change being a reality arises from the fear of nature and human anxiety of being out of control; this has "created an antagonism between humans and their environments" (Estok, 2018, pg. 1). This is what Simon Estok coined as ecophobia, "a uniquely human psychological condition that prompts antipathy towards nature" (pg. 1). Robinson exhibits this within his trilogy; in the opening chapter of *Fifty Degrees Below*, the President declares "we are at a state of war with nature" (Robinson, 2005, pg. 2) which connotes a sense of political uneasiness towards the overwhelming forces of nature due to the fact that Washington had just been flooded in the previous novel. Ecophobia functions as part of the problem as people may feel powerless against the forces of nature and so do not see a plausible reason or positive outcome to escape the fate of environmental destruction. Within *Forty Signs of Rain*, ecophobia is placed in opposition against a political presence, the President has an obnoxious ignorance towards climate change perhaps due to his feeling of powerlessness regardless of status and money. When the President refuses to listen to Phil Chase, Chase explains to Charlie that "If the Earth were to suffer a catastrophic anthropogenic extinction event over the next ten years, which it will, American business would continue to focus on its quarterly profit and loss" (pg. 190). Although this appears to be the political preference of economic preservation, human beings refuse to alter their behaviour to potentially save their planet out of the fear of the unfamiliar and the unknown. It is only at the end of the primary novel when a mass flood spreads across Washington D.C. that Charlie shouts to Phil whilst floating through Capitol Hill, "Are you going to do something about global warming now?" (pg. 356), portraying the notion that human beings do not act until it is too late, and the damage has already begun to take place. This final moment of the novel, although heavily impactful and serious, has comedic undertones due to the fact that Charlie had been trying to persuade Phil to take climate change seriously through his political role with little success and it takes a horrendous flood to finally convince him that ecological devastation is a very real threat. It seems that Robinson is deliberately trying to inject humour into a topic that is generally extremely serious to potentially widen the appeal to mitigate climate change. Often, climate change is presented with cold, scientific facts and a dead tone manner, however Robinson fuses the subject with a comedic tone in order to make the reader feel at ease so that they may have more interest and concern in something that they can understand on a human level.

The President of the United States refuses to accept the reality of the situation and barely takes the topic seriously, stating to Charlie that "we do [not] know for sure if [climate change] is the result of human activity" (pg. 144). Estok explains that attempting to solve the problems that bring about environmental destruction "means addressing ecophobia and the blindness it imposes about the scale of things" (2018, pg. 79). Readers can see ecophobia induced blindness through the President due to the fact that he believes that nature is attacking itself and that humans cannot be capable of causing such terrifying consequences. Asimov and Pohl state within *Our Angry Earth* that "the American people, and especially American politicians, are addicted to growth. When environmental concerns threaten to slow down that economic growth passions rise" (1991, pg. 397). We are able to see this through *Forty Signs of Rain* in the conversation between Charlie and the President through the President's statement: "we [would] be sucking the life out of the economy if we were to go too far with this" (2004, pg. 149). It is evident that Robinson was making the point that the political perspective of climate change was to pretend it did not exist in order to maintain economic growth within society. It is possible that this derives from the fear that nature is uncontrollable, even by the President who has power over everything; by acting blind to the scenario of climate change, the President keeps his power. Estok confirmed this idea, explaining that the mindset of ecophobia has "greatly serviced growth economies and ideological interests" (2018, pg. 1) due to the fact that people of power neglect to see the environment as something worth sacrificing the economy for. Robinson positions ecophobia alongside the concept of catastrophobia within this trilogy; people commonly are afraid of impactful disasters that have catastrophic consequences such as climate change. However, these ideas together correlate throughout his texts: the fear of nature versus the fear of the collapse of nature is a concept Robinson explores in his trilogy through showing the plausible consequences of climate change with a purpose. It is probable that he was harnessing ecophobia and catastrophobia to overcome technophobia; choosing to put our faith in technology in order to prevent ecological destruction would be better than an ecological catastrophe. Barbara Hand Clow states that "many of us are afflicted with Catastrophobia […]. This causes individuals and societies to think of the future in terms of a coming, potential disaster; thus, most people do not care for Earth and its inhabitants, which includes themselves and their families" (2001, pg. 2). It is worth noting that Clow believes that catastrophobia leads to an acceptance of a disastrous fate, possibly due to the

