

Changing Planets and Climates in Select Fantastic Literature

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Abstract

This thesis is concerned with literature's engagement with the environment, specifically ecosystems and climate change. Literature of the fantastic, works that break from the tradition of mimetic literature and the limits of realism, are the focus of this thesis, which argues, alongside ecocriticism, that literature must be part of the interdisciplinary drive towards greater ecological awareness. Speculative literature adds fantastic elements or draws on scientific extrapolations into the future, and offers a platform to engage with the science of environmental issues alongside philosophical engagements with the relationship between humans and the more-than-human world around them. This thesis draws on ecocriticism to examine the role of reading and criticism in constructing more ecologically sustainable societies. From this position, it asks how fantasy can be used to convey these themes. As a result, this thesis is interested in definitions of fantasy, drawing on science fiction and fantasy to examine Kathryn Hume's framework of the fantastic impulse. Placing fantastic texts on two axes, Hume examines the ways texts support or subvert the reader's expectations, and encourage or discourage reflection on their extratextual worlds. This thesis contends that, texts that encourage engagement are most transformative, but that the spectrum of engagement and disengagement challenges authors to navigate between didacticism and emotive imagery.

To show this, this thesis examines four series of novels drawing on the fantastic impulse. Frank Herbert's *Dune Chronicles*, Kim Stanley Robinson's *Mars Trilogy* and *Science in the Capital*, and George R.R. Martin's *A Song of Ice and Fire*. The first two are on opposite ends of both of Hume's axes, and imagine the challenges of constructing Earth-like ecosystems on other planets, asking questions about the sustainability of such a project as well as the possibilities of transforming society. The latter two engage with rapid climate change, Robinson's looking at contemporary climate change and Martin's engaging with historical climate change. They interrogate the impact of the climate on human and more-than-human life, and reveal the tension between comforting didactic revisions of human-environment interactions and framework-disturbing alternate ways of relating to the environment. This tension is where the fantastic is powerful, allowing alternate visions to pierce sceptical readers' defences.

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The Fantastic and the Green: Introduction

Cheryl Glotfelty, literary critic and environmentalist, provides the motivation behind her studies. For her, the impetus for environmentalism is “the troubling awareness that we have reached the age of environmental limits, a time when the consequences of human actions are damaging the planet’s life support systems” (xx). In 1996 she interrogated “literary studies in an age of environmental crisis” (xv), bemoaning that from a glance through “the major publications of the literary profession”, “you might never know that there was an Earth at all” (xvi). Since then, the field of ecocriticism has expanded alongside an increasing awareness of environmental crises such as global climate change. Alongside this, there has been a growing critique of the overemphasis on “realism” in Western literary criticism. Kathryn Hume, an American critic with an interest in the fantastic, suggests that readers “[may find] they have been reading fantasy, teaching it, and writing about it without ever having brought their critical consciousness to bear on the fantastic elements” (3). Both shifts towards new areas fall into the evolution of the concept of literary studies, which Glotfelty says “in our postmodern age [exists] in a state of constant flux” (xv). As a result of these areas of developing emphasis, this thesis is concerned with the dramatic changes in the global ecosystem through the 20th and into the 21st Century, and how literature engages with them. The purview of ecocritical approaches to literary studies has already begun to wrestle with the scope of literature mediating the environment and its changes to us. At the same time, this thesis looks to genres that transport the reader away from their immediate context, across time or into worlds fundamentally different from our own. In order to introduce and entwine these concerns, this introduction will engage with the question of what ecocriticism aims to achieve and what is meant by the fantastic in literature. From this, a framework drawing on the work of Kathryn Hume, and on elements of posthuman theory will be presented as a lens for the following chapters.

Ecocriticism begins with the assumption that, as Ken Hiltner puts it, “the humanities, such as literary study, also have a major role to play in our shared challenge of forging an environmentally better future” (xii). Cheryl Glotfelty defines ecocriticism as “the study of the relationship between literature and the physical environment” (xviii). The importance of a cultural element to ecology is highlighted, then, by the distinction between “problems in ecology”, analysed by scientists and ecologists as if humans have no presence, and “ecological problems” that are determined by and determine the ways human individuals and society relate to the environment (6). The latter is related to the field of human ecology, which “inquires into the patterns and process of interaction of humans with their

environments” (McDonall & Pickett 1233). Literature, according to ecocritic Greg Garrard, can render scientifically-identified “problems in ecology” visible as “ecological problems” facing society, making them relevant to the layperson. Both Patrick Murphy and Lawrence Buell argue that ecocriticism returns critical emphasis to the relationship between literature and the real, in this case the relationship between ecological themes in literature and the environment these texts represent. Buell outlines the challenge posed by postmodern and poststructural theories which emphasise the linguistic construction of the environment, suggesting that “art removes itself from nature” (98). However, Buell goes on to argue that, in fact, literature is involved in a complex negotiation between linguistic constructs and real environments. He emphasises the use of literature in studies of history and in the social sciences, finally arguing that there is a “reality of these fictional realities” (100), which is to say, ecocriticism allows for “the recuperation of natural objects and the relation between outer and inner landscapes as primary objects” (100). Murphy argues that teaching from an ecocritical perspective “[challenges] students to bring to consciousness their views about the world, their sense of personal responsibility in that world, and to consider the impact of contemporary society on the environments in which everyone lives and dies” (6). Similarly, Hiltner argues that the construction of the environment in literature, and the resultant relationship with nature mediated through texts, is key in enabling deeper understandings of environmental concerns. To that extent, “literary representations are [...] not only generated by popular cultures, they play a significant role in generating those cultures” (xiii). He goes on to argue that the works of American nature poets and the Romantic movement laid the way for the seminal text of environmental activism in the 20th Century, Rachel Carson’s *Silent Spring* (1962). Ecocriticism, in some of its sundry manifestations, is an interdisciplinary effort, examining the way in which literature engages with environmental science and philosophy, playing a role in the communication and representation of these issues.

As a result, literary engagements with climate¹ are important sites of ecocritical focus. The Intergovernmental Panel on Climate Change (IPCC) reports, synthesising the enormous body of scientific studies on climate change, are the united scientific front on anthropogenic

¹ It is important to emphasise the definition of climate here as opposed to weather. In brief, climatologist James Hansen distinguishes climate as “the average weather over a finite interval” (4). Weather is the short term effect of the motion of the atmosphere and ocean currents “sloshing about” (4), and weather forecasting is “mapping the current sloshes and looking upstream at where the next one is coming from” (4). As a result, the effects of a factor like the amount of atmospheric carbon dioxide are not always readily observable. Climate, on the other hand, is “deterministic”, “forcing agents” (4) like atmospheric carbon dioxide to affect it predictably over longer observational periods. Climate change, then is the gradual alteration of the climate in a region, and globally, due to greenhouse gases, which Hansen terms “an imposed perturbation” (5) on the complex climate system.

climate change. The 2014 synthesis report begins by unequivocally stating:

Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems. [...] Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen. (Pachauri & Meyer 2)

The scientific consensus on climate change's anthropogenic factors is overwhelming, and the projected effects of unmitigated climate change outlined by the IPCC are extensive and destructive: "Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems" (8). Climate scientist James Hansen emphasises that global warming presents what seems a paradox: "that mild heating can have dramatic consequences" (70). In discussing the complex nature of predicting overall warming, he lists the following as effects of even the lower predicted scales of warming:

The current smaller net climate forcing [due to greenhouse gas emissions] already is causing a notable recession of mountain glaciers around the world, affecting freshwater availability, shifting climatic zones, increasing fires and flooding, promoting the loss of Antarctic sea ice and vulnerable coral reefs, accelerating mass loss from the Greenland and Antarctic ice sheets with a rising sea level, and putting pressure on many species, leading to a danger of mass extinctions. (100).

Much of Hansen's *Storms of My Grandchildren* is about the forcing agents that drive climate change, and the feedback loops of ocean current alteration and ice melt due to global warming. The loss of albedo due to the melting of polar ice and the rising levels of warmer oceans makes further warming more likely. Furthermore, in their overview of potential effects of climate change on water and food security, researchers for the UN Food and Agriculture Organisation Turrall et al. highlight the threat climate change poses to the resilience of water systems vital for food production, stating "Substantial adaptation will be needed to ensure adequate supply and efficient utilization of what will, in many instances, be a declining resource" (xv). They emphasise the uneven effects of climate change on water availability globally, and highlight the difficulty in predicting the complex effects on rainfall that climate change will have. Overall, however, "Climate change will significantly impact agriculture by increasing water demand, limiting crop productivity and by reducing water availability in areas where irrigation is most needed or has comparative advantage" (xvii). They also show how climate change threatens the reliability and resilience both of food and

water systems, and that the areas most likely to be affected are often those least able to mitigate against these effects. Finally, they emphasise that we must examine carefully “the environmental consequences, options and trade-offs involved in both meeting future agricultural demands and accommodating climate change” (xxv), drawing on the recommendations of scientists working in climate studies.

However, Liisa Antilla, in her work on climate in the news, observes what she calls “a climate of scepticism” fostered through predominantly US news media: “One problematic trend of the US media has been the suggestion that substantive disagreement exists within the international scientific community as to the reality of anthropogenic climate change” (338). It is important to note, as Willem van Rensberg and Wouter Poortinga et al. emphasise, that climate change doubt is a complex set of beliefs regarding the veracity of climate change data, not always mere denialism. Poortinga et al. explore the complex network of personal beliefs and social factors that drive differing kinds of doubt in the public, rather than in the media, or amongst political or scientific bodies. They note that uncertainty about the impacts of climate change is more notable than uncertainty about its existence, but that “uncertainty about one aspect of climate change easily permeates to other areas” (1021). Another key insight is “that it may be easier to instil uncertainty than to communicate certainty, in particular considering the inherent tentativeness of scientific knowledge” (1022). Ultimately, the study concludes that, as “simply providing climate change information is unlikely to be successful, as new information is often interpreted by people in line with their existing attitudes and worldviews” (1022), a variety of communication approaches is best. This is a validation of the emphasis on environmental themes in literature central to ecocritical approaches. Already there are engagements with climate change in literature. The term ‘cli-fi’ is gaining traction as a descriptor for works that engage with the climate and climate change as a challenge, with cli-fi critic Rebecca Thuhus-Dubrow arguing that this kind of fiction can “refashion myths for our age, appropriating time-honoured narratives to accord with our knowledge and our fears” (61). Furthermore, critic Adam Trexler has dubbed literature about issues such as climate change ‘Anthropocene Fictions’ (Trexler 2015).

Since much of the research into anthropogenic climate change is concerned with modelling what may happen in the future, this thesis further concerns itself with ecocritical attention to genres that fall outside of the mode of realism, genres which use imaginative speculation in order to extrapolate from current environmental scenarios. While engagement with science and research into environmental issues is important, another vital element is a renegotiation of the philosophical underpinnings of the interaction between humans and their

environments. Posthumanism, in this regard, intersects with the aims of ecocriticism. This philosophical standpoint begins by dismantling the assumptions of Humanism, an aim which in part entails a rethinking of the conventional binaries between humans and animals, and between nature and cultures. Rosi Braidotti argues that posthumanism replaces the approach of humanism, “which rests on the binary opposition between the given and the constructed” (3). In contrast, posthumanism is “a non-dualistic understanding of nature-culture interaction” (3). Identifying the intersectionality of posthumanist critiques of humanism, especially the othering implicit in its binaries, Braidotti (alongside other posthumanists like Cary Wolfe) identifies animality and nature-culture as bound to other elements of domination in humanist thought. She argues that posthumanist sensibilities need to encourage an awareness of “life beyond the species” (55), a feature of posthuman and “postanthropocentric” (55) thought. What Braidotti argues is that with the current environmental challenges alongside changes in our understanding of humanity’s place in the ecosystem and the enabling of alternate forms of being through technology, “the activity of thinking needs to be experimental and even transgressive in combining critique with creativity” (104). This suggests a need to explore alternative ways of representing what she terms the “posthuman and postanthropocentric sensibility” (104). Karl Kroeber similarly identifies the opportunity provided by scientific advances to “think beyond the self-imposed political and metaphysical limits” of humanism “to make literary studies contribute to the practical resolution of social and political conflicts” (qtd. in Murphy 4). Hence, this thesis will argue that the fantastic in literature offers this combination of critique and creativity in a manner that reflects these sensibilities².

Already there are many ecocritical engagements with genres like science fiction, including studies of science fiction by critics like Eric Otto and Patrick Murphy, or Matthew Dickerson and Johnathan Evans who study works of fantasy through an environmental lens. The key engagement, especially with scientific or speculative fiction, is the quality of extrapolation from current environmental trends to create imagined futures. Murphy maintains that “Extrapolation emphasises the present and future are interconnected” (89). In other words, speculation about the future in science fiction allows authors and readers to understand present ecological issues through imagining future scenarios in both alien and Earth landscapes. Furthermore, speculation is an artistic approach which has similarities to the future-scenario modelling of environmental sciences – a method visible in many scientific studies of contemporary climate change. In scientific literature, future-scenario building “can

² Posthumanism will not be the focus for each text, but the concerns of many of the texts this thesis will examine reflect posthuman views, and thus it is useful to begin by defining it here.

provide an interdisciplinary framework for analysing complex environmental problems and envisioning solutions to these problems” (Alcarno 3), and for predicting the effectiveness, or ineffectiveness, of various climate policies. This partly aligns environmental future-scenario modelling with the extrapolations of fantastic literature³. What this discussion suggests is that, before environmental themes in the selected series of novels can be examined, it is important to outline the nature of fantastic literature. For this thesis, the work of Kathryn Hume in defining “the fantastic impulse” will provide the foundation.

Hume begins by arguing that prevailing definitions of fantasy have done much to obscure the wide gamut of the fantastic in literature by presenting it as a kind of “subliterature” (2). Hume, along with many other scholars of the fantastic, attempts to address this myopic approach, or what she calls “the disenfranchisement of fantasy” (5) in the predominantly mimetic Western critical tradition. Much like Hume, Tolkien scholar Tom Shippey argues that “the dominant literary mode of the twentieth century has been the fantastic”, and he traces the growth of fantastic literature from George Orwell, J.R.R. Tolkien, and Kurt Vonnegut to contemporary writers like George R.R. Martin (vii). However, as these critics, along with others such as American literary critic Robert Scholes, argue, fantasy has been lost to a “critical void” (Hume xiii) as a result of the overemphasis of realism or mimesis. Although, Scholes argues that the advent of postmodernism and poststructuralism⁴ has undermined the assumption that mimetic fiction is lifelike, and thus changes the role of the critic:

Once we knew that fiction was about life and criticism was about fiction – everything was simple. Now we know fiction is about other fiction, is criticism in fact, or metafiction, and we know that criticism is about the impossibility of anything being about life, really, or, finally, about everything. Criticism has taken the very idea of “aboutness” away from us. (1)

Scholes’s extreme position on the subject leads him to argue that imaginative fiction, like science fiction, or what he calls “future-fiction” (17) or ultimately “structural fabulation” (45), provides a route to navigate the challenge posed by the belief that “there is no mimesis, only poesis” (7). In order to grapple with the fantastic, to tease out the implications of Scholes’s argument, the nature of the fantastic must be explored. Hume offers a number of different definitions of the fantastic founded on the notion that fantasy is “the deliberate departure from the limits of what is usually accepted as real and normal” (xii). She goes on to

³ This is not to suggest that these complex climate models are mere fiction – the ontology and methodology of scientific modelling and science fiction writing are different.

⁴ Indeed, Scholes’s argument for future-fiction echoes many of the concerns about the failure of contemporary critical paradigms that Buell notes.

draw out historical definitions of fantasy and realism, engaging with the dilemma Scholes raises by showing that “literature bears an inescapable *resemblance* to reality” (5, emphasis added) but that the overemphasis of mimesis rooted in the philosophies of Plato and Aristotle “tore a large and ragged hole in western consciousness” (5-6). Following this, Hume argues that attempts to define fantasy that posit mimesis as the essential impulse in literature result in flawed “exclusive” definitions (8).

In order to construct a stronger definition, Hume expands on ideas from M. H. Abrams’s *The Mirror and the Lamp*, drawing up a schema which calls attention to a work’s relationship to the artist, the audience, and what Abrams terms the universe. Abrams’s term here means “nature [...] [or] people and actions, ideas and feelings, material things and events, or supersensible essences” (qtd in Hume 9). Hume expands this into what she terms “world-1”, that is “everything outside the author that impinges upon him, consciously or unconsciously” (9), and “world-2”, that is the world “enfolding the reader” (9), or the world that the reader has experienced. The relationships between a text or work and its author, audience, and world-1 and world-2 are reciprocal and teased out in fuller detail in Hume’s work. In summary Hume argues that, through conscious selection from, and unconscious influence by, world-1 the author creates a work that the audience engages with in ways impacted by experiences from world-2, and which may structure the way the audience responds to world-2 as a result. Through this framework, Hume discards previous exclusive definitions as overly selective, privileging certain elements of the schema and neglecting others. Instead, Hume begins by reframing the fantastic as an equal impulse to mimesis, rather than a genre separate from mimetic literature:

[Literature] is the product of two impulses. These are *mimesis*, felt as the desire to imitate, to describe events, people, situations, and objects with such verisimilitude that others can share your experience; and *fantasy*, the desire to change and alter reality – out of boredom, play, vision, longing for something lacking, or need for metaphoric images that will bypass the audience’s verbal defences. (20)

Fantasy, therefore, is not a genre separate from other kinds of literature, but rather the underpinning of literary engagements with the unreal in all its forms, and therefore as valuable a tool for artistic communication and delight as mimesis. What both Hume and Scholes ultimately argue for is a dissolution of genre definitions such as speculative fiction, science fiction, or fantasy. For Hume, all of these are simply comprised of texts that rely on “departure from consensus reality” (21) in some clear way, and therefore are texts of the fantastic. This is a similar conclusion to what fantasy critic Rosemary Jackson draws on for

her argument that fantasy is deeply subversive, appearing to be free to explore “that which has been silenced, made invisible, covered over and made ‘absent’” (4). This occurs because fantasy, as opposed to mimesis, refuses “to observe the unities of time, space and character, doing away with chronology, three dimensionality and with rigid definitions between animate and inanimate objects, self and other, life and death” (1-2). Simply, texts that depart from consensus reality contain the essence of what Braidotti requires from literature that challenges humanist assumptions about the environment.

Working from her broad definition of fantasy, Hume lays out four different uses of the fantastic in literature, rooted in four different approaches to reality. She terms them “illusion, vision, revision, and disillusion” (55). These four forms are produced by the interaction of two binaries: does the text seek to comfort or disturb the reader’s assumptions about reality, and does the text invite the reader’s emotional and cognitive engagement or disengagement? Each form offers a route to engage with ideas that can be best represented outside of mimetic literature. Together, they form a pair of axes, comfort-disturbance and engagement-disengagement, which interact to produce the four literatures. Literature of illusion seeks to comfort the reader and encourage disengagement from the “grey unpleasantness” (55) of everyday life and is the literature of pure escape. Literature of vision uses alternate visions of reality “more varied or intense than our own” (55-56) in order to disturb our assumptions about “our settled sense of reality” to encourage emotive and cognitive engagement with this new vision. Relatedly, the literature of revision also seeks to drive our engagement with the text and reality but, through didacticism or implicit future plans, offers “the eventual comfort of order, of a programme, of decisions made and rules laid down” (56). Finally, the literature of disillusion undermines our comfort and engagement, as it “insists that reality is unknowable. It strives to dismantle our comforting myths and offers no replacements” (56). In her shortest summation:

Escape literature, with its enchanting illusions, is an arbitrary starting point, but it is what most people think of as fantasy. Literature of vision, instead of offering retreat, challenges us with the new, but still offers this experience as a pleasure for our consideration, whereas literature of revision wants a stronger commitment from us. Literature of disillusion tries to persuade us that our happy beliefs are nonsense. When we accept its destructive proofs, we are free – whether to go on living without false props, or to bury ourselves in illusions, that we may not have to face the void. (57-58).

This thesis will draw on Hume’s framework in order to examine the different kinds of environmental engagements in four series of novels rooted in the fantastic impulse, which use the fantastic to reimagine human life in the complex system of the environment, helping us, as

Braidotti puts it, to “reconfigure our relationship to our complex habitat, which we used to call ‘nature’” (81). The four series are divided into two related topics, changing planets and changing climates. Frank Herbert’s *Dune Chronicles* and Kim Stanley Robinson’s *Mars Trilogy* both engage with the science, politics and ethics of planet-wide “terraforming”, or making a planet Earth-like in climate and ecosystems. Robinson’s *Science in the Capital* and George R. R. Martin’s *A Song of Ice and Fire* both engage with climate change and the threats it poses to human lives, societies, and the ecosystems that support them. The distinction is gradual, with the first two novels focusing on making other planets more earthlike, and the latter two engaging with contemporary and historical (albeit with a fantastic layer) real-world climate change. The novels render issues ranging from the potential destruction of other planets to fuel human expansionism, to the looming danger of anthropogenic climate change. All four novels ask questions about the ways in which we conceive of our environment and humanity’s place in it.

Chapter one will examine the environmental concerns of Herbert’s *Dune Chronicles*, showing the relationship between human societies and the environments they inhabit in a series of novels set in a distant future on a desert planet. Drawing on posthumanism and environmental science, this chapter will examine Herbert’s emphasis on an almost inevitable cycle of environmental awareness and responsibility, and collapse in an uncertain universe, consistent with the tropes of Hume’s literature of disillusion.

Chapter Two will contrast this with Robinson’s more optimistic *Mars Trilogy*, which explores a more proximate future where humankind expands to settle the Red Planet. This chapter will explore Robinson’s questions of how we remove ourselves from the baggage of history, and the ethics of settling another planet. Robinson’s novels draw the reader to his position, placing themselves firmly in Hume’s literature of revision.

The same can be said of Robinson’s *Science in the Capital*, which is an engagement with the immediate future under threat from anthropogenic climate change. Questioning the assumptions of global capitalism and the nature of science in relation to politics, Robinson lays out a revision of these relationships to provide new ways of thinking about the challenge of climate change. This text most clearly deals with the challenge of climate in the 21st Century, unavoidably demanding that its reader take action.

Martin’s *A Song of Ice and Fire*, instead of focusing on current climate change draws on historical medieval climate change to create a vision of life under threat from any drastic climate change, as a supernatural winter threatens all of human life. Chapter Four will show how Martin, through his new world, invites us to examine our own political and social

institutions and their response, or failure to respond, to climate change. Furthermore, Martin invites us through magic to reimagine our relationship to other species and the environment as a whole⁵.

These chapters will reveal the ways in which different literatures produce different engagements with the environment through their positions on Hume's framework of comfort and disturbance, engagement and disengagement. Through this, it will become clear what these positions expect of their reader; in other words what the texts suggest about the environment in what Hume calls world-2, the world outside the text as the reader experiences it. This will be done by examining how these four texts deploy fantasy to position themselves environmentally, allowing for an examination of the ways in which these authors' subversive fantasies challenge variously humanist discourses, capitalist domination, and comforting myths of easy ecotopias. Finally, by exploring the environmental themes in the novels, this thesis will explore how fantasy is used to navigate the tension between enjoyment and wonder, and didactic ecological discourse, or what Scholes might term "sublimation and cognition" (5).

⁵ It is important to outline here why no texts from the literature of illusion have been discussed. This form of literature's comforting and disengaging foundation renders it less than useful for encouraging critical awareness of the environment; it does not seek to decentre the anthropos as literature of vision does, nor to reinvent a route through contemporary ecological crises as the literature of revision aims to do, nor does it undermine our current assumptions about the environment and our place in it, as the literature of disillusion does. However, it is worth giving a definition and examples briefly here. Hume uses the term "escape literature" (63) almost interchangeably, as literature of illusion is about pleasant distraction and escape from reality. She gives examples of pastoral, adventure, comic, and pornographic literature as forms of escape literature. An example of the critical weakness in this form is suggested by a comparison between the superheroic strength of Robert E. Howard's Conan, whose strength is merely a gift "used to kill opponents more numerous and more varied" (80), and the moral dimensions of the nature of heroism in Tolkien's *Lord of the Rings*, which surpasses mere escapism.

Wisdom from the desert: Frank Herbert's *Dune*

Frank Herbert's *Dune*, and the series of novels which it begins, are classics of Science Fiction, with the first novel winning both the Hugo and Nebula Awards, and garnering both widespread readership and academic, critical attention (such as Tim O'Reilly, Jeffrey Nicholas and Susan Stratton). *Dune* itself opens with a dedication to "the people whose labours go beyond ideas into the realm of 'real materials' – to the dry-land ecologists, wherever they may be, in whatever time they work" (Herbert, i). Susan Stratton summarises the central concerns of the first novel as "the interplay of social, political, and environmental forces" that serve "to heighten readers' awareness of ecological issues" (306). However, she goes on to argue that *Dune* is limited in its ecological impacts by its focus on what she terms, after Le Guin, the "death narrative" (306), a heroic narrative of violence and tragedy rather than regeneration and comedy⁶. It is important to note here that Stratton's focus is on only the first novel of the *Dune Chronicles*, and it is the aim of this chapter in examining the first three novels to add to Stratton's analysis by examining how the later novels complicate and critique the hero narrative in the same way that she does. This will involve an analysis of the intersection of the features Stratton identifies in the first novel across all of the novels in the scope of this chapter, in order to trace the grander argument that Herbert is making about resilience, the interplay of culture and environment, the cyclical threat of both history and future awareness to developing a stable society, and ultimately the question of leadership under ecological pressure.

The novels of the *Dune Chronicles* which will be my focus here trace the entwined developments of Paul Atreides and the desert planet Arrakis. Indeed, the opening of *Dune* emphasises the deeply intertwined nature of the two, saying in Chapter One's epigraph that "Arrakis, the planet known as Dune, is forever his place" (Herbert 1). The first novel covers the young Paul's arrival on Arrakis, the killing of his father by the Harkonnens, a rival family in the interplanetary governmental system, and his adoption into and of the nomadic Fremen way of life. He takes a new name, Muad'Dib, and becomes their Messianic figure. The novel ends with his supreme triumph over his enemies, as he declares himself emperor. However, the following novel undermines this triumph of heroic will, opening with a plot against his life by new and diverse forces. The heroic act of will to save both himself and Arrakis has turned Paul Atreides into a figure that inspires deadly furore in a religious war of conquest on multiple planets, and eventually this momentum is the undoing of Paul as he seemingly

⁶ Here comedy is taken in the sense of a narrative that ends with regeneration and resolution, as opposed to tragedy.

destroys himself as a figurehead, wandering blindly into the desert, there to die after a weapon of mass destruction sears his eyes. The final novel in the opening trilogy, which I will call the Muad'Dib cycle, shifts its focus to the twin children of Paul, Leto II and Ghanima, who together begin to dismantle the totalitarian theocracy set in place by Paul and his younger sister Alia, under the influence of the ancestral memory of the psychotic and totally egocentric Baron Harkonnen, their grandfather. Paul, in disguise as a mysterious figure known as the Preacher, openly defies Alia's rule, and undercuts the hero worship accorded to Muad'Dib. Finally, Leto supersedes his father, bonding with the larval stage of the mighty sandworms endemic to Arrakis to become the "first truly long-range planner" (*CoD* 396) in human history and to foster a millennia-long empire which is itself only the larval stage of a truly free humanity.

Underpinning all of these political developments is the challenge of Dune's ecology. Over the course of Paul's and Leto's lifetimes, the terraforming process turns the barren, unforgiving desert landscapes in *Dune* into a green world which is rich in water and offers resilient, sustainable ecosystem services. It is important here to note that this process is unintentionally destructive in a way that has far-reaching economic and political side-effects. The life-extending spice, Melange, harvested on Dune is produced by the great sandworms, to which water is a lethal poison. This produces a deep tension between human needs⁷ and ecosystem needs, and between the needs of the Fremen and of the politically and economically powerful. Clearly, the development of Arrakeen life and the shifts in Paul's fortunes are deeply connected throughout the novels to the terraforming project, and it is through this connection that Herbert examines the intersection of the environment and society, what Rosi Braidotti calls "the nature-culture continuum" (3). First, the elements of Fremen society, and the character of Paul Muad'Dib which emerge from the dry-land ecology of Arrakis must be examined, and from this the broader concerns that Herbert has with history and the future can be examined in light of Hume's literature of disillusion.

"A man's flesh is his own; the water belongs to the tribe".

From the first novel's dedication, it is clear that Herbert's interest in dry-land ecosystems is deeply entwined with the political and economic world he has created. Ecocritic Clive Ponting argues that "Human history cannot exist in a vacuum. All human societies have been, and still are, dependent on complex, interrelated physical, chemical and biological processes"

⁷ I classify the spice as a need not only because it underpins the interplanetary Trading Guild's ability to navigate through space and therefore the interplanetary economy, but also because it is extremely addictive, causing physiological changes in those exposed, especially the "blue-in-blue" eyes of Arrakis natives.

(8) which are part of the ecosystems in which human societies form. There is a complex link between the nature of a society and the environment in which it develops. In fact, historian Felipe Fernandez-Armesto's investigation of civilisations chooses the relationship between society and environment as the root of his classification. He draws on Arnold Toynbee's doctrine of "challenge and response", which argues that "challenging environments inspire civilising responses" (26) to highlight the mutually altering relationship between the environment and the society that forms in it. Perhaps the area in the novels in which this is most evident is the semi-nomadic desert culture of the Fremen. The first novel opens with the Atreides moving from the water-rich Caladan to Arrakis, and the shock in the difference between the climates is mirrored in the many moments of culture shock, from the act of spitting as a compliment, to the repurposing of dead bodies for water which is central to Fremen culture. These examples indicate the way in which culture and environment intersect in the novels. What is perhaps most interesting is the way in which the planet itself acts as a double for the protagonist of the first two novels, Paul, and for the Fremen society itself, binding the three together into one symbolic nested system.

One of the major turning points in the first novel is Paul's acceptance into Fremen society. Part of this ritual involves his adoption of a new given name, Usul (meaning base of the pillar) and one of his own choosing, Paul-Muad'Dib. In the language of the Fremen, Muad'Dib is the kangaroo rat, a small desert mammal. His choice of name is lauded by the Fremen leader, Stilgar, thus:

Muad'Dib creates his own water. Muad'Dib hides from the sun and travels in the cool night. Muad'Dib is fruitful and multiplies over the land. Muad'Dib we call 'the instructor-of-boys'. That is a powerful base on which to build your life, Paul-Muad'Dib, who is Usul among us. (*Dune* 355)

This indicates much of Fremen culture, and also serves to underscore the link between Paul's development as leader and the shift in the Fremen from desert nomads to world-conquering military nation. Paul's new identity is bound to desert life, and it is the beginning of his achievement of the "desert power" (110) his father believed was necessary to control Arrakis. The necessities for life of a desert organism – finding water, and moving in the cool of the night – take on a spiritual and cultural significance to the Fremen, making desert creatures the instructors of the people. Fremen culture, as Fernandez-Armesto may put it, "defies the desert and defers to it", and he argues that "the durability of civilisation in hostile environments depends on getting the right balance between those strategies" (61). Paul becomes the archetype of the new Fremen, prescient, powerful, and supremely adapted to desert life, in reverent deference to its power and able to overcome the challenges of living in the harsh

environment. This is further suggested by the constellation also called Muad'Dib, "The One Who Points the Way" (234), which again emphasises Paul's role as leader and archetype. As he first accepts this potential future, Paul also identifies himself as a source of ecological growth as well as the growth of Fremen society, thinking of himself as "a seed" fallen in "fertile ground" (233).

The emphasis of water in the above section on Muad'Dib's name is vital to understanding the challenge facing the Atrides dynasty on Arrakis. To the Fremen, water holds economic, ecological, and spiritual significance, for good reason. With the scarcity of water, control or ownership of water is a sign of extreme wealth across Arrakis. In this way, as Stratton puts it, "Herbert dramatizes the relationship between ecology and economics" (307). Indeed, the governor's palace in the capital Arrakeen has a massive reservoir to highlight the political and economic power of the ruler. As Daniel Anderson, exploring bioregionalist impulses in *Dune*, puts it, this image shows how "within capitalism, one purpose of controlling a resource is the ability to privately exploit it through private excess that is publically celebrated" (231). Emerging from the scarcity of water, therefore, are the Fremen customs regarding the resource. These include the 'stillsuit', which repurposes the fluids excreted by the wearer into drinkable water, the repurposing of a dead body for water, and the significance of crying and spitting as acts of extreme compliment and of compassion and agreement respectively. What Otto notes is the way in which Herbert uses the reaction of Duke Leto to highlight that it is not only Fremen culture that is influenced by environment: "just as the Fremen veneration of saliva finds its origin in Arrakis's thirst-inspiring environment, the Atrides disgust finds its origin in Caladan's thirst quenching environment" (36). One of the many Fremen sayings in the novel is that "A man's flesh is his own; the water belongs to the tribe" (251). This speaks to the deeply interconnected nature of Fremen sietches⁸ as a result of water scarcity, which results in the strong sense of shared community which the Atrides believe makes the Fremen such a formidable armed force, and will shape their leaders (the Atrides line). Indeed, as Leto II argues in *Children of Dune*:

You see, whatever system animals choose to survive by [in the desert] must be based on the pattern of interlocking communities, interdependence, working together in the common design which is the system. And this system will produce the most knowledgeable rulers ever seen. (406)

A further impact of water scarcity on the society of the Fremen is their close link between the ecology of Dune and their religion. It is this link which Paul and his mother, trained in a kind

⁸ Herbert defines the sietch as "a place of assembly in times of danger" (601). Because of their persecution and the dangers of desert life, "any cave warren inhabited by one of their tribal communities" (601) is considered such.

of comparative religion by her secret order, the Bene Gesserit, take advantage of in order to secure their place in Fremen society. Paul styles himself, or perhaps more truly, is forced to by Fremen expectation, as the messiah who will turn Arrakis into a water-rich Eden-like planet. Another nexus of the ecological and the spiritual for the Fremen is the sandworm, or Shai-Hulud, Arabic⁹ for “Thing of eternity”. These massive creatures are, Paul intuitively early based on Fremen behaviour, “to be respected and not feared” (287), and this is clear in the Fremen’s other name for them: the Makers. Indeed, the sandworm is central to many aspects of Fremen life, as a form of transport, natural defenders of the desert where they live, and suppliers of the religiously significant Crysknife made from their teeth. However, it is only made clear to the Atrides later in the series that the Makers are in fact the source of the Melange spice which is central to Arrakis’s position as strategically and economically significant.

Ironically, however, these two central elements of the Fremen religion, water and sandworms, are mutually incompatible. Indeed, the larval stage of the sandworms is responsible for the sequestration of the planet’s water underground, and therefore its desert climate. As the subsequent novels in the series progress, it is clear that the terraforming project’s success is killing the sandworm population at an alarming rate. This occurs alongside the momentum-collapse of Muad’Dib’s cult into totalitarian despotism, and the weakening of the internal core of Fremen culture. *Children of Dune* opens with Stilgar musing on the change in Arrakis, and his people:

The breeze spoke of carelessness as it spoke of the time. Warren dwellers no longer maintained the tight water discipline of the old days. Why should they, when rain had been recorded on this planet, when clouds were seen, when eight Fremen had been inundated and killed by a flash flood in a wadi? Until that event, the word *drowned* had not existed in the language of Dune. But this was no longer Dune¹⁰; this was Arrakis. (3)

It is interesting to note, as does Fernandez-Arnesto, that after examining civilisations environmentally, hostile environments need not preclude society, “nor, on close examination, do some of the supposedly favourable environments turn out to be as conducive as is commonly thought” (27). The terraforming project does not secure the continuation of Fremen society, and in fact undermines both the source of the Atrides’s power and the culture that is founded on melange. It is this that necessitates the transformation of Leto II, son of Paul Atrides, as the first step along his utopian vision of “The Golden Path”, the

⁹ Although not central to the above discussion, it is worth noting that many elements of *Dune* draw on Arabic influences. O’Rielly argues that this is to provide the reader a point of modern reference in language for a religion and culture closely associated with desert life. “The Fremen are close kin to the seventh-century Bedouin” (42).

¹⁰ Once again, names take on a deep significance in the novels.

nature of which can only be made clear after an examination of the forces which undermine Paul's regime.

“We pay for the violence of our ancestors”

Chapter 2 of *Dune* opens with the following epigraph:

To attempt an understanding of Muad'Dib without understanding his mortal enemies, the Harkonnens, is to attempt seeing Truth without knowing Falsehood. It is the attempt to see the Light without knowing Darkness. It cannot be.

-from the “Manual of Maud'Dib” by the Princess Irulan. (25)

This comment, by Paul's eventual wife and conspirator against him, suggests a starting point in tracing the failure of Paul's heroic regime. Throughout the Muad'Dib Cycle of the *Dune Chronicles*, the Harkonnens pose a threat to Paul and his children. The Baron Vladimir Harkonnen is the antagonist of *Dune*, who decimates the Duke Leto's forces as part of a long-standing feud between the houses. Furthermore, the opening chapters of *Dune*, especially the one from which the above epigraph is taken, serve to set up the two houses as polar opposites. On mere appearances alone, Leto Atreides and Baron Harkonnen are entirely different: the Duke is characterised by his leanness, good looks, and noble carriage, while Vladimir Harkonnen is ruthless, grossly overweight, irredeemably ugly, and decadent in both dress and pleasures. He is, moreover, a paedophile. This simple distinction plays out in their approaches to leadership, politics, and ethics. Leto is known by the lesser houses as “Leto the Just” (107), and binds his comrades to him with force of personality and friendship, while the Baron rules through fear, Machiavellian realpolitik without any code of ethics, and vast wealth.

However, this very distinction between the houses is entirely undermined early in *Dune*: Paul's mother is in fact the daughter of the Baron Harkonnen, unbeknownst to her until Paul's expanding consciousness grasps it. In symbolic terms, this highlights Paul's role as the avatar of Arrakis and the Fremen – bearing the legacy of both his father's short rule and the more removed reign of the Harkonnens – and situates his attempt to navigate this history and his “terrible purpose” (22) within a spectrum, rather than simply on the side of ‘the good’ Atreides. In other words, Paul's reign cannot be read, as Stratton seems to suggest, as the embodiment of only an abstract “good” way of ruling; instead, Herbert problematizes Paul's reign through this mixed bloodline. Indeed, part of Paul's tragedy is symbolised in his embodied experience here: Paul, the Fremen, and Arrakis bear the burden of a long history of feudal-capitalism, inter-house struggle, and Machiavellian politics. Paul himself notes that “there is no escape. We pay for the violence of our ancestors” (173), in a moment that

foreshadows his inability to restrain the cult that has been prepared for him by the Bene Gesserit, by Fremen culture, and indeed by the psychological hero narrative. This is one of the primary characteristics that place the *Dune Chronicles* into Hume's Literature of Disillusion, as the Atreides battle against a social system and universe that is totally beyond their control. Paul's terrible purpose is merely a point within the terrible purpose of the feudal-capitalist society in the novel, and these terrible purposes "drove against all odds. They were their own necessity" (22).

This is not, however, the only manifestation of this problem, as Paul's sister, Alia (called Saint Alia-of-the-knife by Paul's religious followers) more viscerally embodies this problem. Awakened by the consciousness-expanding spice in her mother's womb, Alia is born with the same "race-consciousness"¹¹ as Paul; that is, she is born with the collected memories of all her ancestors. As a result, Alia yields to the influence of her grandfather, Baron Vladimir Harkonnen, allowing him to reach beyond death to attack the Atreides legacy once again. As Leto II says in *CoD*, "It is with reason and terrible experience that we call the pre-born Abomination. For who knows what lost and damned persona out of *our evil past* may take over the living flesh?" (8, emphasis added). The words "our evil past" suggest Leto's awareness that the history of violence, domination, and oppression which the Atreides wish to challenge is in fact ingrained into the current socio-political landscape because of the legacy of past evils which shape it. In other words, the question which the Muad'Dib cycle raises continually is how to escape and change a system premised on historical violence, without causing violence again. This is the symbolic implication of Alia's possession – her conscious mind, her will, and her desires are all conquered and stripped away from her systematically by the Baron, himself representative of the capitalist oligarchy of the system in the *Dune Chronicles*.

As a result of this afterlife of violence and despotism in Alia, the regime under her, beginning in *Dune Messiah* and culminating in the totalitarianism of *Children of Dune*, the Atreides legacy appears in fact to mimic the Harkonnens, rather than overthrowing them. Indeed, Paul is aware of this problem:

He'd thought of himself as an inventor of government. But the invention had fallen into old patterns. It was like some hideous contrivance with plastic memory. Shape it any way you wanted, but relax for a moment, and it snapped into the ancient forms. Forces at work beyond his reach in human breasts eluded and defied him. (*DM 133*)¹²

¹¹ By this, Herbert appears to mean an awareness of the lives, knowledge, and experiences of one's direct ancestral forebears, rather than what is commonly understood by the term 'race'.

¹² It seems to be ironic that Paul is unable to reinvent government, while his son argues that Arrakis will produce "the most knowledgeable rulers ever seen". This irony will be revealed to be potentially false in the next section.

This is paralleled with the failure of the vision of the planetologist Liet-Kynes for the development of Dune into a sustainable paradise. Liet-Kynes, like Paul, is fully integrated into Fremen society despite his Imperial, outsider status. His vision is shared by Paul of bringing Arrakis into an ecological stable state where the sandworms and the Fremen, as well as the other inhabitants of the planet, are all able to access sufficient resources to survive in balance with one another. The Harkonnens leave Liet-Kynes to die in the desert, and he, too, is haunted by a vision of the past, a hallucination of his father lecturing him on ecology. Through Liet-Kynes's delirium, Herbert raises some of the most obviously ecocritical concerns of the text. "The highest function of ecology is the understanding of consequences" (314), the ghost of Liet-Kynes's father states as his son faces the consequences of his support for the Atrides. However, poor "ecological literacy", the evils of the past borne out in the present, turn humanity and its endeavours into "a disease on the surface of their planets", setting them at odds with the natural world which "tends to compensate for diseases, to remove or encapsulate them, or incorporate them into the system in her own way" (317-318). Anderson further notes that even "the role of the ecologist here is ambivalent", acting both as "advance men for capital... reporting back to the empire" (251) while in the case of both of the Kynes ecologists, working "to promote a different agenda – a more democratic one" (252). Anderson argues that this different agenda, and Paul's own views in the novel, suggest "human potential and utopian tendencies" (237), but the complication of the later novels undercuts any certainty of progress and suggest that the difficulty of navigating human relationships with their environment is not easily solved. Indeed, the question suggested by Liet-Kyne's father, and mirrored by the development of the later novels, is how to navigate this difficulty of humans at odds with their environment. The novels ask how the Atrides and Fremen are to escape the destructive ecological legacy of humanity's relationship with nature without tipping the economic and political scales into the horrors of Paul's terrible purpose. While, as the next section will show, Paul's son aims to put humanity on the path to navigating itself out of this difficulty, Herbert maintains a careful ambiguity because, as O'Reilly argues, he is unwilling "to let himself be trapped into a final position" so that the reader "must let go of the need for certainty" (11). Otto adds a further layer to this ambiguity, exploring the way in which the novels ask "whether we can live as part of nature given modern historical circumstances that compel the management of nature" (38), raising further uncertainty over the project of terraforming as a site for Fremen social justice, and for Leto's Golden Path to order.