belief that there is nothing that can be done about it. The narrative voice in *Sixty Days and Counting* informs the reader that "the world's climate was already far along the way to irrevocable change" (Robinson, 2007, pg. 5). There is an ironic notion of viewing climate change as a disastrous, irrevocable event that humans cannot stop due to the fact that human actions have enforced and influenced global warming and ecological damage for as long as they have existed; this acceptance of disaster encourages people to ignore climate change which will make its impact even more inevitable. Arguably, presenting climate change as catastrophic and disastrous could result in a lethargic response towards attempting to prevent complete ecological collapse due to it seeming completely unavoidable.

To contrast this, fear is a powerful motive to prevent certain events from happening due to the human need to protect and survive, especially when they feel under imminent threat. Clow stated that "until very recently scientists investigated catastrophes that were comfortably distanced from us" but "their [recent] discoveries seem to have arrived just as a tidal wave of millennial fear and apocalyptic fanaticism has begun building in the world" (2001, pg. 2). Matthew Cole has explored the growing trend of apocalyptic fanaticism, stating that the salient question of climate and disaster narratives is whether they provide a "deepening of the imaginative engagement" or a "mode of disengagement"; Cole states that catastrophism leads people to become more paralysed than mobilised when acting towards the prevention of climate change (2021). Contrary to this, in *Sixty Days and Counting,* Phil Chase makes a speech stating that "The potential disruption of the natural order is so great that scientists warn of a mass extinction event. Losses on that scale would endanger all humanity, and so we cannot fail to address the threat. The lives of our children, and all their descendants, depend on us doing so" (pg. 63). This mirrors Asimov and Pohl's declaration in *Our Angry Earth*; Robinson emphasises the obligation to future generations to do everything we can to make the future better for our potential offspring. Robinson uses his fiction to motivate humanity to take action against the effects of climate change and push for a solution.

Many Hollywood disaster films seem to induce catastrophobia through their exploration of the disastrous impacts of climate change. Roland Emmerich's 2004 'The Day After Tomorrow' depicts iconic landmarks such as the Statue of Liberty submerged in snow so that only the ice-covered torch is

showing. Robinson's trilogy has similar shocking images presented on the front covers of his novels; Washington DC immersed in snow and frozen. The fact that Robinson presents the issues of climate change specifically effecting Capitol Hill and the White House is extremely prominent due to the fact that he is showing that nature has no prejudice and will affect everything in its path, no matter how much power someone has. Chris Wallace explains that Roland Emmerich has imagined "floods, earthquakes, alien and terrorist attacks, [and] human-caused climate change disaster" and given viewers "images with which to imagine, a wide gamut of our deep-seated fears in high definition" (2013, pg. 3). Similarly to Robinson, Emmerich gave audiences a glimpse into the worst cases of a climate change disaster with the added power of a visual element whereas readers of the *Science in the Capital* trilogy could only imagine such an event from Robinson's textual descriptions. The depiction of "the abrupt and catastrophic transformations of the Earth's climate into a new ice age" (Lowe, et al, 2006, pg. 435) had a powerful effect on audiences after its release and led to a tipping point of public awareness of climate change and its devastating consequences. Arguably, climate change blockbusters have a stronger impact on audiences than novels due to the visual aid of the silver screen; however, Kathryn Manzo states that if films about climate change fail to show the complete view of climate change due to the completely unpredictable nature of the subject, then they are "necessarily imperfect" (2017, pg. 89). Robinson's novels have the advantage as there is no limit on the length of a book whereas films often have to fit into a certain run time.