“The Golden Path”

It is evident through Herbert’s scepticism about history as progress, instead emphasising a cyclical view of history, that he himself is sceptical about the hero narrative that develops around Paul. Stratton argues that “*Dune*... offers no solution to human problems, including environmental ones, and it is *Dune*, not any of its sequels, that is widely considered to be among the greatest SF novels” (308). However, reading *Dune* in isolation prevents the profound alterations made by the sequels from becoming evident. It is arguable that the ties between the hero narrative and the death narrative that Stratton sees as problematic in *Dune* are in fact being problematized by the subsequent novels. A vital reason for this is the historicity of Paul’s regime, undermined in its infancy by the very forces that create it – the mythology of the Fremen and the socio-political and economic climate in which Paul lives. The weight of this prevents Paul from finding any way to avert his “terrible purpose”, and in *Dune Messiah* he meditates on the gross violence his regime has caused, saying, after discussing Genghis Kahn and Hitler:

Statistics: at a conservative estimate I’ve killed sixty-one billion, sterilized ninety planets, completely demoralised five hundred others. I’ve wiped out the followers of forty religions [...]. We’ll be a hundred generations recovering from Muad’Dib’s jihad. (*DM* 112)

What appears to be a central question to the *Dune Chronicles* is how to escape the magnetism of the personal, heroic narrative which is so closely bound to a system which totally engulfs the individual. The vision Liet-Kynes has of his father warns of the dangers of this problem, saying: “No more terrible disaster could befall your people than for them to fall into the hands of a hero” (*Dune* 319). Paul also reflects a number of times on his helplessness; he cannot stop the momentum that has built around him through the work of the Bene Gesserit planting mythology, the training given him by his parents and tutors, the interplanetary economy, and most importantly the strategic importance of Arrakis’s unique ecology. As a result of this, the novels in the Muad’Dib cycle also concern themselves with epistemological problems as a challenge to the act of predicting future events. In this way, the novels engage not only with philosophical concerns about human knowledge, but also with the challenge facing ecologists in predicting the outcomes of human actions in massive and complex environmental systems. In a review of Scenario Analysis, Joseph Alcamo begins by asking “how suitable is the traditional scientific method for studying a future that does not exist?” (2). Scientists attempting to predict the future must perform experiments that are “often expensive, unwieldy, and cover only limited aspects of possible future states of the environment” (3) in order to adhere to the expected rigors of science. This is not to suggest

that Future Scenario analysis is simply science fiction, but rather that the epistemological problems facing Paul and his limited prescience reflect similar difficulties to scientific modelling of the future.

Interestingly, it is the very hero narrative of *Dune*, and arguably continuing on in *Children of Dune* through Leto II, that most clearly highlights the problem of epistemology. The world in these novels is populated with people who have elevated their physical and mental prowess beyond anything seen before. In a society where some have the power to command through vocal modulation, compute intense algorithms as computers are now able to do, and predict the movements of celestial bodies to allow high speed space travel, Paul is still raised above as something unique. He has a kind of prescience that goes beyond the comprehension of all the characters in the novel, with the partial exception of Leto II and Ghanima, who intuit the trap which Paul falls into. The other characters in the novel see Paul's prescience as a kind of divine salvation, and it serves as the culmination of his Messianic powers, ensures his victory at the end of *Dune*, and even survives his blinding and desert exile from the end of *Dune Messiah*. However, as O'Reilly argues, both Paul's opponents and his allies attempt "to tailor a surprise-free future from themselves" because of the corrupting "fear of the unknown" (4). This is because the desire for foreknowledge comes from a desire for sustainability, resilience, and ultimately security. Similarly, there is a demand from scientific models in the popular consciousness for a certainty about future events, but as the ecologist Liet-Kynes's father says, "You can't draw neat lines around planet-wide problems" (*Dune* 315). However, scientific uncertainty, despite high scientific consensus, on environmental issues like climate change has been used as "yet one more reason why the status quo is best for us" (Nissani 37-38).

Herbert acknowledges this tension between the need for certainty and knowledge and the fundamental complexity of the environment, society, and human beings: "Deep in the human unconscious is a pervasive need for a logical universe that makes sense. But the real universe is always one step beyond logic" (*Dune* 430). This is a quotation attributed to Muad'Dib, and certainly it is a lesson Paul learns over the course of his rise to power and the culmination of his terrible purpose. In *Dune Messiah*, an anguished Paul asks: "Where is the substance in a universe composed of events?" He continues: "Is there a final answer? Doesn't each solution produce new questions?" (136). Again, in *Children of Dune*, Paul as the Preacher asks "How can you create an epoch when you cannot see every detail? Your tough mind will not serve you. This is where you are weak" (90). Indeed, the novels show a concern with perception typical of Hume's literature of disillusion, which acts to reveal "how fallible

our senses are through exposure to visions of reality that contradict the senses” (125). In part, this concern in the novels arises from the gains of quantum mechanics, as evidenced by the novel’s references to Heisenberg’s uncertainty principle, which reveals that parts of the universe are fundamentally unknowable. Similarly, there are parts of the human animal that are unknowable, the novels suggest, and this is a source both of vitality and tribulation.

The nature of human beings as animals is a frame for the text itself. *Dune* does not open with the move to the planet, the source of the plot, but rather with an obscure test to which Paul is subjected and which is used to foreshadow his already developing powers. The *gom-jabbar* is a pain test, where Paul places his hand into a sealed box where intense pain is simulated, while a deadly poison on a needle is held against his neck. The Reverend Mother who administers this test says the poison “kills only animals” (19), by which she means not that Paul is immune to it, but that by passing the test he has earned the right to *be* human. She explains:

You have heard of animals chewing off a leg to escape a trap? That’s an animal kind of trick. A human would remain in the trap, endure the pain, feigning death that he might kill the trapper and remove a threat to his kind. (20)

What is intriguing about this test’s definition of human is that it defies the conventional distinction of human and animal, while still relying heavily on a division. Instead of the conventional understanding of humans as superior forms of life to animals, the Reverend Mother classifies humans as we know them as animals, and treats the term human as indicating a kind of transhuman. It is important here to note that *Dune* predates both the transhuman movement and posthuman philosophy, which both seek to engage with the idea of people transcending the limits of what we currently understand as human, through technology (in the case of transhumanism), as well as reinventing our understanding of the relationship between human and animal, and the relationship between life and the environment, among other elements in posthumanism. Herbert’s inversion of the conventional definition of human and animal predates Jacques Derrida’s questioning of the difference between “what calls *itself* man and what *he* calls the animal” (qtd. in Wolfe 83). What Herbert has presented is a form of early transhumanism, but inverted: we are not humans now, but with training and preparation, we can achieve the qualities to transcend the animal. What makes them different is that transhumanism is predicated on the use of technology to achieve transcendence, whereas in the world of the *Dune Chronicles*, it is secret, almost mystic, techniques and training that raise Paul’s awareness to computer-like levels. Herbert seems to draw a similar conclusion to Derrida and Cary Wolfe about the

similarity between humans and animals (albeit with the inversion discussed above):

[H]umans and animals share a fundamental “non-power at the heart of power,” may share a vulnerability and passivity without limit as fellow living beings, but what they do *not* share equally is the power to materialize their misrecognition of their situation [...]. (Wolfe 95)

In spite of this similarity, it seems unlikely that the Reverend Mother would draw similar conclusions to Derrida or Wolfe; however, Nichols makes an argument for the relevance of the *gom jabbar* scene to contemporary environmental destruction:

In this [our unwillingness to adapt our lifestyle to the environment] we are not human. We cannot escape the trap of the imminent and immanent environmental collapse because we are the trap. We refuse to sacrifice now to live tomorrow, and we especially refuse to look for some way to turn the trap back on the one who created the trap. We’ve created the trap with our rampant desires. (10)

Based on the above, it is clear that one of the qualities which the Bene Gesserit value most, and which Wolfe, a posthumanist drawing on Derrida would disagree with, is the total subjection of the body to the mind. Indeed, as Adella Irizarry argues in her thesis, the Reverend Mother’s definition of human is insufficient in the face of posthuman theory, and the novels themselves complicate it:

[The Bene Gesserit definition of “human”] is narrow, elitist, and simplistic. In spite of its attempt to segregate and emphasize what is most “human” from what could be considered base and animal, it betrays many of the qualities that humanists value most: individual liberty and agency, freedom of choice, and self-sufficiency. (25)

The ‘quality’ that the Bene Gesserit value, albeit misguidedly, is very similar to a quality the text suggests has prepared the Fremen for a higher, disciplined, ecologically in-tune and patient society: “‘spannungsbogen’ – which is the self-imposed delay between the desire for a thing and the act of reaching out to grasp that thing” (333). This patience, much like the fortitude tested in the *gom jabbar*, is required to escape short-term planning, and to move beyond a society founded on what the Bene Gesserit dismiss as animal instinct, immediate gratification, and selfish individualism. Irizarry offers a rephrasing of what is implied in the *gom jabbar*, refracted through the Fremen’s epistemology:

While there is no separation between who can be considered human and who is not—all Fremen are born human—there is a sense that a member of the community must earn his or her status and be able to pull his or her own weight. (35)

Paul’s prescience initially appears as a route away from short-term planning, using the community-oriented Fremen trained to endure hardship and sacrifice, to prepare a better long-

range future. He can see the web of possible futures radiating away from each decision, and his companions therefore trust that he will lead them towards a secure and better future; in other words, he is relied on to predict the social and ecological futures of his people and to guide them towards the best one. However, a quote from Paul as Muad'Dib in later life undermines this: "The concept of progress acts as a protective mechanism to shield us from the terrors of the future" (*Dune* 371). Paul's prescience, that which raises him above the human-animal, does not guarantee anything and is in fact as limited as human perception:

Muad'Dib could indeed see the Future, but you must understand the limits of this power. Think of sight. You have eyes, yet cannot see without light. If you are on the floor of a valley, you cannot see beyond your valley. Just so, Muad'Dib could not always choose to look across the mysterious terrain. He tells us that a single obscure decision of prophecy, perhaps the choice of one word over another, could change the entire aspect of the future. He tells us "The vision of time is broad, but when you pass through it, time becomes a narrow door." And always, he fought the temptation to choose a clear, safe course, warning "That path leads ever down into stagnation". (254-255)

If short-term vision cannot secure an ecological and social future that is vital, secure, and in balance, Paul's prescience is also unable to do so. He repeatedly attempts to seek a path that avoids the jihad he sparks, but ultimately believes it is inevitable, as is his belief in the inevitability of his lover Chani's death during childbirth in *Dune Messiah*, and this pessimism carries into the ecological and social transformation his regime attempts. The failure of prediction to model a perfect society pushes Paul's children away from prescience; instead, Leto II fuses with the larval form of the sandworms, in an ironic inversion of the Reverend Mother's views on humans and animals, in order to extend his life into millennia, promising to find humanity a "Golden Path". This "Golden Path" is Leto's ultimate plan to offer an escape out of the paradox that, despite all learning, science, modelling, and even prescience, "The most persistent principles of the universe were accident and error" (320). However, it is worth noting that Paul entirely disapproves of his son's plan, dismissing it as leading to stagnation, problematizing its seeming success. Once again, Herbert's deliberate ironising of a character's viewpoints complicates any notion that a kind of transhuman being can navigate the complexity of ecological management in a random universe.

These moments suggest that the *Dune Chronicles* fall into Hume's "Literature of Disillusion" (124), challenging our ability to perceive and seek resolution due to what she terms "Our limitations as human animals" (135). Hume concludes this section by arguing that this kind of Literature of Disillusion is premised on exploring our biological limits:

All these works show that our perspective is unreliable simply because we are humans living in human society. We are blinkered by cultural traditions to the

point where we drastically limit what we perceive without being aware that we do so. (136)

What is striking about the *Dune Chronicles* is that their project of disillusion goes beyond this, showing also our failures when we transcend some of our biological limitation. Irizarry argues that “Paul’s character encompasses all possible versions and values of humanity within the universe” (57), and even this fails to produce a sustainable utopia. Indeed, the failure of Paul’s prescience to divert his self-destruction and the bloodbath his cult unleashes on the galaxy corresponds to and goes beyond what Hume describes as literature of disillusion that shows “the limits of individual perspective” (126). This kind of literature makes use of dreams, visions, and psychotropic drugs to explore the tenuousness of our grip on reality. Instead, Paul’s visions should raise him out of this problem – he sees reality as a kind of dream, and one of many strands that the reader in *Dune* may assume can be played like the baliset Paul is skilled at playing. By the end, however, it is clear that his prescience is as limited as human perception, implying a fundamental unknowability to life, and specifically to the project of engaging sustainably and organically with the environment. This is shown in the failure of the terraforming project described above, and this is one of the central moments of disillusion that produces the tragic narrative which Stratton identifies. However, the novels may not be merely pessimism, but instead take the unresolved paradoxes as a basis for a call for a kind of transhumanism or posthumanist awareness of ourselves as animals, and our limitations as a result, as far as managing both human society and its engagement with the ecological is concerned. However, Herbert, like many posthuman thinkers, including Cary Wolfe, Rosi Braidotti and Gary Elkins, would agree with Elkins’s view that merely technological attempts to direct human evolution will not be enough; the world of the *Dune Chronicles* echoes Elkins’s conclusion that by forfeiting the negative traits that make us human (in our current form), we lose the potential positive qualities that result from difficult life experiences” (20). Indeed, as Irizarry argues, it is necessary to negotiate a new posthuman existence, what she terms “the human-animal-machine relationship at the center [sic] of *Dune*” (71). This serves as a warning against valorising the idea of transhumans, or as Herbert calls them “superheroes” (qtd. in O’Rielly 5) as an end of all human suffering and tribulation. Instead, it is this very suffering and tribulation that is perhaps more clearly valorised in the text.

A science of discontent

While Stratton is correct that the novels centre on tragedy, her analysis is limited in its

exploration of the implications of this. The novel is framed by an overwhelming paradox, which Herbert intimates with the pain test in the opening chapter of *Dune*. Arrakis is a similar pain test for the Fremen and the Atrides, a test that mirrors the symbolic death and resurrection with the right to live from the Hero's Journey as outlined by Joseph Campbell. It is through facing extreme pain that Paul earns the right to be human in the *gom jabbar* test, and it appears that similarly, the Fremen have earned the same right in the crucible of Arrakis. However, the subsequent novels of the *Dune Chronicles* emphasise that, as the world is made more hospitable, the discipline and resourcefulness of its inhabitants wane. The heroic end of *Dune* is undercut by this, coupled with the runaway Jihad that similarly undermines the legitimacy of Paul as Muad'Dib. As Otto explains, *Dune* is tragic because of its concern with the pervasiveness of power: “[*Dune*] encourages us to think further about how economically driven, imperialist modern ideology cannot easily be subverted by an appeal to human embeddedness” (35). Growing ecological awareness simply is not enough to reform society on its own. Young Leto's Golden Path, too, seems an escape from the cycle of destruction and rebirth – a way in which humanity as a whole can be redeemed into being, in the eyes of the Bene Gesserit, human. However, *The God Emperor of Dune* shows us a 3500-year reign of terror under the immortal-seeming Leto, where he wages constant battle with the endlessly re-cloned weapon-master and moral compass of the Atrides line, Duncan Idaho.

Counter-intuitively, this reign of oppression is not a failure of the Golden Path; rather it *is* the first stage of the Golden Path. Leto's prescience leads him to totally oppress his subjects across the galaxy for millennia in the hopes of acting as a final *gom jabbar* – a pain test for all humanity. It is this structure that suggests the reason for the tragic narrative: Herbert's emphasis on ecology is tragic. For humanity to learn to value its environment, and indeed to learn the best forms of self-governance in resilient and sustainable societies, either catastrophe or other forms of oppression and suffering *must* occur, an idea that reinforces the kind of disturbance inherent in literature of disillusion. The Golden Path's first stage also undercuts the hero narrative in the most obvious way, and in a way in line with Stratton's critique of its ecocritical usefulness, by showing that it simply is not enough for one messiah to set humanity on an ecologically sound path, but rather it requires a total overhaul of all human systems¹³. This is what positions the novels as Literature of Disillusion, and suggest to Stratton that they offer no solution to ecological problems. Instead, the solution suggested by the series indeed *is* ecological problems, as a real-world *gom jabbar* that can refine our

¹³ Of course, Herbert also in some ways undercuts or contradicts this by suggesting that it takes a kind of post-human ability to ensure that this happens.

species out of being human-animals and into a transcendent, self-aware and therefore self-sustaining species. This is suggested in the imbalance of Arrakis's ecology under the Atreides line, which culminates in the more careful ecology in *The God Emperor of Dune* where both the people and the sandworms finally can share the planet in their required space and moisture levels. However, to emphasise again the need for danger, there is the moment in the fourth novel where Leto, now part sandworm, is wounded by an unexpected rainstorm, and similarly his death by water as the culmination of the Golden Path represents the tenuousness of this balance and the need for both "long-range planner[s]" and a population trained by the science of discontent in order for humanity to survive the ecological problems it creates for itself.

The Dune Chronicles, resilience, and ecological problem solving

Simply, therefore, the novel engages with the ecological problems as a necessity: they are part of the science of discontent that refines human systems, improving our sustainability. Gurney Halleck, the warrior-poet, looks on the destruction of the sietch water systems by Leto II and reflects that "All of this struck him suddenly as an enormously fragile containment of energy, of life – everything threatened by an abrupt shift in the pattern of change" (*CoD* 357). Halleck here is aware of something that Herbert suggests is the first ecological lesson offered by the Fremen, Arrakis, and the Atreides's attempts to terraform both the planet and its people:

After the Fremen, all Planetologists see life as expressions of energy and look for the overriding relationships. [...] The thing Fremen have as a people, any people can have. They need but develop a sense for energy relationships. They need but observe that energy soaks up the patterns of things and builds with those patterns. (357)

What Paul's heroic failure teaches is that ecological problem solving cannot be an exact science, and most importantly should not, and perhaps cannot, ensure a human ecological-social system free of the necessary discontent and struggle that produces the discipline to live in balance with nature.

This requires a massive shift in human systems. The oligarchic capitalist system portrayed in the novels must be completely overturned by the Atreides, and an interstellar war, and finally a millennia-spanning oppressive regime are needed to prepare humanity to overcome its limitations. However, these events appear catastrophic even to Paul, who is arguably their instigator, and it is only the voice of Baron Harkonnen, possessing Alia, that seems to offer any comment on this problem: "From one viewpoint, child, each incident of

creation represents a catastrophe” (*CoD* 60). The paradox presented here: the destruction and creation required by Herbert’s vision of human social and ecological development, is the synthesis of the two competing drives inherent in the patterns that energy and life follow: “we pay for the violence of our ancestors” (*Dune* 173), but this violence can become the *gom jabbar*, the Arrakis that trains the faithful in the ways of better governance. Again, Herbert’s cynicism which places the novel within Hume’s Literature of Disillusion, undermines also the tragedy of Paul’s failure, saying “Muad’dib’s Jihad was less than an eye-blink in this larger movement. [...] What mattered a single moon in such a universe?” (*DM* 134)

Ultimately, the novels still do present some unanswered concerns about the paradoxes of refining human systems. They express a profound scepticism of ecotopian idealism, and instead encourage the reader to embrace ecological problems as moments where human and environmental systems are refined. Furthermore, the *Dune Chronicles* challenge anthropocentrism, dismissing Muad’Dib’s jihad as ultimately no more central than any other part of the universe. Most importantly, perhaps, the novels serve as a warning and a reminder about the limits of human, and post-human, prediction and perception. This surprisingly meta-textual element raises important concerns about both environmental modelling in a chaotic universe “one step beyond logic”, and of the imaginative act of speculation central to Science Fiction. What Herbert is not saying is that these are therefore irrelevant, but rather that they should be seen just as what they are: models of *potential* futures, which have the ability to shape the present in different ways, and therefore these predictions cannot be relied on to be accurate, as the very act of prediction alters the course of human activity. O’Reilly argues that science fiction like Herbert’s offers a partial solution to this, being “not a predictive but an informative tool, which seeks to prevent mistakes by trying to keep up with change rather than stop it” (8). Similarly, Paul realises in *Dune* that “it is one thing to see the past occupying the present, but the true test of prescience was to see the past in the future” – to see the lines of potential cause and effect reaching from past decisions, which inform current behaviour – into the future, as a science fiction writer may draw on past causes for present circumstances and posit models for the future for evaluation. Similarly, organisations like the IPCC draw on past models to provide suggestions for current action to prevent future disaster. Future Scenarios, especially in terms of environmental scenario analysis attempt to model potential futures to create “the potential to link, and even integrate, environmental science and policy” (Alcamo 5) by extrapolating the effects of various actions and inaction on environmental systems. This suggests an interdisciplinary overlap between these scientifically-rooted models and the imaginative modelling of science fiction. *Dune* captures

the power and danger of the acts of predicting the future in order to achieve security in a universe ruled by “accident and error”. As science fiction writer Olaf Stapledon says, similarly to Paul’s visions of the webs of possible futures: “We can only select a certain thread out of the tangle of many equally valid possibilities” (qtd. in Scholes 20).

Mars, the experiment: Kim Stanley Robinson's *Mars Trilogy*

One of the fundamental failures of the Atreides regime in the *Dune Chronicles* is the inability of one totalitarian individual to achieve any form of ecotopia. This is represented by the failure of Paul's regime and the excessive brutality enacted by Leto II to set humanity on the Golden Path. Robinson, too, presents a challenge to the hero narrative as a route to ecological improvement, but does so in a more positive way than Herbert. His novels structurally are strikingly democratised, most notably through the multiplicity of focalisers and the lack of a single ultimate hero narrative. Indeed, the closest figure to a potential conventional hero is assassinated in the flash-forward opening chapter of *Red Mars*. It is this dispersal of responsibility and dominance in the narrative that reflects one of the profound emphases of the trilogy: that it is through multiplicity, or a "polycephalous revolution" (*Blue Mars* 290) that ecological and social development must come, rather than unilateral hero activity. The hero narrative hinges on the power of an individual, limited by lifespan and capability, while the polycephalous narrative of the *Mars Trilogy* negotiates paradoxes and competing ethical standpoints to achieve synthesis.

Robinson's *Mars Trilogy* has garnered numerous awards such as the Hugo and Nebula awards as well as a significant amount of critical attention in light of its engagement with economics, politics, and post-colonial and feminist lenses. These include analyses of ecosocialism in the text by critics like Eric Otto, and the exploration of radical politics by Marxist critic William Burling. An exhaustive list of the many discussions on fields ranging from the land ethics adopted on Mars to the notions of utopia in the trilogy are beyond the scope of this project. However, by focusing predominantly on the relationship between Martian potential and Terran history, between Terran biology and Martian environment, and the debates about the ethics of terraforming, this chapter will engage with the *Mars Trilogy* as an example of Hume's literature of revision, and thereby explore the link between this didactic form of fantastic literature and its engagement with environmental issues.

From the opening of the trilogy, there is already an emphasis on the multiplicity of the main characters' backgrounds and viewpoints. The first hundred settlers and areologists (scientists who study Mars) have been through a difficult screening process before being chosen to travel to Mars. During a tense solar storm as they are confined in a small radiation-proof shelter in the *Ares*, their space ship *en route* Mars, they admit to having lied and hidden many of their true beliefs and opinions. It quickly becomes clear that the result of this is a far from homogeneous group: with radical socialist Arkady Bagdanov arguing for a complete sloughing off of Terran culture, syncretic John Boone, practical and work-minded Nadia

Petska, and the money-driven capitalist Phillis Boyle all representing a small fraction of the charismatic or noteworthy figures from different philosophical and ethical viewpoints within the First Hundred. Most important, however, is the difference of opinion on terraforming Mars between Sax Russell and Ann Clayborne, which will be discussed in detail later. This variety of viewpoints within the First Hundred is further emphasised as other settlers land on Mars from a broader cultural and national base than the American- and Russian-dominated First Hundred, especially Arabic and Japanese settlers. Furthermore, there is an obvious generation gap that develops between the Issei (first-generation Martians) and the Nissei, Sansei and Yonsei (second, third and fourth generation Martians)¹⁴, exacerbated by the extreme age allowed by the longevity treatment discovered by the First Hundred's trio of researchers Vlad, Marina and Ursula.

This multiplicity of viewpoints, with focalisers drawn from the First Hundred, the Nissei, and even Sansei in *Blue Mars*, shows the simultaneous problem-solution of multiplicity. There is no easy central authority figure, no easy hero behind whom the Martians can unquestioningly rally. Indeed, John Boone, the first man to walk on Mars in the events before the novels begin, appears at first to embody the typical American science fiction hero: handsome, charismatic, kind, and determined. However, Robinson chooses to fundamentally undermine the single-truth hero narrative by opening the trilogy with Boone's assassination, which, importantly, remains a mystery for the whole novel. The multiplicity of truths and viewpoints provides a broader base for society to evolve without an overbearing tyrant, with room for a deep syncretism that evolves into a new eco-social Martian reality driven at heart by the struggle presented by multiple ethical and philosophical standpoints, the centre of which is the terraforming debate.

Terraforming areology

The debate about terraforming between Sax Russell and Ann Clayborne in *Red Mars* echoes throughout the series, even in the titles of the three novels, indicating different terraforming positions: Red, Green, and finally Blue. As the situation on Mars goes through its failed first revolution, its successful second, and attempts to negotiate the results of these two revolutions and the actions of both Martian and Terran groups, it is the divide between those who are for and against terraforming Mars that provides the opportunity for strongest eco-

¹⁴ The use of Japanese numbers for the generations of Martians is, curiously, unexplained by the text. These are terms used by Japanese immigrants to America in the 20th Century, and this reflects both the Japanese influence on Martian society through Hiroko Ai, originally Japanese, and captures the tension between Earth cultures and Mars's demands for new cultures and societies

critical commentary, and serves to connect Robinson's thoughts on culture, society, the mind, and the body, to the environment. While the multiplicity of viewpoints broached above gives the lie to the assertion that the Green and Red positions are fundamental, the spectrum they seem to offer structures much of Martian politics and the difficulties in negotiating this fractious political sphere.

The debate begins between Sax Russell, a physicist in favour of, initially, the fastest possible terraforming project to make the surface of Mars safe for humans to inhabit without needing life support systems, and Ann Clayborne, a geologist who argues that Mars should be left as untouched as possible, seeing an innate value in the areology of the planet. Sax argues:

Science is part of a larger human enterprise, and that includes going to the stars, adapting to other planets, adapting them to us. Science is creation. The lack of life here, and the lack of any finding in fifty years of the SETI program, indicates that life is rare, and intelligent life even rarer. And yet the whole meaning of the universe, its beauty, is contained in the consciousness of intelligent life. We are the consciousness of the universe, and our job is to spread that around [...]. Changing [Mars] won't destroy it. Reading its past might get harder, but the beauty of it won't go away. (*RM* 179)

The emphasis in this passage on the responsibility of life to continue, to expand outward and propagate consciousness in the universe, becomes central to the green position. There is an inherent value in life, especially intelligent life, because, as Sax begins his exposition, "The beauty of Mars exists in the human mind [...]. Without the human presence it is just a collection of atoms, no different than [sic] any other random speck of matter in the universe" (*RM* 177). For this reason, Sax, and the greens see Mars as key to solving population problems on Earth, achieving a just society, and spreading consciousness in a resilient pattern across the solar system.

The counter position, as Ann Clayborne takes it, disputes the fundamental assumption that life has greater intrinsic value than the pristine landscape of Mars. She rejects Sax's view, saying:

I think you value consciousness too high, and rock too little. We are not lords of the universe. We're one small part of it. We may be its consciousness, but being the consciousness of the universe does not mean turning it all into a mirror image of us. It means rather fitting into it as it is, and worshipping it with our attention. (179)

The red position, therefore, begins by questioning the assumption that consciousness has greater intrinsic value. Ann argues this assumption is a false product of consciousness granting itself a central position in a universe that predates it, exists beyond its comprehension, and does not necessarily *need* consciousness for anything. As a result, humanity has a

responsibility to respect and protect the untouched places in the universe, for both scientific and psycho-spiritual reasons. She argues that by terraforming Mars there is a distinct loss to the universe as well as an encouragement of anthropocentric thinking, because “when we look at the land we can never see anything but our own faces” (*RM* 158) after we have so radically changed it.

The tension between these two groups is central to the protracted difficulty of setting the Dorsa Brevia agreement, a proto-constitutional document for Mars in *Green Mars*, and indeed leads to outright conflict between Martian natives over whether or not to destroy the space elevator, key to maintaining ties with Earth by obviating the need for ground-to-air space ships. Radical reds hover at the fringes of Martian society, initially almost entirely as groups of eco-terrorists sabotaging invasive terraforming stations. Interestingly, these groups exist beyond the control of the First Hundred, including their prototypes Sax and Ann. While Ann remains a key figure for the reds, the movement evolves beyond her scientific and personal aesthetic love for Mars, into a spiritual, scientific and aesthetic movement. After the strongly ecological Martian government is started, the reds call for certain areological formations to be named “kami sites” (*BM* 318), founded on the Japanese Shinto belief in a kind of animism where kami or spirits are present in natural formations, here unusual or archetypically Martian forms. Furthermore, some of the more radical reds, calling themselves the Kakaze, replace their eyeteeth with red Martian stone to symbolically connect their bodies to the land. Similarly, the Green position moves far beyond Sax’s emphasis on the facticity or “the haeccity”, “*thisness*, [or] here-and-nowness” (*RM* 293), as he calls it after the philosophy of Duns Scotus, of life on Mars. The greens grow to include a number of different groups, including an interplanetary social movement and a syncretic Martian spiritual religion (although this moves beyond terraforming into another field neither red nor green). At its worst, the green position is co-opted as a part of metanational capitalist domination, as these extremely wealthy and powerful corporations use terraforming as a stamp of their domination over Mars and Earth.

Another central element of Robinson’s presentation of these viewpoints is the shift in values displayed by Sax and Ann. Both characters undergo extreme changes in their viewpoints as a result of the stress of leading Mars through two armed revolutions to escape the influence of the corrupt Terran Metanationals. Sax, undercover after the first failed revolution in 2061, is captured and mentally tortured to discover the locations of the remaining members of the First Hundred. As a result he suffers a stroke and requires extreme brain plasticity treatments to regain his ability to speak. A side effect perhaps, although the

process begins before his stroke and treatment, is a rapid development of his aesthetic and emotive engagement with Mars. Walking in the newly created Martian fellfields, Sax learns to see “this unexpected beauty” (*GM* 181) of the rocks themselves rather than the plants he contributed towards making possible on Mars, and begins to change, “the result of a new and growing conceptual understanding of the landscape. It was a kind of cognitive vision, and he could not help but remember Ann saying angrily to him, *Mars is the place you have never seen*” (*GM* 189). In the final novel, *Blue Mars*, the destruction Sax has witnessed on Mars compels him to apologise to Ann for instigating what became a reckless metanational terraforming process with no regard for the intrinsic value of rock, identifying that in his mind “Ann and Mars [are] all intertwined” (*BM* 711).

Similarly, by the end of *Blue Mars* Ann identifies herself as “a fully Martian Ann at last” (754), after her process of change to embrace life on Mars. The First Hundred psychiatrist Michel Duval suggests that Ann loves Mars because she is in a Keatsian way in love with death as a result of her childhood mistreatment on Earth. She falls into extreme depression and after the death of her long-term lover Simon, who dies from leukaemia, and considers allowing herself to be killed in a landslide, and then refuses to take the longevity treatment, believing that it stems from the destruction of red Mars. However, a run-in with a polar bear in *Blue Mars* causes her to realise that she desires to live, and to see the vitality of life, what Hiroko Ai, the Green mystic of the First Hundred, calls *Viriditas*. This culminates in her contemplating any potential life forms struggling to live in the extreme altitude of *Ascraeus Mons*, thinking “live, thing. She said the word and it sounded odd: ‘Live’” (*BM* 281). Both of these characters undergo a shifting of value, a process the Swiss on Mars term “*werteswandel*” (*BM* 449), and this alteration of values is a central concern for Robinson’s ecological vision.

Areofforming Terrans

In the pressure-cooker situation of the solar storm, radical-minded Arkady takes an opportunity to exhort the First Hundred to become fully Martian on landing. Most of this is his idea that Mars represents, through its spatial distance from Earth, the best opportunity to refine, or slough off, Earth’s troubled history. Throughout their voyage, he emphasises the ability of the First Hundred to make deliberate choices on Mars as a result of this spatial break from Earth:

Evolution is a matter of environment and chance, acting over millions of years. But history is a matter of environment and choice, acting within lifetimes, and

sometimes within years, or months, or days! History is Lamarckian!¹⁵ So that if we choose to establish certain institutions on Mars, there they will be! And if we choose others, there *they* will be! [...] I say we should make those choices ourselves, rather than having them made for us by people back on earth. By people long dead, really. (RM 88)

He sums up his statement here unequivocally by stating “We must terraform not only Mars, but ourselves” (89). This is a formulation of what Patrick Murphy argues is a key question in the novels: “whether or not it might be less risky to try and reengineer ourselves rather than our environments” (56). This is an idea that John Boone will continue to emphasise, and even offers as an olive branch to Ann during her more radical viewpoint period in *Red Mars*, and indeed his formulation of the idea makes it Martian: “People may try to change the planet, but all the while the planet will be changing them too. [...] So we terraform the planet; but the planet areoforms us” (253). The process of areoforming people and culture is central to the development of Mars’s strong environmental ethics.

The areoformation of the First Hundred is a vital trope that runs throughout the trilogy, especially in *Red Mars*. Indeed, through the areoforming process the reader and characters are led through the process of constructing a better society, a project which clearly places the novels in the utopian sphere of the literature of revision. I have already discussed the changing both of Ann and Sax, but the trope manifests in other characters too, especially Michel Duval and Nadia Petska. Nadia’s areoformation is gentler, and happens faster. She lands on Mars and throws herself into her work but characterises herself as feeling hollow in the low gravity. However, during her journey north with Ann, she is struck by the beauty of Mars – she sees Mars in the way Ann does:

Beauty could make you shiver! It was a shock to feel such a physical response to beauty, a thrill like some kind of sex. And this beauty was so strange, so alien. Nadia had never seen it properly before, or never really felt it, she realized that now; she had been enjoying her life as if it were Siberia made right, so that really she had been living in a huge analogy, understanding everything in terms of her past. But now she stood under a tall violet sky on the surface of a petrified black ocean, all new, all strange; [...] she didn’t feel hollow anymore; on the contrary she felt extreme solid, compact, balanced. A little thinking boulder. (RM 141-142)

In *Red Mars* Michel, the First Hundred’s psychiatrist, suffers from an extreme form of homesickness, which impairs his ability to treat his patients, and causes him to lose track of time and events. A longing for the green of his native Provence, and his isolation as the only

¹⁵ What Arkady refers to here is an alternate view of biological evolution as a guided process: the changes an organism undergoes in its lifetime are passed on to its offspring to make their adaptation easier. While biologically Darwinian evolution won out as a theory, Arkady suggests that cultural evolution acts in this way, and therefore the changes they see and cause are not random natural selection, but the result of human agency.

French-speaker in the First Hundred, becomes a psychological disorder for the psychiatrist. This is only remedied in *Red Mars* by his induction into Hiroko's Areophany, a syncretic kind of eco-mysticism that attempts to navigate the dislocation of humans on Mars through a blend of slow terraforming called ecopoesis¹⁶, worship of the land as it was before human arrival, and thereby claiming Mars, in whatever state, as home. It is this process of making a home on Mars that revives Michel, and indeed drives his subsequent thinking about the long-lived First Hundred as continually reincarnating beings. Again, it is clear that what marks the turning point is a physical ecological experience – tasting Martian earth as a kind of communion with the planet, Hiroko giving it to him saying “This is our body” (228). Sax, Ann, Nadia, and Michel are areoformed when they are struck by the beauty and haecceity of their presence on the planet. However, it is important to note that this is not a simple solution – Michel returns to his native Provence and is struck by a double alienation. The green landscapes and beautiful beaches he associates with home have been destroyed by factories and the massive rise in sea levels as a result of the collapse of the Antarctic ice shelf. This highlights the difficult and fragile nexus of place, environment and one's sense of home. The little green patches on Mars are what Michel sees as pieces of a little Provence emerging on Mars, but this does not entirely make him feel at home there either.

One part of this paradox is rooted in Michel's unwillingness to become totally Martian, unlike Nadia, or eventually Sax and Ann. The chapters focalised through the young nissei Nirgal emphasise that Mars is home for those born there. After his diplomatic tour of Earth in *Blue Mars*, Nirgal is almost killed by exposure to Terran environment as a kind of allergic reaction to something uniquely Earth-bound, be it a pathogen or the makeup of Earth's atmosphere as opposed to what he is used to on Mars. The novels also go into detail about the biological changes that those born on Mars experience, including growing much taller as a result of the lower gravity. This biological result of Martian colonisation serves viscerally to emphasise the refrain used by Maya Toitovna, one of the most politically active of the First Hundred focaliser characters, “You can never go back” (*GM* 482). This phrase becomes a slogan visible in red graffiti throughout the build-up towards the second revolution in *Green Mars*. Nirgal, in his speech to the Martians at the climax of the second revolution, says something similar: “We are living pieces of Mars. We are human beings who have made a permanent, biological commitment to this planet” (*GM* 590).

The changes wrought by Mars on its new inhabitants are not only biological and

¹⁶ Ecopoesis here is the term coined by Robert Haynes, meaning “making an abode for life” (Haynes & McKay 133). Robinson uses it to suggest a slow, adaptive form of ecosystem engineering focused on sustainability, opposed to the mass-scale, invasive and destructive terraforming done by the multinationals.

personal. There is a clear change in the way people live on Mars, in a manner not unlike the way Arrakis in *Dune* necessitates or allows certain socio-cultural developments among its people which align them more closely with an ecological vision. However, Robinson's vision of the effects of space and place on society is more liberating than the fatalistic cycles of growth and entropy in *Dune*. The process of areoforming society begins with the pressures placed on the First Hundred, living on a planet of scarce resources and relying heavily on life support systems and one another for daily survival. Nadia notes that in their lives in Underhill, their first settlement, "It all interlocked; all their tasks linked together, were necessary to each other" (*RM* 106). This produces the radically different approach to work on Mars among the first hundred, as they develop a prototype of the gift economy visible later in the novels¹⁷, asking no pay for their work. Indeed, the majority of the First Hundred cannot conceive of an economy at this stage of Martian life.

The precariousness of human life on Mars, exhibited perhaps most strongly in the global dust storm later in *Red Mars* and the brutal killings of Martians by disabling life support systems, necessitates a purification of systems of trade and work. Similarly, the enclosure of craters and canyons to make them inhabitable shifts emphasis from the global back to the local, ultimately changing the way the Martians conceive of governing themselves in *Green* and *Blue Mars*. Part of this is also a drive towards increased freedoms, encouraged by the reasons the settlers have for leaving Earth – often to escape the hierarchies and structures in place in their original countries of origin. The novels suggest that the most profound challenge for implementing an ecologically sustainable Mars is the legacy of Terran division, especially in the encoded nature of domination in Western culture, pervading gender and racial politics, and the conception of statehood. Otto identifies a similar concern with division arising from capitalism, which "disintegrates ecosystemic integrity through its quantification and extraction of exploitable resources" (119). The division of humanity from, as Otto terms it, "otherkind" (119) is part of the complex of dominating principles of capitalism. As a result, key to the Dorsa Brevia agreement and the Martian constitution is the enshrining of human and environmental rights, going hand-in-hand, and a deep level of sexual liberation and deconstruction of racial, ethnic, and nationalist lines. As Art, a late Issei, reflects when meeting a woman of Greek, Colombian and Australian descent, "what would the Graeco-Colombian-Australian position be" (*BM* 150), revealing these lines to be constructs that are the baggage of Terran history. Instead, we see a Mars that focuses on local governance (or anarchy as the case may be) under an environmental and social court to

¹⁷ This will be discussed in greater detail in this chapter.

protect the rights and liberties of both Martian inhabitants and the environment that supports them. This is what Otto describes as “a fundamental change from a decidedly nondemocratic mode that is deaf to the people who speak for ecosystemic integrity, to a democratic dialectical communal mode that is always open to the voices of its stakeholders” (119).

Furthermore, the deep connection between survival and ecology leads to an emphasis on ecopoesis, “the humanly-directed process of establishing a self-sustaining ecosystem on a lifeless planet” (Haynes & McKay 134) and on Mars takes the form of a slow shifting of a small area into an earthlike state, as opposed to global intensive terraforming. The metanational companies that lead the terraforming effort on Mars in the first novel adopt highly destructive approaches, including releasing massive underground aquifers and flooding large areas of Mars, and later building an orbital lens that cuts deep chasms into the rock to release trapped carbon and thicken the atmosphere. Even pro-terraformer Sax resents this wanton destruction, not least because he feels it is unnecessary and dangerous. In fact, the climax to *Red Mars* is arguably the massive flood that chases Maya, Sax, Ann, Michel, and a few others of the First Hundred down the Valles Marinas. This flood is a direct result of reckless terraforming and the reckless eco-sabotage by radical reds of these projects, and the flood symbolically sweeps away the Machiavellian politician Frank Chalmers in an instant as he tries to free their car from being trapped atop a boulder. On Mars, clearly, the environment is far from controlled and is in fact a present danger that can easily sweep aside political and social concerns. The same pattern is seen again on Earth as the ice sheet collapses in the Antarctic, ushering in a new age of global crisis and co-operation that effectively allows for the second Martian revolution’s success as Terran attention is focused elsewhere. It is clear that “In the face of worldwide desperation, power struggles of all kinds were recontextualised, many rendered phantasmagorical” (*BM* 162). Ultimately, Robinson seems to suggest that many of Earth’s problems are overshadowed by potential environmental collapse, highlighting both the ephemeral nature of many power struggles in comparison and the importance of imagining scenarios where this comparison can be drawn before it happens in reality. However, this is not an absolute process, and the Martian areoformation of Terran people, societies, and cultures, is under ever-present threat from Earth and its troubled history.

“Falling into History”

After we see the start of the First Hundred’s voyage through Maya’s eyes, Robinson breaks his strict focalisation, a feature throughout the books broken only in the short prologues to

each character's section, in order to talk about the escape velocity required to break free from the gravity well of Earth. The problem of overcoming gravity is also evident in the space elevator, which significantly is built, maintained, and demanded by the metanationals on Earth. The end of the out-of-focalisation musing by the narrator discussing the change in velocity, as a measure of energy expended, to escape Earth and the inertia of gravity, turns philosophical:

History too has an inertia. [...] In human affairs, individual world lines form a thick tangle, curling out of the darkness of prehistory and stretching through time: a cable the size of Earth itself spinning around the sun on a long curved course. That cable of tangled world lines is history. Seeing where it has been, it is clear where it is going – it is a matter of simple extrapolation. For what kind of Δv would it take to escape history, to escape an inertia that powerful, and carve a new course? The hardest part is leaving Earth behind. (*RM* 50)

While Arkady in his calls for radical reform views Mars as a further example of what Antarctica represented on Earth under the Antarctic Treaty, an example of “the way the world should be run, if only we could free it from the straightjacket of history” (87), history repeatedly inserts itself into Martian affairs, from questions of Terran immigration to Mars, and the oppressive actions of the Metanationals, to the nature of the Terran-Martian relationship.