With this added bonus in mind, Robinson is able to go into significant depth into the scientific facts behind the cause of climate change as well as the scientifically led pursuit to prevent more ecological damage taking place. Furthermore, there is no limit to the detail he could give within his writing whereas Hollywood films have certain budgets to keep within as well as taking into account what is possible to present on screen. Robinson gives the reader a description of the beginning of the flood in *Forty Signs of Rain*, informing us that "The Mall was covered by water. The streets beyond were flooded. Constitution was under water that looked to be at least two feet deep, maybe deeper" (2004, pg. 326). Through providing such impressive imagery of a globally recognised location completely underwater connotes a sense of the overwhelming power that nature has over humanity, reinforcing the idea of

ecophobia as water cannot be stopped or blocked out or controlled, regardless of wealth, political power, or status. To be able to envision Robinson's *Science in the Capital* trilogy as a film series would perhaps add a visual aid to his powerful words and have a bigger impact on his audiences through being able to see what could become of our reality. However, it may also have the opposite effect and come across as over-sensationalised and ingenuine; reviews of *The Day After Tomorrow* called Emmerich's plot "profoundly silly" and found it amusing that the movie veered its focus away from the annihilation of subcontinents and on to whether or not the main character's son should tell a girl that he loves her (Ebert, 2004). On a more positive note, Emmerich was praised for the special effects that showed the terrifying worst case scenario of climate change. *Forty Signs of Rain* was published in the January of 2004, and Emmerich's *The Day after Tomorrow* was released later that year on the 17th of May; they share a multitude of similarities between themes of the end of the world through climate change, and violent flooding spreading through the city. Additionally, they both present a scientific solution to the problem of climate change. Robinson's novels portrays a scientific quest to prevent the events of climate change; the answer they unveil is a technological solution.

Through the increasing popularity of apocalyptic and dystopian fiction, there is a growing awareness of possible environmental disasters that could take place in the near future which has led to a desperate pursuit of a solution. Like with many things in our modern world, science turns to technology for an answer, which has been met with a variety of reactions. This is something that Asimov and Pohl explore within their novels; Asimov appears to be more techno-optimistic than Pohl, who was more apprehensive due to the negative consequences certain technologies and powers can have that are arguably worse than climate change. Although not a complete Neo-Luddite, Pohl presented a world torn apart by nuclear weapons and people fighting for the hierarchy of energy. Within their polemic text, Asimov and Pohl discuss which power would be the best solution and the cleanest; in the section of the book entitled 'The Technocures', they state "The one significant remaining fuel alternative for 'steam engine' power plants is nuclear" (1991, pg. 245). This was widely agreed with in the scientific community as it was "believed to be cheap, clean, safe, and a reliable energy source, [and] was perceived as an advanced technology and benefitted from positive technological spill over" (IAEA,

2015, pg. 1). They follow this statement by explaining that nuclear power has risks and that they are the worst possible accidents that power plants could have; they use Chernobyl, Browns Ferry, and Three Mile Island as examples of the type of accidents that nuclear power plants could have if not handled and run with extreme care and precision. Since the text was written, knowledge and understanding of climatology, and methods to slow and prevent the issues of climate change have evolved over the span of thirty years. In the years that followed *Our Angry Earth*, governments all over the world kept track of the world's climate and greenhouse gas emissions that were produced by the global population. In 2001, the IPCC Third Assessment Report found definitive evidence "that humanity's emissions of greenhouse gases [were] the main cause of the warming seen in the second half of the twentieth century" (BBC, 2013). This issue, although generated from technology, has been exaggerated through the size of the population and their usage of resources that lead to the release of greenhouse gases into the atmosphere. Regardless of this, developments within scientific research have led to a reliance on a technological solution that may not be shared by everyone.