One of the major catalysts for the failed first Martian revolution is the extreme rate of influx of Terrans onto a Mars that is undergoing a kind of burgeoning planetary consciousness movement as a result of the work towards Areoformation by John and Arkady. The metanational-built space elevator allows for a rapid influx of Terran businessmen and workers onto Mars in order to strip its resources, particularly valuable metals, to send back to feed the insatiable demands of metanational capitalism. The concern, which is strengthened again after the second space elevator's construction and becomes a key political issue for Martian governmental politics, is that the new issei are less Martian and are not being areoformed as the established Martians have been. The immigration issue is framed as a hauling of Terran nationalism into Martian post-national life. Religious, gender and ethnic divides reassert themselves with a common frame being the assault of liberated Martian women by conservative Terran colonists¹⁸.

¹⁸ The distinction between colonists and settlers is part of Martian discourse in the build-up to the second Martian Revolution. Nirgal argues that those who have been areoformed and inducted in some way into the Martian areophany are settlers, implying a symbiotic ownership of the land, while those who resist and remain fundamentally Terran-oriented, like Phyllis for example, are colonisers. Frank also emphasises the similarity of capitalism and colonialism, saying “that's what transnational capitalism means – we're all colonies now”(392).

In this way Robinson draws on ecosocialism (Otto 101), eco-feminism¹⁹ and ecological theories in post-colonialism²⁰, connecting the oppressive and invasive control of the land by Earth's capitalist elite to patriarchy and colonial oppression. Robinson's argument follows a similar trend of uniting issues of environmental domination to other social domination along gender, race, and national lines to Alaimo and Hekman's argument for a re-engaging with materiality of the human body and the natural world in light of its connection to "every aspect of feminist thought". This they expand to include "science studies, environmental feminisms, corporeal feminisms, queer theory, disability studies, theories of race and ethnicity, environmental justice, (post-) Marxist feminism, globalisation studies, and cultural studies" (148)

What sits at the heart of this nexus of ecological and social pressure on Mars is the presence of Earth's metanationals. These are corporations that have grown large enough to act as if they are, and have influence over, even large nations. This handful of corporations is able to buy out states and manipulate the UN in increasingly insidious ways. One of the ways the novels engage with the power of technology is to reflect on its enslavement to capitalist agendas as a method of control and profit-making. From charging exorbitant amounts to administer the longevity treatment, to destructive terraforming of another planet, to annihilating entire Martian cities that stand against them, the metanationals deploy the extreme powers of technology in destructive ways: "One might say that their reach no longer exceeded their grasp. Which, given the directions their reach sometimes took, was a frightening thought" (*GM* 211). Robinson roots his criticism of the metanationals in the current economic paradigm, emphasising their historicity in the novel, reflecting the conditions of the 21st Century that thinkers like political economist John Borrego note. Borrego notes that global capitalism coexists with and emerges from previous forms of political and economic systems, but that multinational corporations "are reducing the power of the nation-state and its autonomy" (174). Robinson's vision of the future is not unlike the projection that Borrego makes:

The new hegemon [within the world economy] becomes the dynamic web of global corporate structures embedded in a vast dispersed network of regions, communities and districts within the world system instead of a nation or several nations combined into a transnational economic region. This new hegemonic social form suggests that we will have moved from a paradigm in which world empires succeeded each other, to one in which nation-states

¹⁹ Otto's discussion of ecofeminism in general, and in other works of science fiction covers the topic in detail that I do not have space for here.

²⁰ See Elizabeth Leane for a full discussion on the nature of the trilogy as a postcolonial narrative set in a space with "the absence of indigenous life" (89).

succeeded each other, to a new paradigm defined by the dominance of regionally embedded global corporate structures. (175)

From this Robinson shows a vision of history more linear than Herbert's cycles of failed revolution and collapse. "Metanationalism is a new kind of nationalism, but without any home feeling. It's money patriotism, a kind of disease" (*GM* 484) that is a culmination of the destructive practises of capitalism and nationalism. In Robinson's view, metanationalism is the remains of a failing system that is now at war with democracy – the next step in social evolution²¹. Metanationalism is the result of capitalism struggling to suppress democracy, and is itself the continuation of a synthesis of capitalism and feudalism, the system it replaced. Nirgal, reflecting on the seemingly endless struggle of the First Hundred and their children and companions, says "Mars right now is the battleground of past and future" (*BM* 624). This battleground is both physical, with the destruction as a result very visceral in the novels, and psychological.

The breakdown of democracy, and its related failure to be ecologically sensitive as a result of the pressures of global capitalism and industrialism, is explored by American environmental philosopher Laura Westra in *Living in Integrity*, where she argues that the result of global corporations like the metanationals is "that 'free democratic choices' are neither truly free nor truly democratic" (54). She further argues that the current conception of democracy has these pressures directly embedded in it, reflecting Robinson's own argument that democracy as it is termed in action currently is a diluted form of another, more truly democratic system. This is what William Burling terms a "radically new and empowering sense of politics" (75) formulated to solve problems not limited only to Mars. Earth also goes through environmental and social collapses exacerbated by (in the case of the former) and caused by (for the latter) the metanationals' disregard for anything other than profit. In response, the Martians devise a system that the First Hundred term "eco- economics" (297), a complex guided economy based on ecological principles, a gift economy and a major trading in hydrogen. However, even after casting off capitalism for eco- economics and defeating the metanational forces on Mars, the Martian-Terran relationship remains a divisive and difficult problem to solve.

The key drama for *Blue Mars* revolves around the political question of what Mars's

²¹ It is important to note here that it is clear that Robinson does not see social evolution as uni-linear, however. It is a process that is complicated and has multiple outcomes, tending towards and away from utopia. This is the reason for the First Hundred's emphasis to each other of remaining involved in fighting to engineer the Mars they want. Arkady emphasises the controlled or Lamarckian, rather than random, nature of this evolution of human social and cultural structures, as a product of those who work on actively changing the system they are in, as discussed previously.

relationship should be to the struggling Earth. Many groups favour total separation from Earth, such as the reds (who have moderated to desire minimising of human impact in certain zones of the planet rather than Ann's early total anti-terraforming stance) and later the popular MarsFirst and FreeMars parties which were central in the anti-Terran second revolution²². In the build up to this difficulty in *Green Mars* Maya expresses a fear that echoes throughout the first two novels: "They would never be free of Earth, never. They were helpless before it" (528). The pull of Earth's difficulties often appears to be too great for Martian society to achieve escape velocity.

Even after the metanationals are defeated, Mars suffers for the sins of Earth as immigration threatens the new syncretic society on Mars. Jackie, the daughter of John Boone, leaves for another solar system entirely as an escape from both personal problems after her daughter's unexpected death in a flying accident and the problems on Mars itself, saying "people are beginning to wonder if we don't have to get that distance from Earth to get a fresh start" (*BM* 634). Partly this is because of the mass immigration of Terrans who form isolationist communities with values that appear grossly conservative to the Martian natives. This is particularly noticeable in gender politics, as Mars is a vastly more equal society than any Terran society presented in the novels, and this leads to conflict with patriarchal groups of Terrans who colonise Mars extra-legally. However, it is clear by the end of the trilogy that Robinson argues that Jackie's escape is unnecessary – what is important is not being free of Earth but freeing it from the baggage of its own history. Indeed, the anti-immigration Martian government is overturned in a velvet Third Revolution as the remaining members of the First Hundred including Sax and Ann, now reconciled and speaking for each other's earlier viewpoints in moderation, declare that it is both impossible and irresponsible to abandon Earth to its fate, that, as Ann says, the Martian government has "broken both the law and the spirit of human compassion" (*BM* 745) in banning Terran immigration. This raises the question of what is then to be done – "Clearly there was a population problem on Earth, but Mars alone was not the solution" (745). Rather, the Martian gains for society and culture need to be applied on Earth suggesting that Earth requires a Terran system analogous to Hiroko's Areophany.²³

²² Again, it is the space elevator that becomes emblematic of this question, with radical reds attempting to destroy it clashing with radical greens who advocate a strong relationship with Earth; the elevator itself, stretching seemingly impossibly into the upper atmosphere acts as a visible symbol of Martian connection with the rest of the expanding solar system, which by the end of the series has human colonies that focalisers visit on Mercury and the moons of Saturn, as well as others we hear about in hollowed-out asteroids, on the moons of Jupiter and with terraforming planned for Venus and moons of Neptune and Uranus.

²³ William Burling's analysis of the theoretical similarities between the way in which this is achieved and the

The Areophany

The Sax-Ann debate, and the continuum it outlines, reflects the predominantly intellectual engagement with the question of human habitation of Mars. However, as is clear with Michel, there is a psychological response to the planet as a home as well. As environmental psychologists Susan Clayton and Susan Opatow put it, the kinds of “emotional connections to particular environmental aspects of places people have lived [...] serve to shape people’s self definitions” (9). The Areophany central to Hiroko and her group appears to blend the intellectual, psychological and spiritual responses to Mars into a dynamic force that drives the areoformation of the individual and society, and what allows the novels to end positively. However, this dynamic, almost paradoxical quality makes it hard to define.

At its most basic, the areophany is “Spirit of place, love of place” (*BM* 639), as per the transformations of Nadia, Sax, Ann, and notably Michel discussed above. The name is a portmanteau of the prefix rooted in Ares, or Mars, and epiphany. This quality of the areophany is evident in the leitmotif of Boone’s first words on Mars: “Well, here we are” (*RM* 385). Ann, Maya, and Michel all use it as a touchstone; Boone’s simple phrasing carries a weight of open-ended acknowledgement of Mars as a destination but also as a starting point for future action, and simply a place where one is. It also acknowledges the “permanent biological commitment” (*GM* 590) that Martians make to their new home. Embedded in this are the set of biological changes resulting from life on Mars, and the peculiarities of biological response to Mars, especially to the longer day. Throughout the novels, the timeslip, a period of almost 40 minutes at midnight where clocks are stopped to keep pace with Earth time, is central to activity, with both positive and negative consequences. The carnival- turned-riot and assassination of John Boone in the flash-forward first section of *Red Mars* happen in the timeslip, as do the beginnings of both revolutions, and numerous raids against metanational forces. This is far from accidental; the First Hundred note the liberating quality of this period of clockless time as a result of the body shifting to an entirely new circadian rhythm, one it has never before experienced.

However, there is much more to the areophany than responding to the planet as a space; it is also a response both to the landscape as intrinsically valuable, and to life as a biological imperative which is equally valuable. The value here is not only about the scientific argument of Ann for maintaining Mars in pristine condition, or the human-centric

theories Laclau and Mouffe in *Hegemony and Socialist Society: Towards Radical Democratic Politics* is beyond the scope of this paper, but provides a useful point of research into the technicalities of Martian democratic politics.

argument of Sax for terraforming. Rather, it is a spiritual response to these arguments:

It was a kind of landscape religion, a consciousness of Mars as a physical space suffused with kami, which was the spiritual energy or power that rested in the land itself. Kami was manifested most obviously in certain extraordinary objects in the landscape – stone pillars, isolated ejecta, sheer cliffs, oddly smoothed crater interiors, the broad circular peaks of the great volcanoes. These intensified expressions of Mars’s kami had a Terran analogue within the colonists themselves, the power that Hiroko called *viriditas*, the greening fructiparous power within, which knows that the wild world itself is holy. (*RM* 229)

Here we see the syncretism that is central to Martian culture, the blending of what works to produce something new advocated by Boone before his death. The concept of kami comes from the Shinto belief in animating spirits in nature that exist *in* and for not only what ‘Westerners’ have defined as living but also inanimate matter. Here is a source beyond intellectual curiosity for a value for the Mars Ann loves, and the Red position shifts over the course of the trilogy to reflect this, arguing at the environmental courts for the preservation of certain distinctly Martian land formations as “kami sites” (*BM* 318) for protection from terraforming²⁴.

However, the areophany also values *Viriditas*, another spiritual value at the heart of a spiritual Green position. It is rooted in medieval esoteric Christian philosophy that sees a manifestation of the divine in living material and the pattern of life; here Hiroko updates it in a lesson to the children by blending it with Darwinian evolution:

Look at the pattern this seashell makes. [...] That’s the shape of the universe itself. There’s a constant pressure, pushing toward pattern. A tendency in matter to evolve into ever more complex forms. It’s a kind of pattern gravity, a holy greening power we call *viriditas*. (*GM* 9)

This is also evident in the name Hiroko gives her hidden sanctuary beneath the Martian South Pole: *Zygote*. Life on Mars is a holy embryonic stage in the areophanic vision of the solar system. Even the arch-Machiavellian Frank Chalmers intuits this position:

How to say that they alone in all that rocky world were alive, their faces glowing like paper lanterns in the light? How to say that even if living creatures were no more than carriers for ruthless genes, this was somehow still better than the blank mineral nothingness of everything else. (*RM* 6)

Viriditas is therefore the placing of emphasis on life and its continual development, shown in the self-editing and evolution driven by space colonisation – where people clip useful or interesting genes to alter their physiology. This engages, both in the privileging of Life and

²⁴ This also speaks to another source for protecting the natural world as intrinsic in and of itself, as opposed to the current paradigm of value determined only through monetary value.

the engagement with life beyond the species *Homo Sapiens*, with what Rosi Braidotti terms “zoe” (65), “the vital and self-organising powers of Life” (115), a posthuman revaluation of the value of life beyond simply our species. The novels emphasise the role of life and viriditas by assuming an empty perceivable universe devoid of all life except for that developed on Earth. However, this raises the question; how to balance the holy greening power with the respect for the Kami on Mars.

The answer, unsurprisingly, is dynamic balance, suggested in the shift in values shown by Sax and Ann under the influence of the growing acceptance of the areophany across Martian society. Much like the opposed relationship of the sandworms and water in *Dune*, these contrary drives in the areophany encourage an ecological awareness in selectively and gently altering one’s environment, the process called ecopoesis. Ecopoesis, a process we see in some detail as Nirgal attempts to make a life as a subsistence ecopoet, demands a radically different approach to use of the land, one that respects the value of Mars itself in the slow approach to changing the landscape as well as the unexpected and complex nest of systems that make up any ecosystem. He encourages the development of a valley ecosystem, leading and guiding it through succession to more complex systems until it can support larger flora and more types of fauna in a complex food chain. Other characters in the novels suggest that this is a kind of gardening, and argue that “nature” as a concept cannot exist on Mars; for example, a Swiss roadbuilder in *Red Mars* argues that both reds and greens are speaking fallaciously about nature on Mars:

The reds say that the Mars that is already here is nature. But it is not nature, because it is dead. It is only rock. The greens tell this, and say they will bring nature to Mars with their terraforming. But that is not nature either, that is only culture. A garden, you know. An artwork. (258)

A similar sentiment is outlined by Tariki, one of the university professors in Sabishii in the section on Nirgal’s attempt at ecopoesis, “Mars is all a garden. Earth too for that matter. This is what humans have become. So we have to think about gardening” (*BM* 89). Both characters conceive of endeavours on Mars to create an environment as the end result of the view that human beings must be custodians of their planet and environment, stewards rather than overlords. Tariki views the widespread destruction of Terran environments, and the long history of human engineering of the environment, as further proof of this view. However, the utter double ruin of Nirgal’s ecopoetic ‘garden’ shows that viriditas is unruly – it is neither wilderness nor garden. Sax sums it up as being something “not nature, not culture: just Mars” (*BM* 679). He also reflects that in the face of the complexity of biology and viriditas, human beings must relinquish the idea that they have any measure of control – the system is too vast

for complete human direction and it is fallacious for scientists to assume they can fully model and guide biology. The first ruin of Nirgal's garden by an unknown virid, a kind of micro-virus, as well as the rapid decline of the aging population in spite of the longevity treatment, attest to this.

The end result of these questions about biology and viriditas, and the widespread belief in and respect for the kami, the spirits of Mars, is the need for a further position. However, Hiroko's disappearance in the second Martian Revolution aptly leaves the discovery of it up to Sax and Ann together. Alongside a growing romance, the two synthesise a position neither red nor green, what they call "Blue" – a synthesis and something altogether new, echoing again the calls by Arkady to invent new socio-cultural forms on Mars and by Boone to synthesise Terran cultural and social forms into powerful new forces. The Blue position is what leads to the final Martian Revolution in *Blue Mars*, one that embraces Earth and promises to aid it in solving its hyper-Malthusian population crisis, and which respects the inherent value of Mars as a planet as well as the right of life to live.

What remains to be answered, however, is how in practice one balances the demands of viriditas with the respect for kami – it is not enough to idealistically place equal value on both, as Ann makes clear in her labelling initially of Hiroko as "the original Green" (*BM* 4). However, this is somewhat a mis-appellation. Hiroko always has a respect for Mars, and bases her actions on a response to the facts of existence there: "Mars will tell us what it wants and then we'll have to do it" (*RM* 115). Here she is ascribing a kind of intelligence communicated where one is forced to say "Shikata ga nai" (109), a Japanese phrase that becomes a motif for the First Hundred, meaning "there is no choice" (109). The response to Mars, both respect for its inherent value and for the value of life it could sustain after terraforming, is structured by practical concerns. These include the insecurity of the tent towns before the atmosphere is breathable, as is evident in *Red Mars* as they are destroyed from orbit by the metanationals, along with the destruction of Nirgal's attempt at ecopoiesis by a massive dust storm. It is, moreover, a way to navigate and reconcile the pressure of history. One of the Mars settlements is Senzeni Na, Zulu for "What have we done?" (*RM* 240), and this is a question one cannot help but ask as we see the destruction wrought by reckless metanational terraforming, the unstoppable nature of viriditas once life takes hold on Mars even in uninhabitable areas, and the chaos of two revolutions destroying both of Mars's moons and marking the land with the impact of the space elevator's cable. These challenges must be and are accepted by the areophany and the Blue position because it cannot be helped, "shikata ga nai" (109).

A final source of a solution to navigating the polarised Red and Green positions into the nebulous Blue is through debate and division. The novels, especially the latter two, emphasise that Martian society is far from homogeneous. It is deeply locally-oriented, with the constitution favouring self-governance for each settlement under a broad planet-wide council that, it becomes clear, has predominantly symbolic power. There are also many parties and groups divided along various lines, ideologically Red or Green, religious, and age-based. Indeed, the generational differences are one of the most marked, with the inclusion of focalisation by a fourth-generation Martian in the final novel to recast familiar characters into new light as they are perceived by the new generation. All of this serves to highlight the importance of debate and division which spreads from the very first moments on the Ares, as Arkady, Frank, John, Sax, Ann and Phyllis all clearly have contrary ideas about the way life on Mars should be structured. John recalls the feeling of seeing Mars below them:

[Mars looked] like a great orange cell, or embryo, or egg. [...] A new creature waiting to be born, genetically engineered for sure; and they were the engineers, still working on what kind of creature it would be. They were all trying to clip the genes they wanted (their own) onto plasmids and insert them into the planet's DNA spirals, to get the expressions they wanted from the new chimerical beast. [...] They would see who managed to create more of the genome in the end. (*RM* 344-345)

This is Robinson's reworking and democratisation of the vision in the *Dune Chronicles* of the Golden Path as something engineered by one visionary. Instead, human relationships with one another, and their environment, come out of everyday interactions and conscious decisions to engineer the structures of society. Part of this process is what Nirgal imagines as a gravitational pull towards the future in opposition to the gravity of history discussed above: "The past has its power, but the future is where we're all going. There's a kind of inexorable power in it, like a vacuum pull forward" (*BM* 624). As a result of this statement, Maya reflects later on her arrival on Mars and realises that what elated her in that moment was "the unconscious mind filled not with the detritus of a dead past but with the unforeseeable possibilities of the live future" (*BM* 630). Viriditas is evident in this final pair of words: the future's weight comes from its living potentiality, and it is through this that Robinson explores the nature of imagination, art, and the future.

***Werteswandel* and Science Fiction**

The Areophany, therefore, takes the debate that Sax and Ann spearhead and uses it to

reinvent the relationship between the Martian settlers and their environment in a dynamic balance of respect for the spirit of precolonial Mars with the right of life to live, and therefore emphasises the radical potential of the Martian colonies to slough off the baggage of Terran culture. A result of these features is that the *Mars Trilogy* is deeply concerned with how social and cultural values evolve as a result of their environment, and equally how a society's values alter the environment. This leads to a defining of an ecology that encompasses individual organisms, their collective activity, and environmental factors in mutually affecting systems:

So life adapts to conditions. And at the same time, conditions are changed by life. That is one of the definitions of life: organism and environment change together in reciprocal arrangement, as they are two manifestations of an ecology, two parts of a whole. (*RM* 205)

The alterations that the environment has on people results in an altering of values in broad-reaching patterns. This is what the Swiss in the novels term “*werteswandel*; [...] mutation of values” (*BM* 192), invoking once again the evolution of life as a result of environment as a metaphor for the change in social systems²⁵. Robinson traces how these changes occur – what conditions within a society and its environment occasion change, and how the change in values causes a change in social systems and thereby the environment. In order to understand this, it is key to trace how Robinson's own novels attempt to encourage *werteswandel* in a way that Hume would argue fits with the literature of revision, which is a didactic employment of the fantastic to re-engage with our current material situation. The starting point for this is an examination of the metatextual moments in the trilogy.

During the debates between Sax and Ann in *Red Mars*, Sax argues that “What we will learn from [terraforming Mars] will be useful in controlling Earth's climate, in avoiding global warming or a future ice age” (171-172). Within the novels themselves this is confirmed: Martian techniques and Martians themselves assist Earth during its climactic chaos following the collapse of the Antarctic ice sheet. However, the comment is not just true for what Earth learns from his experiments, but from fictional thought-experiments about the future in general. It is worth examining potential solutions to terraforming Mars now, Robinson may be arguing, because what we can learn from these thought-experiments, which share much with scientific future modelling, is useful to reflect on our current situation. This thought is echoed again by two minor characters. Kenji, a Japanese researcher at the university in Sabishii says “We are trying to find a new way, a way which rediscovers the old

²⁵ Indeed, one of the sections detailing new forms of Martian society, including neo-hunter-gatherer communities, is called “*Werteswandel*”. This indicates the term's importance, as other key terms and phrases discussed above, including “*Viriditas*” and “*Shikata Ga Nai*” share the same treatment.

one, or reinvents it, for this new place.” Someone interjects: “Kasei Nippon [Martian Japan]” to which Kenji replies “Yes, but not just for Mars! For Japan also. As a model for them, you see? An example of what they can become” (*GM* 353). Similarly, Maya argues at the Dorsa Brevia debates before drawing up their agreement for moving forwards to a constitution that Mars and Earth must share a relationship because of what Mars can teach Earth: “We exist for Earth as a model or experiment. A thought experiment for humanity to learn from” (*GM* 376). Again it is clear here that it is not only the fictional Terrans that can learn from the fictional Martians; rather, the fictional Martian situation is a thought experiment for readers to engage with and learn from. Burling argues that, using the *Mars Trilogy* as a point of examining democracy theoretically, the future presented provides “interlocking axes of radical political modelling which *concretely* strive to demonstrate how the ‘articulation of democratic antagonisms’ could work in real historical circumstances” (93). Each interconnected element in the Martian system is held up as an alternative that could be achieved in the real world as a result of *werteswandel*, and this is what places Robinson’s work within the sphere of literature of revision and casts each part of the trilogy as a kind of revising didacticism.

Included in this is the emphasis on decentring Western modes of thought in favour of a more syncretic or diverse system. Partly, this is achieved through selective exoticism: the Other is made initially appealing through the focaliser as an alternative to the problems in ‘Western’ thinking. This includes the quite exotically presented Sufis, who chant and dance in the desert in a kind of mystic ritual, and in the use of Japanese animistic belief. However, it becomes clear by the end of the novel that Robinson does not intend to present these as fixed forms of otherness, but rather as some expressions of the deeper idea of Blueness on Mars, with corollaries and linked processes in ‘Western’ belief, like Viriditas, and in intellectual understandings of the world. This is most clear in the ends to which this kind of potential exoticizing are used²⁶, the undermining of ‘Western’ capitalist assumptions about the way we value resources and the environment, and therefore how we relate to it. As Darko Suvin argues, the “bourgeois categories of institutionalizing, fragmenting and alienating cognition... begin to break down” (253). The novel’s progress through this towards what Suvin terms “a post-industrial Kingdom of Heaven” or “utopian something” (252), reveals a vision of an ideal world that has “[acquired] a dynamic vector” (252). Suvin’s label of the

²⁶ This is also supported by the shifting inwards of characters like Zeyk who is initially Othered by Frank in his section, but by the end has been shown to be a complex character. The Other, here the Arab, is not presented as per Orientalism as an unchanging foil to the dynamic ‘West’, but rather is equally undergoing *werteswandel* in a process where each group borrows from others to develop new Martian forms of society.

text as a “parable” (250), a didactic lesson in the nature of utopia, is clearly in line with reading the *Mars Trilogy* as Hume’s literature of revision that focuses on “the morality of everyday life” (102).

Another key metatextual aspect of the novels is their engagement with art and *werteswandel*. Early on in the settlement of Mars, Boone watches a video of a performance of *Hamlet* at the bottom of a deep crevasse. This foreshadows the use of drama by Maya as a tool for connecting with the Martian populace. What is interesting here is that, after Frank’s death, Maya is the most politically active of the First Hundred. She is a major part of the debates at Dorsa Brevia, and the mission to Earth. She is active in party politics after the development of Mars’s government, and is the instigator of the peaceful Third Martian Revolution. Art, therefore, is clearly a political tool that Maya recognises as having its uses where conventional political agendas cannot function: “This was a way of getting at people *and changing their values*, less wearing than the direct approach of politics, more entertaining, and perhaps in some ways even more effective” (*BM* 612 emphasis added). Robinson seems here to be underscoring how valuable art is as a driving condition in the process of evolving values. William Fort, the owner of a pseudo-metnational Praxis, which is presented as an alternative to neo-colonial, destructive, and short-sighted metnational capitalism, underscores the challenge to *werteswandel* thus: “You can’t make people do things [...]. It’s a matter of changing ourselves” (*GM* 83).

Therefore, art, and in this case art that acts as a model for the future, is a way of encouraging the change in values that is required in a broad base for social change to develop. This is a similar impulse to what Westra argues for when she says:

For both the legitimate economy and the shadow economy it is necessary to understand the essential nature of ecological and climate functions and related global threats. It is equally necessary for all of us to understand the natural functions of natural systems and the effects of the products we buy on these systems. (57)

The need for communication and illustration of these ecological systems and functions necessitates not only clear scientific communication, but also, Robinson seems to suggest, an artistic communication that blends aesthetics with activism, or at the least didacticism. As a result, it is clear that the trilogy’s engagement with the issues discussed above is not intended to be read as merely entertainment, but as a didactic example of a potential future, with, as Nirgal says, “a vacuum pull forward”. Another part of this is an acknowledgement of the difficulty in showing this vacuum pull forward. Boone is Robinson’s mouthpiece for this: “How can I say [what new Martian modes of thought might be]? If they’ve never existed it’s

hard to talk about them, because we don't have the images" (*RM* 349). Here, Robinson is making a case for imaginative, fantastic fiction which can attempt to provide new images to aid in new conceptualizations while still showing that any act of future vision and imaginative grasping for images of the future is limited by the context of its creation, while drawing its strength equally from this connection to the context of its creation. The attempt forces the writer, and the reader, to echo Boone's statement "well, here we are" as well as allowing both to draw from this statement an idea of where we are going.

Immediate Futures: Kim Stanley Robinson's *Science in the Capital*

If Kim Stanley Robinson's *Mars Trilogy* is an exploration of our potential future engagement with the environment on other planets in order to better understand our own, then his *Science in the Capital* trilogy is the grounding of those answers in an immediate future speculative scenario. The world presented in the novels is almost indistinguishable from contemporary American society. The United States and China vie for the ignominious title of world's largest total polluter, as they do today (Doyle, 2015). Technologically, too, the novels seem contemporaneous, although intelligent cellphones, like Apple's Siri, had yet to be rolled out when the novels were first published. These novels seek to engage with the resilience of contemporary world society, especially American society, in the face of climate change. They also question the role of science in driving politics in times of actual and potential environmental crisis, and indeed the paradigm of science and the philosophy of science as it stands in the 'West'. Through an examination of these features, this chapter will address the way in which Robinson seeks to bind politics, economics, and science in order to form a more resilient combination in the face of global climate change. Through this, the use of speculative scenarios as a form of didacticism will be explored.

From the opening of the first novel, *Forty Signs of Rain* (henceforth *FSR*), the concern with science, specifically environmental and climate science, and the immediacy of the setting are combined. Many of the italicised section openings mimic this first one's popular science tone:

A good portion of Earth's albedo, or reflectivity, is created by its polar ice caps. If polar ice and snow were to shrink significantly, more solar energy would stay on Earth. Sunlight would penetrate oceans previously covered by ice, and warm the water. This would add heat and melt more ice, in a positive feedback loop. (1)

What seems a description of the feedback loop caused by the melting of polar ice, speeding warming, becomes a warning of the impending disaster the trilogy will explore: the description of the rapid breakup of arctic ice is followed by "That was last year" (2). Already, it is too late to prevent global warming from deeply affecting the world's climate; this work of future speculation has moved only briefly ahead in time, and begins by looking back to the damage already caused by our economic systems and ways of living, and the political denialism that enabled it to happen. The focus is on both political actors and the everyday actions of a world implicated in consumer culture.

This reflection on current (middle class, 'Western') lifestyle is heightened over the course of the first novel through a seemingly trivial everyday-ness. Indeed, immediately

following the dire feedback effect outlined in the first italicised section, the reader is launched into the morning routine of National Science Foundation (NSF) member Anna Quibler: “Weekdays always begin the same” (3). Without the warning of the opening section, the majority of the first novel contains little warning of the impending climate catastrophe. The trilogy starts with the slow suspense building in *FSR*, which culminates in the repeated climate-related disasters in the later parts of the trilogy: the stalling of the Atlantic Current – a trigger event for extreme and rapid climate change – and the massive flooding of Washington DC as the first novel’s climax, a second flooding of the Tibetan exiles’ island nation Khembalung, and a truly frigid winter in *Fifty Degrees Below* (henceforth *FDB*). The final book, *Sixty Days and Counting* (henceforth *60DC*), explores the fallout of these events and the global response to an energy and pollution crisis in China. In spite of these grand events, the novels resolutely focus not on the powerful, but on those who have ancillary relationships to power. The interest is less on the senator and eventual president of the United States, Phil Chase, and more on the scientists of the National Science Foundation (NSF), Frank Vanderwal and Anna Quibler, and Anna’s husband Charlie who is Phil Chase’s environmental advisor. As a result, the novels become more about science and the human, everyday effects of climate change than about the political grandstanding required to run for office. This allows, as shall be shown, a focus on the social dimension of living through climate change (especially for the most vulnerable), and the nexus of social oppression and environmental exploitation. However, its most important feature is that the tight focus on the everyday lives of Anna and Charlie, who live a relatively conventional American suburban lifestyle, and Frank, who begins a project of neo-paleolithic living closer to nature. By examining the everyday, Robinson highlights the difficulty of navigating what may be called, to borrow Orwell’s phrase, “environmental doublethink”: being aware of the damage consumer culture does to the environment but not reacting in a way to ease this pressure.

Resilience, habits, and new ways of living

The trilogy’s focus on the everyday lives of a wide variety of people allows Robinson to examine the ways in which the environment and human systems are tied to one another, and to question the resilience of the American system, which is a lifestyle emulated in many countries. Resilience theory is rooted in the idea that “many of the serious, recurring problems in natural resource management stem from a lack of recognition that ecosystems and social systems are dynamic and inextricably linked” (Moberg & Simonsen 6). This premise directly challenges conventional separation of the environment (or nature) from

human society, especially economic systems where environmental services and effects are externalised. Instead, resilience theory explores the complex interplay of ecological and social systems, with a focus on the amount of stress either can handle before shifting into a new state, which is “something radically new, with characteristics that are profoundly different from those of the original” (Davoudi 302). What is important here is that the term resilience does not imply the system’s ability to bounce back and return to normal, but rather its ability to adjust to stress before shifting to a new state. This focus on tipping points is also seen in the novels, especially with regard to the stalling of the Gulf Stream, an environmental tipping point that threatens North America and Europe’s climate, and a probable cause of the harsh winter in *FDB*. The question both Robinson and resilience theorists ask is whether our current city planning, political institutions, economic systems and everyday lives are sufficiently resilient in the face of the stress we are placing on vital ecological systems. Resilience thinking focuses on the complex network of factors in any system, marking off thresholds for trigger events, such as parts per million of atmospheric carbon dioxide or albedo loss for rapid global warming.

However, it is through the focus on the everyday lives and habits of the characters that Robinson approaches this question. As discussed, the novels stay predominantly in the realms of science labs, the offices of the NSF, and the home lives of the major characters. Charlie and Anna live a relatively average American suburban lifestyle, which is forced out of its stable state by a combination of environmental factors and their economic and infrastructural effects. This change is not easy, and it is paralleled by the worrying change that Charlie faces with his youngest son, Joe. As a stay-at-home father, Charlie is deeply concerned by his son’s changes in temperament, even requesting that the Buddhist Khemablis they have befriended perform two separate ceremonies on Joe to restore him to his prior state of being. This is coupled with his return to the workplace after his boss is elected as the president. Charlie reflects on these changes:

Charlie hated it. He liked being; he hated becoming. This was, he thought, an indicator of how happy he had been with the way things were. [...] Charlie wanted to live on in this life forever. Or if not forever, then as long as the stars. And he feared change as the probable degradation of a situation that could not be bettered. (*60DC* 45-46)

It is not only Charlie who fears change: his comfortable suburban lifestyle is one held by many who do not wish for it to end. However, as power cuts become frequent during the

extreme winter and as a result of flood damage, as hoarding of foodstuffs depletes local supermarkets and groceries, and as the general cost of living (especially when carbon emissions are no longer externalised) increases, the Quiblers, and by extension many suburban Americans, have to change their lifestyles to something more resilient.

As a result the novels do not solely focus on this lifestyle, but engage with a multiplicity of alternative ways of living. The primary focaliser for this journey is Frank Vanderwal, who himself undergoes a radical shift into unconventional living after unexpectedly staying in Washington. Instead of finding an overpriced apartment, Frank chooses to live in a modular home made up of a treehouse in Rock Creek Park, a van, and the showers in the gym. With a hint of self-irony, he asks of “Living in a modular home distributed around the city: ‘How perfectly rational and sane?’” (*FDB* 62) and indeed it seems a radical step at first. However, Frank soon realises that there are many who live alternative lifestyles, from the homeless “bros” that also live in the park, to the fregans who live solely off what they scavenge from restaurant dumpsters and share in abandoned buildings. Indeed, even after living among these people for a while, Frank struggles to conceptualise the fact that many do not follow the dominant consumer culture ideal lifestyle, as he reflects on not knowing where the head of the NSF, Diane Chang, lives:

But then again, she [Diane] certainly had a home somewhere. Everyone did, except for him. And the bros in the park. And the fregans and ferals proliferating in the metropolis. Indeed, some twenty or thirty million people in America, he had read. But one thought of everyone having a home. (29)

Through Frank’s attempt at changing his lifestyle, the reader is forced to re-engage with common assumptions about the ideal, or as Frank calls it, the “optimodal” lifestyle. A lens through which Frank does this is sociobiology, an attempt at “systematic study of the biological basis of all social behaviour” (Wilson qtd. in Driscoll 1). Although the field has been contested for various problematic assumptions, one of the areas of use for Frank’s purposes is the understanding of humans as animals, driven by environmental factors to develop in various evolutionary ways to the current genetic form of *Homo Sapiens*. Frank is the editor of a journal of sociobiology, which he later reflects is an area that interests him precisely because he finds human social interactions opaque. Throughout the sections focalised by Frank, we see him using his sociobiological lens in an attempt to understand why he behaves the way he does. From drawing on the openness of the savannah as a reason for optimal work spaces having big windows to the aggression of a truck driver being about contesting male dominance, Frank rationalises his world by seeking evolutionary causes for the behaviour he observes. It is interesting to note that over time, Frank becomes aware that

he has proceeded from flawed premises, reflecting criticisms of sociobiology which argue that its hypotheses are untestable, and as Frank sees the wide variety of human interaction he begins to strip away his assumptions. After an encounter with the brilliant scientist Francesca Taolini, he becomes aware of his biases about women's bodies and clothing choices, springing from a change in evaluating the use of toenail polish to the broad thought: "He would have to rethink some of his opinions" (135). This leads him to a blistering critique of the usefulness of the discipline: he sees human interactions as the behaviour of "apes, with desires shaped by life on the savannah" but that this awareness of humans as evolved animals "was not actually very *helpful* to him" (140).

However, one of the areas of probable benefit to Frank is his re-evaluation of lifestyle to mirror more closely the evolutionary context of Homo Sapiens. Frank calls our awareness to the climatic context of human evolution: "[Our] bodies, brains, minds and societies had grown to their current state [...] while the climate was shifting" (13), and as a result an attention to the ways of life of the past could inform a more sustainable present and future. He terms this his repaleolithisation project, which seeks through a combination of closer to nature living, exercise that resembles savannah hunting, and closer personal interaction to reconnect the human animal with its environment. As a result, Frank begins to consider the city not as an urban space but as a habitat:

The city too was a habitat, and as such was a riot of sensation. He would have to think about how that fit in with the repaleolithization project, because the city was a big part of contemporary society, and people were obviously addicted to it. (42)

Just as Frank's observation of the various feral zoo animals let loose in Rock Creek Park shows the way in which habitats can be adapted to, it becomes clear that the urban environment is both a result of human activity and something to which humans adapt. An example of this dual process is the often anti-optimal use of "buildings as clothing, in effect" as we "[heat] and [cool] these spaces to imitate what clothing did, no matter how crazy this was in energy terms" (231). This becomes especially apparent in the cold winter, where Frank spends his time encouraging the homeless bros to change their clothes for gear better suited to the icy temperatures.

The result of this scrutiny of human urban habitats, and Frank's close living with people leading various alternative lifestyles – from going to potlucks with the fregans to living in the communal space of the Khembali refugees, to nights around the fire with the bros – Frank and the reader can question the assumed ideal way of life, and this provides a framework for restructuring the urban habitat in the face of climate change.

Always Generous: the prisoner's dilemma and environmental insecurity

Another area of Frank's interest, coming out of evolutionary and biological examination of social interactions, is cooperation and game theory. Sociobiology has an interest in understanding why cooperation develops in situations where exploitation of others seems to bring the maximum individual benefit. Frank reflects throughout the novels on the games set up to examine how cooperation may develop, and how being cooperative is better not just for the individual but for the group as a whole. The experiments Frank describes emerge from game theory, namely the Prisoner's Dilemma and the Snowdrift Game. These games both place individuals in a situation where co-operation yields mutual benefit at some cost, while defecting, that is acting selfishly, can yield great benefit so long as the other player also does not defect. Through this simplified modelling of cooperation and exploitation, it is possible for sociobiologists like Frank to speculate about why humans cooperate in situations where it is often not personally advantageous to do so.

However, this is done incrementally, as Frank grows towards a more nuanced understanding of the unmechanistic way the people around him behave. At first, he is captivated by the playing out of a pure Prisoner's Dilemma in traffic. In the classic game, two prisoners are questioned on the location of their buried treasure. If one defects and is let go and the other co-operates (keeps the secret from their captors and faces jail time as a result), the defector achieves maximum gain. The study shows that those who always defect profit most. Similarly, those who break the rules of the road, pushing their way into crowded lanes of traffic and exploiting the generosity of others, benefit more and leave the other player as a "sap" (111). However, as the events of the novels progress, Frank reflects on other permutations of the game that may model human interaction better, such as the iterative prisoner's dilemma, where the same players repeat interactions and therefore can adjust their behaviour based on previous games. Another major permutation that Frank thinks about is the game called Snowdrift, which sets the players as motorists blocked by a snow drift. Here, there is still a major benefit to defecting, staying in the warmth of the car while others clear the road, but cooperation appears more likely because sharing the costs of working speeds up the process and benefits everyone, even if some actors defect. This is made clearer in the Iterative Snow Drift (ISD) where players are matched up against each other repeatedly, allowing players to learn each other's habits and behaviour. Game theorists Kummerli *et al* discuss how this iterative version of the Snowdrift is useful in modelling human cooperation:

[The] ISD can potentially explain high levels of cooperation among non-

relatives in humans. Moreover, the ISD might even reflect the social dilemma more realistically because it corresponds to frequently observed natural situations where cooperators contribute to a public good that is exploitable by cheaters but also provides immediate direct benefit to the cooperator. (2969-2970)

Frank reflects on the strategies that Kummerli *et al*, and other game theorists like Doebli and Hauert discuss: “tit-for-tat”, where we treat players the way we have been treated, always generous, where we never defect regardless of exploitation; and “firm but fair”, where we will forgive a few exploitations but over time begin to defect only against defectors.

While Frank’s engagement with this, much like his engagement with sociobiology, focuses on his immediate context and tends to reflect his own preferences and personal philosophy, the novels ask questions about the nature of co-operation in periods of environmental stress. Frank himself reflects, during the great cooperative effort of relieving those trapped by the flood in *FSR*, that “it takes something like this to free people to be always-generous” (337). However, Doebli and Hauert note that an ‘always generous’ impulse can lead to a “tragedy of the commune” (760), a situation where a similar decline to the tragedy of the commons occurs, despite the always generous impulse immediately benefitting the individual and society in general. Furthermore, barely a few pages prior to this thought Frank angrily observes looters that represent the defectors in the iterative snow drift implied by this natural disaster²⁷. Cooperation is not a simple process in the novels, but Frank feels that since always- generous can “create a spiral upwards maximising profits for both players” (Robinson *FDB* 281) it should be the best practice to follow. The question this raises is whether the always- defect mentality of a society – or perhaps even a species – focused on immediate gain can be engineered towards adaptive cooperation²⁸: “Human cognition had all kinds of blind spots. [...] We act, in short by projecting our desires” (97). Frank considers this in response to the neural damage he has received due to a blow to the nose which has impaired his personal cognition.

Clearly [cognition driven by desires] could lead to error. The question was, could one’s desires be defined in such a way as to suggest actions that were truly going to help make them come to pass in one of those futures still truly

²⁷ It is interesting, but not within the broad scope of this chapter, to note the novels’ engagement with human and animal relationships. There are numerous examples, such as the use of animals in testing. When Frank is found in the midst of winter in a heated shelter for feral animals in Rock Creek park, the animals – despite being a mix of predators and prey – are peacefully coexisting and only show fear of Frank. This occurs at the opening of the section titled “Always Generous”, and that certainly seems to be the intra-animal cooperative strategy for winter. However, Frank and humans are treated in a tit-for-tat manner; Rudra suggests this when he hears Frank’s story, saying “the animals don’t love us any more” (519).