Robinson's *Science in the Capital* trilogy presents readers with ecophobia, catastrophobia, and technophobia. All three of these concepts represent the notion of a lack of control and unpredictability; these are notions that humanity has come to fear above many things. The trilogy harnesses ecophobia and catastrophobia to subdue technophobia and allowed the reader to have a more techno-optimistic stance due to the fact that technology has a way of saving people and reversing the consequences of climate change, regardless of the dangers and risks that go hand in hand with it. In contrast, the threat of ecological destruction is far more alarming and imminent than the negative possibilities of technological progression. Fear can be a powerful motive against the oncoming threat of destruction and extinction; it can allow people to put their faith in something they do not necessarily trust or understand. Moreover, technophobia allows us to comprehend and accept how humanity has used technology to increase our own catastrophobia; we have switched the focus of our anxieties "from what nature can do to us to what we have done to nature" (Beck, 1998, pg. 256). Robinson, in turn, pushes for a technological solution to reverse the damage humans have inflicted on the world and recognise the human error afflicted onto the environment.

The *Science in the Capital* trilogy takes a techno-optimistic stance which mirrors Asimov's perspective who encouraged readers to trust in technological progression within his science fiction. Within *Our Angry Earth*, Asimov and Pohl themselves attempt to find ways in which humans could alter their usage of power and electricity to resolve the effects of climate change, such as discussing how wind, solar and nuclear power could have advantages and disadvantages on both the natural environment and human life. A similar thought stream occurs in *Sixty Days and Counting* when Diane Chang is exploring scientific solutions to climate change. She comes to the conclusion that "Clean power is our only way out. That means solar power, I'd say. Maybe wind, although it would take an awful lot of pylons. Maybe Nuclear, just one last generation to tide us over. Maybe ocean power too, if we could properly tap into currents or tides or waves. To me – when I look at factors like technical development readiness, and manufacturing capability, and current costs, and dangers and damage – I'd say our best chance lies in a really hard push on solar" (Robinson, 2007, pg. 17). In our twenty first century reality, "the benefits of using solar energy have been campaigned repeatedly for a long time" and it has been utilized to generate power which greatly reduces the emissions of CO2 by decreasing the demand for fossil fuels (Infinite Energy, 2020). Robinson's choice of having the Head of NSF make this statement enables the reader to feel confident in the decision she has made, additionally with the knowledge that solar power is a consistently affective method of generating energy In an interview about *Fifty Degrees Below*, Robinson said that many scientists believe that it is feasible for the Gulf Stream to collapse which would lead to mass flooding in mainland countries and cities, stating that "the slight change in pH could well destroy the bottom end of the food chain, so we might all be screwed if it went much further" (pg. 2). Within this interview, Robinson proved that he had spent time researching the feasibility of the events in his novels becoming a reality and making sure that the science was correct in the most part. This is similar to Asimov and Pohl who were both extremely knowledgeable about climate science, on top of the fact that Asimov had a PhD in Biochemistry. The verisimilitude of the cli-fi plot is of high importance due to the fact that there would be no emotional impact of the novel if the scientific research was not accurate. The facticity of climate fiction is what gives it its power and influence within literature; people are educated and motivated on a level that they understand. Daniel Dinello explains that "science fiction imagines the problematic consequences brought about by […] new technologies

and the ethical, political, and existential questions they raise" (1998, pg. 3); climate fiction does not imagine the problematic consequences of climate change; instead, it reminds readers of what is actually coming and feeds them the visualization of reality. It has always been common knowledge in the scientific community that energy could be produced from sunlight; the "first solar collector was produced in 1908, three years after the publication of the paper on the photoelectric effect that won Einstein the Nobel Prize" (GreenMatch, 2021). At the time *Sixty Days and Counting* was published, Solar power was providing a cost-effective solution for energy needs in the daytime and benefits were being seen in areas such as energy independence, the economy, and job creation (SEIA, 2021). This information may not have been available or understandable to the general public in 2007 which would have led to a disconnect between humans and science. Robinson brings science to literature readers through his novels and allows people to understand a world otherwise unfamiliar to them.