²⁸ Furthermore, other characters like Anna dismiss the usefulness of game theory in modelling the real world. Even more notably, Frank’s Buddhist friend Rudra Cakrin is amused by the idea that a game with “winners” represents anything like real life.

possible, given the conditions of the present [...]. And could these cognitive errors exist for society as a whole. (97)

Here Frank begins to tap into what the novels seem to suggest as a role of science in political and social systems: a route to explore the cognitive errors in society, and much like how his doctors relieve Frank's own cognitive blockage, to assist in making a more fair, cooperative, and environmentally friendly world. As Adeline Johns-Putra puts it in her persuasive examination of the series as near future utopian science fiction, for Robinson "goodness exists not as panoply, in a simple utopian sense, nor as possibility, in a critical utopian sense, but as a work in progress" (751) that emerges in these novels as they place "the spotlight [...] on the ideological work of those who positively terraform it out of the negative terraforming it has undergone over the twentieth century" (757).

Science as fiction

Before the vision of a politically powerful science presented by the novel can be discussed, it is important to understand the philosophy of science that dominates in the world presented by the novels, and how this is insufficient. This involves analysing both the paradigms of science and its discourse about itself, its engagement in policy and political debates, and the uncomfortable relationship of science with capitalism and vested economic interests that obstruct environmentally friendly development. This discussion therefore has its roots in the philosophical and historical underpinnings of science.

However, tracing the definition of science is a difficult task. Philosopher of science Geoffrey Gorham traces the historical development of science from classical thinkers like Aristotle to the rise of science that is close to the modern definition during the Enlightenment. Through this, and an exploration of theories about what constitutes scientific theory, Gorham lists a set of principles that suggest scientific qualities but argues against a strict monolithic definition:

Although we will expect a science to involve empirically testable, mathematically precise, logically coherent explanations of natural systems, different sciences will exemplify these virtues in varying degrees. (40)

Gorham's synthesis of various theories and philosophies of science highlights the contested nature of the scientific enterprise. Questions of epistemology, the social construction of science, even the appropriate methods and aims of science, abound with little agreement.

Gorham argues, based on questioning science's position as a perfectly factual enterprise free of social construction, that in fact science is rooted in its context, but that this produces an interesting paradox. He mentions that "science is both a social construction *and*

our truest, most objective picture of the world” (114). Part of what produces this paradox is the fact that science occurs under material and social constraints, and proceeds – as the novels show – in a social environment of research collaboration and peer review. However, both Gorham and Robinson are concerned with the discourse of science operating at a remove from society. It is most intriguing that both draw on the work of Thomas Kuhn to examine the nature of science as it stands, and for Robinson to suggest how it must change in the face of global warming. Before Kuhn’s ideas of normal science can be discussed, however, it is worth examining the state of science portrayed in the opening two novels of the trilogy.

The Capital in Science

The series title suggests the novels’ engagement with science in policy making. However, much of the first book deals with another meaning of the word capital. Many of the scientists featured in the novel are concerned with the capital interests in science. Indeed, the novels lay much blame for both environmental catastrophe and the obstruction of scientific progress on capitalism. The constraints of profitability, trade secrets, and vested interests in preventing scientific inquiry are all highlighted by the novels.

While the community of scientists represented by the National Science Foundation (NSF) in the novel work on an “extensive economy of social credit” (*FSR* 19), it is readily clear to Frank and his friends at the biotech startup Torrey Pines that this exists only between scientists. The whole subplot of Torrey Pines revolves around the speculation that happens when venture capitalists gamble on biotechnology, often with little understanding themselves of the science they are funding. A result of this is that the head of Torrey Pines, much to his head researcher Leo Mulhouse’s chagrin, makes inflated claims and promises to the media in the hopes of luring potential investment with little regard to the actual lab results Leo and his team are finding. Furthermore, in such a lucrative industry, there are obstructions in the forms of patents and trade secrets that prevent the open sharing of research, and this galls the scientists involved, arguing that the “secret scientific method” (33) needed to protect patents undermines the transparency of scientific knowledge.

Not only is capitalism’s interest in science harmful to the scientific method, but it obstructs the results of scientific inquiry from reaching those in power and affecting change. The global carbon economy, driven by capitalist expansion, is sluggish to move on issues of global warming because that may affect profit margins. Edgardo in *FDB* says “When you exteriorize costs onto future generations you can make any damn thing profitable, but it isn’t really true. [...] Economics is incorrigible. They call it the dismal science but actually it’s the

happy religion” (114). Edgardo’s scepticism of religion is made apparent in many instances in the novels, as he adopts a purely positivist scientific view of the universe; in this statement he is therefore criticising economics as both unscientific and ill-suited to approaching the real world. The novel seems to bear this out, with respect to the lack of progress made by economics in the face of the mobilising scientific community. In *FSR* Charlie, working on a statement for then-senator Phil Chase, likens the big bureaucracies in the pocket of big business, and the capitalist economy as a whole, to his son’s toy dinosaurs. Against their combined slowness, the NSF is a small mammal-like creature from Joe’s playset. The incumbent president of *FSR* is shown to have vested interests in the oil economy, and his advisors keep him in the dark about scientific certainty about climate change, a reflection of real world frustrations with politicians arguing for a lack of scientific certainty about climate change. As Dunlap and McCright (144) argue:

The motivations of the various cogs of the denial machine vary considerably, from economic (obvious in the case of the fossil fuels industry) to personal (reflected in the celebrity status enjoyed by a few individuals), but the glue that holds most of them together is shared opposition to governmental regulatory efforts to ameliorate climate change.

This points to the necessity of the development of the scientific community in the novels from merely researching problems to taking an active role in politics: the movement of science to the capital.

Science in the Capital

In some ways, the novels act as a bildungsroman for science, alluding to its being cast out by the Nixon administration and now, under Phil Chase, maturing into a new, powerful force for positive change in the world, working alongside other forms of government both in terms of projects and in literal spatial proximity. The first two novels show the NSF scientists and Charlie working in a situation hostile to their work, but this is not the fault of the common person. Even though in the novels’ world the majority of citizens want climate action the problem lies, according to Diane who later goes on to be the science advisor to the president, with the system of government: “it was not a matter of being outnumbered [by climate change deniers] so much as denied, as part of a more general breakdown of democratic systems in the U.S.” (*FSR* 252). However, Phil tells Charlie in the run-up to the election that they cannot throw out democracy, as it is too central to modern ideas of good governance: “Democracy *can’t* lose. It *has* to succeed”. However, it becomes clear that what democracy is understood to be, and how science fits into this image, needs to shift.

The novels raise many different concerns about the ability for democracy to come to terms with global climate change. A primary concern outlined by the arch-scientist Anna Quibbler (whose punning initial and surname suggest “A Quibbler”) is the fact that, while politicians *need* to be well informed, deliberate ignorance makes political manoeuvring more flexible. The following arises from her research into the fraught history of governmental environmental and scientific research agencies:

They [the politicians] didn’t want to know. For Anna there could be no greater intellectual crime. It was incomprehensible to her: *they didn’t want to know*. And yet they did want to call the shots. To Anna this was clearly crazy. Even Joe’s [her infant son’s] logic was stronger. How could such people exist, what could they be thinking? On what basis did they build such an incoherent mix of desires, to want to stay ignorant and to be powerful as well? Were these two parts of the same insanity? (*FSR* 109)

The same line of thought leads Anna to a paper’s conclusion: “No agency works in a vacuum” (*FSR* 109). It is clear from this that political interference with science can stymie its usefulness, while scientific and environmental agencies can be effectively quashed by giving control over to representatives of the industries they are supposed to regulate, or to deliberately ignorant politicians. All of this can be drawn into the issue of “knowledge politics” (414) coined by Reiner Grundmann to describe the deployment of knowledge and scientific authority, or the undermining of it through funding contrarian views, in order to make political decisions. What Grundmann argues is that the same scientific discoveries can be strategically deployed to support very different policy approaches, and that in the United States this has meant increased visibility of politically useful doubt about climate change. His finding is that the United States shows “a politics of knowledge where the power of the IPCC experts and their open environmentalist allies had little influence on US climate policy. Instead, it was the political agenda that drove US climate change policy” (423).

Another concern, which gestures towards the source of the incoherent mix of desire for power and ignorance, is the corrupting nature of power. In *FDB*, while Phil and Charlie discuss the potential for running for president in the upcoming election, Phil worries that the power may corrupt him. They discuss the old adage that “absolute power corrupts absolutely” (98), to which Charlie replies “but you’re already powerful” (98). In response, Phil raises a contrary view: “Power corrupts, absolute power corrupts absolutely, and a little bit of power corrupts a little bit [...] and everyone has a little bit of power” (98-99). Emerging from this is Phil’s frustration with the “Midas touch in reverse, where everything you touch turns to shit” (99). Here, Robinson echoes the repeated plague on the Atreides line in the *Dune Chronicles*: that power’s corrupting influence spreads to those close to powerful people so, as Phil puts it,

“[people] debase themselves. [...] they go corrupt right before my eyes” (99). One of these forms of corruption is the environmental doublethink made visible in the novels: many of the characters, even the Quiblers, are both environmentally conscious *and* contributing to the lifestyle that is damaging the planet. Further, the advisors to the President before Phil, like environmental advisor Strengloft in *FSR*, wholly debase themselves to maintain their small hold of power, openly manipulating him for their own interests. These issues pose a double challenge: those with a lot of power using it for self-serving ends, and the failure of self-interest to produce a positive environmental result. The latter directly challenges the idea of the invisible hand guiding the economy to the betterment of all, as well as the belief that democratic voting as it stands can bring about a government that can rise above this corrupting influence, as even the voters are complicit in it.

A further criticism of the government comes from their evaluation of political decision based on economics rather than ecological security, as the former makes for short-term electability. Laura Westra argues that democracy fails environmentally because Western liberal democratic systems²⁹ are “insufficient to protect us from endangerment caused by reckless practises of individuals and corporate citizens” (59), due to the manner in which these corporate citizens can influence government. Similarly, Frank’s sceptical friend Edgardo says in frustration in *FDB* “They [the politicians] want a silver bullet. Some kind of technical fix that will make all the problems go away without any suffering on Wall Street” (107). While the novel shows many technical solutions to the various climate problems, from the mass scale resalination project in the Arctic Sea, to the engineered lichen made by Torrey Pines to speed up the capture of carbon by trees. However, these are not easy fixes, and while the novel’s lack of focus on the economic fallout from Chase’s policies means we do not see how business reacts, the attempted assassination of President Chase suggests that many with vested interests in the carbon economy are unhappy with his presidency. In a prescient moment, Phil says in his inaugural address, affecting the conversational tone of his idol Franklin Roosevelt, that his policies will be radically focused on the people:

Some of what we do may look a little unconventional at first. It may look more than a little threatening to those few who have been trying, in effect, to buy our government of the people, by the people, for the people, and use it to line their pockets while the world goes smash. (86)

Another broad concern of the novels is the link between human and environmental exploitation. Chase runs on a promise to improve equality in America, and uses his

²⁹ In her work, as in much of the discussion of this essay, American and Western European democracies are the referents for the term “democracy” or “liberal democracy”.

presidency as a platform to encourage other countries to improve their human rights records, on the ecofeminist grounds that countries with better human rights, most importantly women's rights with regard to reproduction, have more sustainable birth rates. These concerns underpin Chase's emphasis that the United States "[join] the global justice project" (86) to improve human rights, and to rectify the damage done by externalising environmental degradation on developing nations. In his inaugural address, Chase links these strong concerns as three pillars of government: "technology, environment, and social justice" (86). Frank's close living with the homeless in Washington underscores this need to rethink social justice for environmental ends, as he thinks about the exclusionary nature of capitalist democracy:

The economy insisted on a minimum of five percent unemployment, to create the proper 'wage pressure.' Millions of people who wanted jobs went unhired and therefore couldn't afford a home, therefore suffered from 'food insecurity,' so that these businesses could keep wages low. These people. (139)

Similarly, the fregans emphasise to Frank how they, too, exist outside of the law overall as the entire legal system is predominantly "property based" (237), meaning that it presupposes a conventional consumer lifestyle based on ownership of property, contrary to the fregans' desire to "live off the excess" (246) of modern life as propertyless foragers in the urban habitat.

Perhaps the greatest strength of Chase's administration is its unconventional approach. With the challenges to established democracy and economics presented in the first two novels, it is no surprise that Chase attempts to mimic his idol and offer a New Deal to the American people, and to the rest of the world. In his speech announcing his candidacy, Phil quotes FDR, saying "the solution is to be found in a program of bold and persistent *experimentation*" (461; emphasis added), in clear contrast to the incumbent President's framing of the environment as a kind of terrorism in order to recapture it into conventional national security discourse. What Chase's quote hints at, and his presidency confirms, is a reintroduction of science into politics. This follows the NSF wading into the political running for much of the campaign phase by entering a scientific shadow candidate into the running, to represent the broad scientific community's wishes from an ideal presidential candidate.

Phil's reimagining of government and its relationship to science is an attempt, arguably, for Robinson to restate a point from the *Mars Trilogy*: that the early 21st Century manifestation of democracy is in fact not true democracy. Phil is correct in saying democracy

has to succeed, but the form it succeeds in must be altered by a shift away from exploitation to a grassroots, deeper democracy that is driven by deployment of scientific principles to guide policy, and a commitment to increased social justice and environmental sustainability. This, K. Daniel Cho argues, is a source for utopian hope emerging from climate disaster, “By postponing Utopia's appearance—perhaps, indefinitely—Robinson is able to focus his energy on the work involved not so much in building Utopia as in ending dystopia” (24)”. What Cho argues here is that the “change without progress” (28) evident in the economic and political system at the start of the series is positively disrupted:

What global warming eliminates is, rather, the immutability of the present. With the ceasing of this vast oceanic metronome, the Earth enters into a period of chaotic time in which every moment is filled with the potential to bring radical, epoch-making, changes to the ecosystem, causing, in an instant, entire species to go extinct and others to ascend to the apex of the pyramid. (29)

The political changes ushered in by the climate disruption are evident in shifts in terminology, as Phil insists on never saying “government” as an empty placeholder. Instead, he insists on emphasising that it is “government of the people, by the people, for the people” (84 *60DC*). This consolidation of discourse reflects the necessary restructuring on a cognitive level before a sustainable society can be created. He further defines the notion of government as a future-oriented enterprise, “making the world we want to give our kids” (52) rather than working towards immediate re-election. Not everyone is easily drawn into a new discursive domain, however, as Charlie discovers in a meeting with the World Bank:

These two groups came from such different worldviews that it was only an illusion they were speaking the same language; for the most part they used different vocabularies, and when by chance they used the same words, they meant different things by them. They were aware at some level of this underlying conflict, but could not address it; and so everyone was tense, with old grievances unsayable and yet fully present. (190)

While the end of the novel is far from conclusive, it does seem as if the dinosaur institutions are dying out or evolving rapidly, while the little mammal-like creature that is the NSF has grown to be a political powerhouse. Despite the final inconclusiveness of the novels, they do serve to direct the reader to a more sustainable future, presenting us with what Hume terms a “positive example” of “an ideal society” so strive towards (104).

Normal Science

It is clear that Robinson suggests that science itself must undergo an evolution to respond to the pressures of climate change. Part of this process, as the above discussion suggests, is that science needs to become more actively involved in the political decision-making process. In

FSR Frank begins to list the flaws with the way the NSF, and by extension western science in general, is limited both by politics and economics. Furthermore, it is also limited by itself. He argues that science keeps itself out of politics as a mirror to the military keeping out of civilian affairs, a hangover from World War Two when “science was part of the military” (292). However, he emphasises that science is transformative and that therefore science “has to insist on itself” (292). The role that science has allowed itself to remain in will not help to solve climate change, as the incumbent President’s cabinet so clearly shows in its denialism and later its inability to frame the problem in a helpful way.

Frank goes on to link this change in the role of science to physicist and philosopher of science Thomas Kuhn’s notions of scientific revolutions, arguing that this is analogous to a kind of scientific revolution. It is worth noting before discussing Kuhn’s theories that Frank is applying the notion of internal scientific revolutions as changes in theory to the behaviour of scientists in general. What Kuhn discusses is the way in which “normal science” proceeds paradigmatically, and what causes the paradigm shifts we associate with scientific revolutions in thinking, like the discovery of electricity or Einstein’s theory of Relativity. Normal science as Kuhn defines it is “the activity in which most scientists inevitably spend almost all their time [...] predicated on the assumption that the scientific community knows what the world is like” (5). These assumptions, which Kuhn shows are not always sound, are firmly rooted in past theories and research that form the “foundation for further practise” (10); that is, they suggest questions that remain to be answered. If the past work helps to explore these questions, it remains the basis for the paradigm of normal science; however, anomalies that science detects that the theory cannot explain begin to challenge this paradigm. By paradigm, Kuhn means something not unlike legal precedent, “an object for further articulation and specification under new or more stringent conditions” (23). If the theory fails to stand up under the weight of increasingly added anomalies, the field undergoes a paradigm shift, an assimilative process, contrary to conventional wisdom assigning responsibility to an individual genius, that “requires the reconstruction of prior theory and the re-evaluation of prior fact, an intrinsically revolutionary process that is seldom completed by a single man and never overnight” (7).

Anna Quibler would agree with Kuhn’s views of normal science: “Meanwhile, in the midst of all this, science proceeded in its usual manner; which is to say, slowly” (453). Anna believes in “evolution not revolution” or the “mass application of the scientific method to get any real world results” (454). However, this is not entirely held up to be true by the novel. The extreme pressure of climate change, especially with the trigger point of the Gulf Stream

stall, galvanises science into a massive act: resalinising the Arctic Ocean to kickstart the Gulf Stream again. Similarly, the scientists at Torrey Pines unilaterally release, with help from the Russian government, an engineered lichen to assist trees in carbon capture. While the latter is condemned by the NSF scientists as an undemocratic risk, it is clear that science itself is undergoing some kind of paradigm shift. It is not one of accepted theory changing to draw in new theories, but rather it is a shift in the paradigm of *how* science is done, forcing it to engage with politics in an active manner. Helped by Phil Chase, Diane, Frank, and the NSF return to the centre of power, and science begins to fulfil Frank's desperate challenge from *FDB*: "[Science has to] become useful. Become a help for God's sake. It was the same in his personal life as it was for the world at large; if science wasn't helping then it was a sterile waste of time" (140). A major part of this process of bringing science back into the political has to do with science articulating itself to power; as well as to the common individuals. This engagement with communicating science is, ultimately, where the novels become self-reflexive.

Disaster Porn and Communicating Science

While the bulk of the *Science in the Capital* trilogy is focused on the nexus of political, economic, and scientific power and knowledge, and the mutual influence of these on the environment and society, the novels are also concerned with the role that language and art has in communicating and framing these issues. Above, discursive contests over the meaning of words and their power to communicate ideas have already been raised. The novels are concerned with how words structure our views of reality. For example, the NSF realises that in current discourse of disasters and the economy there can be no provision to pay to prevent environmental collapse: "It would take a change in thinking [...]. Up until now, people have only wanted to pay for disasters after they've happened, to make sure the payout is really necessary" (18). This concern echoes Laura Westra's emphasis that in terms of global warming, "to wait for the actual (albeit delayed) body count would mean dealing with irreversible environmental catastrophes" (57). This is just one of the many examples in both the real world and the novel where the way in which issues are conceived of and spoken about needs to radically shift. Discourse on the environment is an important topic in the novels, so a key area of interest for Robinson appears again to be the role of language, particularly artistic language, in communicating environmental issues in an ethical manner.

It is already clear that Robinson has engaged with the different ways in which government, the environment and security are conceived of and discussed. Part of the

trajectory of environmental issues in the novel is a move from existing outside the bounds of conventional science and politics to becoming central to the idea of national and international security in its own way, rather than being rebranded as the bizarre “climate terrorism” discourse that the incumbent president in the novels deploys. However, portrayals of disasters make up a large portion of the novels, from flooding to extreme winter and imminent collapse of environmental systems. The novels engage, therefore, both with journalistic representations of disaster, as well as their own representation of natural disasters in a rather reflexive way. This is primarily explored through the NSF climate scientist Kenzo, and the various focalisers’ engagement with him and with the news as it appears in the novel.

We meet Kenzo for the first time as Frank visits the copy room, dubbed “the Department of Unfortunate Statistics” (66) as its walls have been covered with prints of articles with interesting, if morbid, statistics on issues ranging from funding, to climate change rates, to economic inequality. Kenzo, Frank feels, presents his climatological unfortunate statistics “with a faintly proprietorial air” (68), a fitting description for a friend dubbed the “Master of disaster” (335). Throughout the multiple climate-related disasters in the trilogy, Kenzo shows a morbid joy in their arrival as vindication of the anthropogenic climate change thesis. He is not alone in this response, however. With the cold winters and stress on the electrical grid in *SDB* the tabloid news fills with stories about people who have died in the cold. Their sensationalism and crass exploitation of tragedy offend Frank, who wonders “if a time would come when people got enough disaster in their own lives and would no longer feel a need to vampire onto others’ disasters” (168). Similarly, Charlie and Anna in *FSR* discuss how, with the rapid spread of news about climate-related disasters globally, especially the current flooding of Washington DC, “the media meteorologists were already in a lather of anticipation and analysis” (315). Anna says this portrayal is alienating the audience from the actual event: “It’s the melodrama [...] Climate as bad art, as soap opera. Or some kind of unstaged reality TV” (316). These representations of climate change are sometimes called Disaster Porn, the exploitation of disaster for a kind of titillation, or as Harbert puts it, representations of environmental disasters and their victims become “commodities consumed by the public to satisfy their morbid curiosity and provided by the media for private gain” (Harbert 14).