Alternatively, the interdisciplinary link between literature and science has been considered a "mixed blessing" due to the fact that the two have limited ability to be wholly integrated. Janine Rogers argues that literature has many interpretations of the truth and can play around with the reality that readers are familiar with whereas science, in most respects, has one truth and cannot bend the facts like fiction has the ability to do; the goal of the scientific method is to find the truth through "putting forward a hypothesis and then conducting empirical research in order to support or refute, that is, refine, this hypothesis" (Johns-Putra, Parham, Squire, 2017, pg. 140). On top of this, there is a delicate balance that authors must adhere to in order to not bombard the reader with scientific facts. Asimov and Pohl completely separated fact and fiction within *Our Angry Earth*; although they used literary techniques in order to draw an emotional response from the readers, they maintain a factual and scientific message throughout the text.

Many people are optimistic and confident with the idea of technology leading the fight against climate change; these are what Daniel Dinello would label as "techno-utopians" (2005, pg. 1). In contrast, Dinello explains that "like a virus, technology autonomously insinuates itself into human life and, to ensure its survival and dominance, malignantly manipulates the minds and behaviour of humans" (pg. 2). It is extremely clear that Dinello had a techno-pessimistic perspective, contrasting the techno-

optimistic stance taken within Robinson's trilogy. On top of the risks of complete nuclear annihilation and radiation poisoning, Pohl and Asimov explored the notion of technology becoming dominant over humanity and leading to the very same issues that humans are trying to prevent. Simon Estok explained that the "fear of a loss of agency does strange things to people. Fear of the loss of agency and the loss of predictability are what form the core of ecophobia" (2018, pg. 36); these same factors also lead to technophobia. Within his science fiction, Isaac Asimov championed technology and encouraged his readers to accept artificial intelligence as society became more technogenic. However the fears that accompanied this rise in technological progression were that of the lack of control and the unpredictable nature of artificial intelligence; people were worried that they would become inferior to or overly dependent upon what they had created and controlled. The same anxieties exist within the twenty first century; humanity does not like what it cannot control, which enhances the terror of climate change. The techno-pessimistic perspective blames technology for climate change through the overuse of energy that powers technological items in the home, as well as burning of fossil fuels and carbon emissions being released into the air when cars are driven. Ironically, if technology was taken away from human beings, life would be a lot more strenuous and less connected; the year of 2020 alone proved the power and dependence humans give to technology through being isolated away from the rest of the world and having to use technology to keep connected.

Dinello's *Technophobia* would disagree with this ideology; he likens technology to a viral infection that "develops into an autonomous, invasive force that expands and fulfils its dangerous potential by flourishing in the societal medium of corporate, military, and religious sustenance" (2005, pg. 247). This apprehension and fear of technology is often explored within science fiction; artificial intelligence and sentient robotic beings often revolt against their creators and over-power humanity. This is something Asimov delved into through the creation of the Three Laws of Robotics in order to maintain control over the positronic brain and disarm the 'Frankenstein Complex'. Although his fiction revealed that these laws were sometimes contradictory, his laws are still referred to in both modern fiction and reality and are seen as a failsafe method against a robotic uprising. Just as Asimov combats technophobia in his robotic fiction, his legacy has inspired Robinson's climate fiction to disarm overly

paranoid fears of technology and climate engineering, seeing it as the solution rather than the problem. Robinson presents a complete certainty in a technological solution; in the final book of the trilogy, *Sixty Days and Counting*. Frank Vanderwal's inner monologue proclaims that "they had fucked up the world so badly that only the rapid invention and deployment of some kind of clean power generation much more powerful than what they had now would be enough to extricate them from the mess" (Robinson, 2007, pg. 18). This inner declaration has connotations that technology is the ultimate salvation and the only thing that could save humanity from the consequences of ecological destruction. There are slight elements of apprehension that could be interpreted as Vanderwal's statement gives the reader the impression that he is not necessarily comfortable with this due to the former part of his sentence; humans had ruined their world so much that they have to use a solution that many do not have faith or reassurance in. When referring to a solar power centred solution, Diane Chang, the head of the National Science Foundation describes the pursuit as "A kind of Manhattan Project devoted to solar power" (pg. 17), following on the point by explaining "I mean the part of the Manhattan project that not only designed the bomb but also entrained something like twenty percent of America's industrial capacity to make the fissionable material" (pg. 17). Although Diane explained that she was referring to the work and jobs that were created for the project, it is an interesting comparison for Robinson to make within a novel that wanted to emphasise the techno-optimistic perspective. Robinson was hinting at the destructive and unpredictable nature of technology when in the wrong hands, making the statement that it in fact humans that are dangerous rather than the technology created.

Robinson's *Science in the Capital* trilogy combines both science fact and fiction in order to explore the imminent climatological issues that reality is faced with in the twentieth and twenty first century. Alongside this, he brings science to literature readers through his novels and allows people to understand a world otherwise unfamiliar to them; he disseminates and popularizes complex, technical ideas. The *Science in the Capital* trilogy allows for readers to view scientists as real people with down-to-earth problems. This is where science fiction has the advantage over scientific reports due to the fact that readers are able to see a more human and relatable figure than cold, hard facts. Alongside mitigating the oncoming devastation of climate change, Robinson's main characters face issues such as raising a

family, romantic relationships, and even homelessness; for example, in *Forty Signs of Rain*, Charlie Quibler stops a conversation with Phil Chase about an "environmental engineering project designed to capture and sequester atmospheric carbon dioxide safely**"** (Robinson, 2004, pg. 46) to prevent his toddler from running into a road whilst they are at the park. Within Robinson's trilogy, the reader is able to see the relationship between Charlie and his toddler, Joe, to whom he is a stay-at-home dad. Through this relationship and the overall family dynamic of the Quibler family, Robinson presents the need for connectivity and community. Adeline Johns-Putra explains that "the discourse of environmentalist crisis, particularly that complex of environmental concerns that fall under the rubric of 'anthropogenic climate change', is peppered with references to posterity as parenthood – images, tropes and heartfelt please that create a sense of transcendence and timelessness on the one hand and conjure up elemental feelings of care and love on the other" (2017, pg. 3). Charlie's toddler represents the future children and grandchildren who will suffer the consequences of climate change if their parents and elders do not protect them. This enhances Anna's position within the National Science Foundation through the fact that she is not merely a scientist trying to come up with a solution; she is a mother trying to better the world for her children. The topic of breast feeding is repeatedly discussed within *Forty Signs of Rain*, acting as a metaphor for the nurturing of young children; the idea of a mother using her body to feed her child is a natural occurrence that allows babies to survive, similarly to humans being nurtured by nature through instances such as the rain watering crops in order for food to grow. The dependency babies have on their mothers is equal to that of the dependency humans have on nature. Readers do not often expect the main character of a novel who is dealing with the emotional ups-and-downs of family life to be the Director of the Bioinformatics Division who can pump breast milk whilst doing her scientific research, or the down-on-his-luck homeless man to be a bio-mathematics expert. Robinson brings these job titles down to earth and gives them a face and personality that 'regular' people can relate to instead of a wild-eyed, bushy-haired man with no hobbies or interests and with little interpersonal skills. Johns-Putra states that "the reader is not called on to identify with any one character" (2017, pg. 149) as they are all relatable in a variety of ways. This multiplicity of characters symbolizes the interconnectedness of humanity and enhances the notion that human beings are all in this together; climate change was caused through the combined actions of people around the globe, and

now it is the effort of these people that will prevent more ecological damage to take place. Through this humanisation of the scientist, the science is also brought back down to a more accessible level allowing for people to understand their involvement in both the cause and prevention of climate change instead of disconnecting themselves away from something they do not understand.

Overall, Robinson's climate fiction carries through the same techno-optimistic discourse introduced by Asimov and Pohl in their fictional works, representing the concept of science as the salvation within science fiction. Additionally, The *Science in the Capital* trilogy stages the issues of both the fear of the environment and fear of environmental collapse that pushes the need for a scientific solution to the White House, allowing for Robinson to present the collaboration of science and politics, two factors that have been heavily explored within Asimov's *Foundation* series and Pohl's *Homegoing.* His trilogy combines the fears and anxieties of ecophobia and catastrophobia to support technophilia and encourage a techno optimistic perspective which allows readers to understand that nature and technology are similar in the sense that humans fear what they cannot control, however humans have more of a chance of controlling technology than they do of controlling the forces of nature; there is a chance that technology is the salvation to our fears of both nature and the downfall of nature. Science fiction enables readers to understand and observe science fact in a non-threatening setting. Robinson humanizes the scientific characters in his novels by revealing their every-day issues, therefore allowing the readers to relate with a Biomathematics expert on an emotional level. Through this process of humanizing the scientist, Robinson humanizes the science behind the cause and solution of climate change. Moreover, this humanisation of the scientist takes the fear and powerlessness away from ecophobia due to the fact that people can put their trust in scientists because they are human and family oriented. In turn, people can understand what they have done and must do in order to save their planet and realise that climate change is a very human issue.

Conclusion: The Future of Cli-Fi

Isaac Asimov once declared that "what is really amazing and frustrating is mankind's habit of refusing to see the obvious and inevitable, until it is there, and then muttering about unforeseen catastrophes" (Qtd. In Canavan, 2010, pg. 1). This observation of the human race and the Cassandra Syndrome[14] is often depicted within both science and climate fiction in which humanity either luckily escapes its disastrous fate or succumbs to disaster. Climate fiction offers a simulated peek into the realistic future of the human race, allowing readers to imagine what consequences they could truly face in their own world.

When asked to write a column on the most important scientific event of 1988, Asimov decided to write about the Greenhouse Effect (Asimov, 1989, pg. 1). As a scientific mind who had been talking about such a topic for twenty years prior, Asimov's extensive knowledge of the Greenhouse Effect and global warming as a whole should be recognised within our twenty-first century discussion of climate change. However, this is not the case; Asimov has been overlooked and ignored as both a writer of climate fact and fiction. This thesis has explored how Isaac Asimov's voice holds significance during a modern-day climate crisis and how his message has travelled across time through literature, often without people being aware of who he is. Asimov and Pohl's polemic text, *Our Angry Earth* was written thirty years ago and their accurate predictions and research are yet to be acknowledged as a pinnacle in the world of eco-criticism and environmentalism; when read today, readers could mistake the words published in 1991 for words written in 2021. This thesis has acknowledged Asimov's place in the discussion of both climate fiction and scientific climate research. In addition to this, I have explored the ways in which my chosen authors present a prominent techno-optimistic stance within their novels when discussing how to mitigate climate change.

Climate fiction enacts simulated world events and allows people to see the worst-case scenario as well as investigate solutions to prevent this from happening. The future of Cli-Fi is uncertain; will it be a passing phase or will it become more popular now that people have seen what happens when humans

[14] The Cassandra Syndrome refers to a situation in which a valid warning is disbelieved and ignored.

remove themselves from nature due to the Covid-19 pandemic? The increasing awareness of climate change within society can only be positive and can allow many areas of cli-fi to be discovered; for example, more research should be performed on the causality between technology and the environment within novels due the human reliance on technological progression. Continued further reading of Asimov's novels may reveal more about our current state of affairs and influence scholars and readers to explore the relationship between technology and climate change, especially if a technological solution could mitigate the effects of climate change; his extensive knowledge and intelligence surpasses that of just robot laws and the positronic brain. Through looking at the past, it is possible to improve the future and help our angry earth.

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