The novels themselves attempt to stand in contrast to this, and they do so in a number of ways. The novels attempt primarily to show the disasters both in their human impacts, in many degrees of severity, and to ensure that the reader is educated on the science that underpins the disasters, in order for the reader to be empowered by the representation rather

than sating morbid curiosity. This is aided by the novels' tight focalisation and by placing the focalisers in the midst of the disasters, rather than observing them from a distance. A key example of this is the centrepiece of *FDB*. The flooding of Khembalung is a powerfully emotive moment as it both recalls the flood from the previous novel and carries a further weight of symbolic resonance. The characters are close friends with many of the Khembalis, and both they and the reader have learnt much about the island nation. Khembalung is an attempt at earthly paradise, overwhelmed physically by the effects of climate change. It is especially traumatic for the youngest Quibler, Joe, who is inconsolable and cannot understand the scope of the tragedy. These moments of overwhelming disaster underscore the fragility of human systems discussed above in a powerfully emotive manner which does not alienate the reader from them.

Another way in which the novels engage with a more ethical approach to representing disaster is to focus on the long-term impacts of climate change on the daily lives of the characters, rather than simply presenting a horrendous disaster for spectacle alone. The everyday routines so central to the first parts of the trilogy become increasingly interrupted, from the power outages that force the Quiblers to sleep in their lounge for its fireplace in winter, to taking in two tigers from the zoo during the flood in *FSR*, their domesticity is impacted upon repeatedly by the climate. And yet another focus of this is Frank and his friends living off the grid. The Bros in the park suffer the most from the climate disasters, and Frank struggles to prepare them, and himself, for the harsh winters. Most key to this is Chessman, a young homeless African-American who goes missing in the winter in *FDB*. Frank's search for him reveals the constricting nature of the social system, as well as the vulnerability of those who fall outside of the conventional economy and its social structures. It is because Frank himself is invested in this group that their plight moves beyond climate porn and becomes a source of reflection on the fairness of a system that leaves the powerless most vulnerable. By doing this, the novels reveal not only the everyday quality of consumer life as discussed previously, but on the everyday challenges of living with climate change.

These everyday challenges culminate in the massive shifts in lifestyle we see for the Quiblers moving to an almost idyllic life with the Khembalis in order to save on the costs of mitigating their personal contributions to climate change. However, the novel's final section has an epigraph from Thoreau: "Our Icarian thoughts returned to ground / and we went to heaven the long way round" (471). This suggests, despite the trilogy's personally happy endings for Frank and the Quiblers, that the battle against pollution, injustice, and climate change is not, miraculously, over. We still may go to heaven, or maybe Shambala, but it must

be the long way round. As the chapter title suggests “You get what you get” (471), and the novels are interested in how we work with the materiality of climate change, especially in the ways in which we aesthetically and emotively come to understand it. The novels are therefore also interested in other literary engagements with the environment, especially American Transcendentalists – Emerson and Thoreau. Frank begins reading both writers, and explores the way in which art alters his perception of his environment. Christopher Maughan emphasises the creative role literature plays in Frank’s development:

Via such literary material Frank fosters not only his nascent anxieties about the limitations of scientific inquiry, but also draws energy and influence from political strategies and philosophies outside of the American political establishment, developing a contrasting and disruptive sub-plot to the dominant narrative of mainstream political action on climate change. (46)

The engagement with Thoreau and Emerson is one way in which this is highlighted as Frank thinks while reading Thoreau’s journal that “the source of conflict between them [was] the question of how to make an impact on the time” (404).

Fundamentally, what Frank, and Robinson himself, seems to conclude from this is that the most ethical form of artistic engagement with climate disaster is to encourage individuals to “make an impact on the time” (404). This is a stronger form of Hume’s literature of revision, stronger even than *The Mars Trilogy*. Johns-Putra’s analysis does to some extent dismiss the far-future representation in *The Mars Trilogy* in favour of the near future *Science in the Capital Trilogy*, arguing its proximity makes for a more “psychologically – and one is compelled to add – politically and ideologically relevant” (15) examination of climate change. This is perhaps, in part, due to the immediacy of the future presented in the novels. Hume suggests that this form of literature is the most didactic form, attempting to present the readers with a clear moral or ethical dimension, which the reader is assumed to share to some degree. However, the reader does not need to share this view if the style or, in the case of speculative or fantastic fiction, its inventiveness may make “its very novelty and strangeness” pleasurable (102)³⁰. Literature of revision can be strongly benefitted by imaginative qualities which may capture even a sceptical reader’s attention, but it always contains an expectation that the reader must, to some degree, answer to its thematic concerns. Indeed, there is an expectation of reader response to the novels’ events, mirrored in the Quiblers’ final re-evaluation of their affluent lifestyle and contemplation of sharing space, and therefore carbon footprint, with the Khembalis. The novels highlight the reader’s ethical

³⁰ A similar notion is emphasised by George Herbert in *The Church Porch* on the use of poetry to reach an audience a traditional sermon cannot: “A verse may find him who a sermon flies / and turn delight into a sacrifice”.

obligation to reflect on their “imagined relationship with this real situation” (309 *FSR*). The challenge for this form of literature is the degree to which these demands can be made before the combination of “the subject, the engaging power of fantasy, and the standards of the readers” (Hume 107) fails to keep the sceptical reader from putting the book down. The *Science in the Capital* trilogy has taken the difficult approach of presenting a very unfantastic world within the ambit of the fantastic. Johns-Putra defends the novels for their richness of character and realisation of space and place as sources of maintained reader interest, but these may still be insufficient to hold the sceptical reader’s attention. However, Hume’s ultimate argument for the more-disparaged literature of revision, alongside Johns-Putra’s defence, highlights the effectiveness of the format:

More than other kinds of literature, this literature of revision allows people to escape from their culture’s imperfect systems of authority supposedly based on reason, and lets them experience other possibilities for ordering experience, whether religious or utopian. We of the western cultural tradition can ill afford to despise exposure to alternative styles of living: we need to reconsider our own too acutely. (123)

What is clear, not only from the thematic concerns of the novels, but also from their complex negotiation of the barrier between the self and the environment, is that Robinson assumes a one-to-one relationship between the trope of ‘truth’ and the world he creates, as it relates to the ‘real’ world. What is less obvious in the novels, but no doubt salient to the undertaking at hand, is that the assumption of the *trope as truth* percolates the novel so that even by its very existence, it performs a didactic function, and therefore aligns, however inchoately, with Hume’s ideas about literature of revision.

Winter is Coming: George R. R. Martin's *A Song of Ice and Fire*

In the prologue to George R. R. Martin's *A Game of Thrones*, the veteran of a hundred rangings into the dangerous North feels afraid: "Something was different tonight" (Martin 2). The opening moments of *A Song of Ice and Fire* introduce the reader to a danger new and terrifying, ghostly beings of ice that no weapon can harm known as the Others. While this medieval fantasy on the surface may share little with the contemporary setting of the *Science in the Capital* trilogy, both open with the staging of a primary danger that the rest of the characters will not be alerted to until the crisis transpires. In fact, in *A Song of Ice and Fire*, most of the characters remain ignorant of what the reader is led to perceive as one of the primary threats: rapid climate change, and the supernatural dangers that this sudden cooling brings. As in the *Science in the Capital* trilogy, the action immediately moves away to focus on the concerns of characters oblivious to the impending danger; the political machinations that give the first novel in the series its name.

A Song of Ice and Fire (henceforth *ASoIaF*³¹) is a broadly popular series of medieval-setting fantasy novels, drawing heavily on the history of the period in order to break through the tropes of the genre. The series is five novels into its planned seven-novel run, *A Game of Thrones* (*Thrones*), *A Clash of Kings* (*Clash*), *A Storm of Swords* (*Swords*), *A Feast for Crows* (*Crows*), and *A Dance with Dragons* (*Dragons*). The final two novels planned are *The Winds of Winter* and *A Dream of Spring*. There is also a pseudo-historical companion titled *A World of Ice and Fire* (*World*). The novels have been adapted into the HBO television series *Game of Thrones*, which drew in 8.1 million viewers on its Season 5 finale, which brings the story somewhat in line with what has been released in the unfinished series of novels. This analysis will focus on the novels, but in some cases alterations to the television series may be mentioned in footnotes where applicable to the points being raised.

While the novels in *ASoIaF* appear on the surface to be predominantly concerned with the nature of power and politics in a medieval-inspired setting, it is clear from his other works that Martin has an interest in the environment. His collection of science fiction short stories *Tuf Voyaging* follows a man with a spacecraft capable of feats of ecological engineering in his episodic journeys to places in need of such services. The stories are concerned with many environmental issues, ranging from Malthusian population concerns, to food security and encounters with nonhuman intelligences. The issues these stories engage with, cast the issues in *ASoIaF* in a light that requires an ecocritical engagement with the

³¹ For the individual novels, a keyword has been chosen to represent each title. For the series, the abbreviation *ASoIaF* is in widespread use throughout communities of fans and readers.

presented world. The themes in *Tuf Voyaging* are evident as undercurrents in developments in the plot of *ASoIaF* that relate to issues of climate change, food security and other environmental concerns.

However, before the environmental subtext can be explored, the political machinations that take up much of the narrative's focus must be outlined. There are three major plotlines in the narrative: Daenerys Targaryen, the exiled legitimate ruler of Westeros, and her dragons in the distant south, the coming of winter and the Others in the North, and the politics of the southern region of Westeros. The former two are both the fantastic elements of the narrative, while the latter is rooted in the history of the medieval period. One of the concerns Martin began with in dividing the narrative was to show "people being so consumed by their petty struggles for power within the Seven Kingdoms [...] that they're blind to the much greater and more dangerous threats that are happening far away on the periphery of their kingdoms" (in Shuster par 8). The novels jump between these areas, following the return of the dragons and Others alongside the civil war in Westeros, which acts as the distraction from the other events. The War of the Five Kings is caused by a crisis of legitimacy for the boy king Joffrey Baratheon, who is opposed by both his uncles Stannis and Renly Baratheon, and two rebel kings, Robb Stark and Balon Greyjoy, declaring themselves King in the North and King of the Iron Islands respectively. This surfeit of kings plunges Westeros into a bloody civil war that devastates the countryside. However, this serves only as a smokescreen to keep both the characters and the readers distracted from the impending threat of the coming winter and the Others, icy beings unseen in eight millennia. They are descending southwards, on the heels of a wildling force prepared to invade Westeros to escape them. The last line of defence for the realm against both threats are the brothers of the Night's Watch who man The Wall, an enormous and magically-enchanted structure of stone and ice.

This chapter will begin by outlining the relationship between the changing seasons in Westeros and historical climate change in Europe in the Middle Ages. From this, it draws an examination of climate as an unrecognised political factor, showing the way in which the military and political structures of Westeros leave the underclasses most vulnerable to the coming winter. Through these two areas, the chapter will discuss the role of magic as an element of the ecosystem in Westeros as well as the manner in which it expands human intersubjectivity *vis-à-vis* their environment. This will lead to an evaluation of Martin's work in the ambit of what Kathryn Hume terms the "literature of vision".

The Stark Words

The novels open with an emphasis on the coming changes in Westeros. The Nights Watchman in the prologue of *Thrones* is aware that something has changed, and the encounter with the Others causes him to desert his post. The next chapter shows the deserter executed by the honourable doomed Northman Eddard Stark. The Nights Watchman's execution is lawful, but nobody questions *why* this ranger has broken his vows and fled south of the Wall. This first chapter was one of the earliest images Martin had when composing the work: "they [Bran and the other Stark boys] see a man beheaded and they find some direwolf pups in the snow" (Martin in Gilmore par 15). Instead of learning about the Others, Eddard is drawn away to die in the South, a symbolic betrayal of his house that drags the focus of the narrative into the midst of the politics that obscure the great threat to the north. His wife Catelyn is a Southron woman and she reflects on the Stark house words as she meets her husband in the godswood, a grove sacred to the old gods of Winterfell:

Every noble house had its words. Family mottoes, touchstones, prayers of sorts, they boasted of honour and glory, promised loyalty and truth, swore faith and courage. All but the Starks. *Winter is coming*, said the Stark words. Not for the first time, she reflected on what a strange people these northerners were. (24)

In travelling to the South, Eddard forgets his house words, which are a core part of his identity. While the other houses are *expected* to dive into politics, the Starks stand apart as eminently concerned with the season and its inevitable change. In the world of the novels, seasons may last for years at a time. The decade preceding the events of the books has been one of continual summer. The coming winter the Stark words warn about will also last for many years. This peculiarity of seasons provides a framework for Martin to engage with issues around climate change, especially a fantastic reworking of historical climate change in Iron Age and Medieval Europe. By framing the narrative within a seasonal and climatic shift, the novels engage with environmental justice and the issue of vulnerability, especially food security.

One of the ways Martin reveals the bleakness of Westerosi winters is through the folktales Old Nan tells Bran. His morbid enjoyment of the horror elements of these stories, especially the descriptions of the Others, allows Martin to reveal the nature of winters, and the beings that once came with them. One striking story is her description of the Long Winter, happening around 8000 years before the events of the novels:

A winter fell that was cold and hard and endless beyond all memory of man. There came a night that lasted a generation, and kings shivered and died in their castles even as the swineherds in their hovels. Women smothered their

children rather than see them starve, and cried, and felt their tears freeze on their cheeks. [...] In that darkness, the Others came for the first time. (*Thrones* 240)

The vision of a seemingly endless winter recalls descriptions from the Norse Eddas of *Fimbulwinter*³²:

[A] winter will come called Fimbulwinter. Then snow will drift from all directions. There will then be great frosts and keen winds. The sun will do no good. There will be three of these winters together and no summer between. (Faulks in Gräslund & Price 437)

Gräslund and Price argue that the various descriptions of Fimbulwinter, which precedes Ragnarök³³, are related to a moment of rapid climatic change in Europe in 536AD termed “the dust veil event” (428). The causes of this event are not precisely known; Gräslund and Price list various posited explanations ranging from a volcanic eruption of enormous scale, to asteroids, and fragments of comets. Mats Widgren follows the thesis that it was caused by volcanic dust in the atmosphere. Whatever the causes, these authors agree that the result was a three year period of extreme cold that presaged a 15-year period of climatic upheaval:

Whether or not its effects endured or were repeated, for as long as 15 years, all sectors of the research community agree today that in AD 536 something drastic occurred to affect the global environment, reflected in so many proxies as to leave no doubt that it was a widespread catastrophic event. (Gräslund and Price 430)

The archaeological evidence that Gräslund and Price draw on shows that, until this period, the agricultural community in the areas of Sweden they discuss was booming. They go on to discuss how, after the three-year winter starting in 536 AD, there is a shift in both the layout of settlements and the religious views of their inhabitants. Ultimately, they argue that the visions of a three-year winter before the end of the world reflected in the *Eddas* “are clear descriptions of specific weather conditions, including their appearance, duration and precise effects—very far from the generic end-of-the-world stories found in many mythologies” (437).

Beyond this similarity between the Long Winter and Fimbulwinter, Martin’s work also draws on the history of a period when European climate was undergoing extreme fluctuations, from what is termed the Medieval Warm Period to the little ice age. Wolfgang Behringer explores the history of climate and its effects on different societies worldwide, and dedicates discussion to the disastrous changes in weather in the Middle Ages. From 1000-

³² Carol Larrington makes this connection in her introduction to her translation of the Poetic Edda, as she discusses the ongoing impact of the Eddas on literature and popular culture.

³³ Their argument ends with a reinstating of the translation for this term as “The Twilight of the Gods” (438) as a result of the long winter.

1300 AD, Europe experienced “the high medieval warm period” (74), a period of unprecedented warm weather between what Behringer describes as “an age of insecurity in Europe” (68) which includes the dust veil event discussed above, and “the little ice age” (85) which began after 1300 AD. This period of warm weather allowed European society to grow along with advancing agriculture, and made warfare such as the crusades possible without placing European food security and life at excessive risk. However, Behringer notes that “the high medieval warm period also saw harsh climatic extremes” (76), including cold winters interrupting the warm period. From the data, “one has the impression that unfavourable harvest periods became more frequent in the early fourteenth century, at the onset of the little ice age” (77). This little ice age is linked to major shifts in European agriculture, the extinction of species like the Bearded Vulture, and the development of large wolf packs which attacked people (95). Quite similar to the dust veil event described above, there are changes in human settlements, with research suggesting “four thousand villages in England alone” (101) were abandoned due to the harsh cold of the period, which was exacerbated by famines and plagues that were also linked to the climate’s change. Furthermore, Behringer notes how urbanisation and intensive resource extraction worsened the effects of the weather.

The world that Martin presents mirrors these features, using the fantastic in an “additive” (Hume 83) manner to create its climatic vision which “reminds us of our own [world] that has much that we pass over unconsciously” (83). The long summer that is drawing to an end in the first novel suggests the Medieval Warm Period, and the harsh coming winter entails the same effects as the little ice age. While in Martin’s world they are called seasons, they draw clearly on real world climate change in their scope and effects. The coming of Martin’s winter involves ecosystem collapse, ravenous wolf packs attacking people for food, and the broad-ranging changes in human behaviour. In reply to a fan’s question about food and farming in the North, which suffers from cold spells even in the long summer, Martin says that “if the winter lasts too long, the food runs out [...] and then people move south, or starve” (*So Spake Martin* par 8). In the same response, he says that “there are “false springs” and “spirit summers.” The maesters try and monitor temperature closely, to advise on when to plant and when to harvest and how much food to store.” (par. 10). One can easily draw clear parallels to the real-world effects of the shift in climate from a warm period to one of extreme cold in the Middle Ages. Martin’s world goes further, however, to suggest that the change in climate is not a simple allegory for historical climate change. In *World* Martin suggests that “the inconstancy of the seasons was a matter of magical art rather than trustworthy knowledge” (11), a notion I shall return to later in this chapter.

What emerges from this is that we are to treat the long winters and summers not as seasons in the conventional sense, but rather as the Westerosi understanding of broad climatic changes as the dominant climate of the area shifts from a warm period into a little ice age. As a result, the world of the novels, much like the study of historical climate change, can be used to reflect on the links between climate change and social systems.

Widgren takes up the work done in this area of historical climate change studies and argues for the ways in which new research into the climatic conditions of the early Iron Age illustrate similar patterns to those evident in contemporary anthropogenic climate change. Widgren begins with a dismissal of climate determinism, arguing that it is problematic to suggest simply that climate events are a “causative factor shaping the emergence and decline of civilizations as well as societal development, more generally” (126). Gräslund and Price similarly warn against falling into the “‘then it was destroyed by the volcano’ school of history” (429). What Widgren convincingly shows is that, while the climate events of 536AD were catastrophic in some areas, “Vulnerability to the severe climate was unevenly distributed geographically and socially” (132). Widgren draws on studies of climate in southern Africa to extrapolate general principles that suggest a synthesis of climatic and social focuses when discussing social change within a context of climate change:

1) Societal changes often coincide with climatic changes. 2) Climatic changes do not always result in societal changes – a stable society can sustain severe climate conditions. 3) Climatic change is a common external trigger when internal instability is already established. When times of climate change coincide with times of socio-economic and political instability, it can not only lead to societal catastrophes but also to new developments. (adapted from Widgren 129)

What Widgren’s argument about the uneven distribution of the effects of the dust veil event suggests is that for that event, and for the climate change events of *ASoIaF*, as well as modern climate change, an investigation into vulnerability is required, especially concerning social stratification and its relationship to environmental threats. Widgren emphasises that research into past climate change and social collapse needs to examine the internal pressures within a society that leave it vulnerable to external climate stress, as well as the degree of internal stratification that leaves certain groups less resilient to these changes. This is particularly important, in Widgren’s argument, when considering the impacts of climate on food production and security:

The role of social stratification is crucial in this respect. Even if it can be established that, for example, grain production decreased significantly due to a series of extreme weather events, estimations of the effect on society need to take into account the crucial distinction between food availability decline and

food entitlement decline. (128)

Can your sword cut cold?

One of the fundamental ways in which *ASoIaF* reflects the general trends extrapolated by Widgren is the way in which social and climatic upheavals coincide. The War of the Five Kings is not the only conflict that Westeros has had to endure at a time when the climate is about to test the resilience of Westerosi society. Robert's rebellion against the Targaryens that have ruled Westeros for 283 years begins because of the events that occur in "the Year of the False Spring" (*World* 124), and plunges Westeros into civil war at a moment when a long winter seems likely to end. However, the warming weather fails, and the majority of the rebellion takes place in winter. While the pseudo-history contained in *World* does not make much of the perils of the rebellion in winter, it is interesting to note that once again, war and winter come close together in Westeros. What makes this an interesting trend is that in both cases, the vulnerability of the lower classes, termed the "smallfolk" in Westeros, is cast in stark contrast to the lives of the powerful. What Martin reveals at a fantastic remove is the failure of conventional politics and military action to identify climate as a threat, by interrogating the assumptions about people and the environment that underpin the politics of Westeros.

The fundamental failing of the political leaders in the novels is their inability to identify the Others as the true threat. This is underscored from the very beginning of *Thrones*, where the reader is presented with two mysteries. The first, revealed in the prologue, is the unexpected reappearance of the ghostly Others after eight millennia. The second is the apparent murder of Jon Arryn, the Hand of then King Robert Baratheon, both of whom are close friends of Eddard Stark. This mystery will draw the taciturn and honourable Eddard, the quintessential Northman, into the deadly world of Southron politics where he and his family will be caught up in what becomes a bloody civil war sparked by his execution. From here, the mysteries and intrigues proliferate. As Eddard's son Robb musters for a war of revenge, Osha, a captured wildling, tells the young Bran Stark: "A man who won't listen can't hear. [...] [Robb] is bound on marching the wrong way. It's north he should be taking his swords" (*Thrones* 579).

Osha has been captured while raiding south of The Wall, a sign of the coming wildling force as it flees before the attacks of the Others. As the narrative progresses through the novels, we see more of the wildlings as the bastard Jon Snow first infiltrates their ranks on behalf of the Night's Watch, humanising them. When Jon is elected Lord Commander of the Watch, he attempts to end the bitter conflict and instead invite the wildlings to submit to

the laws of the Seven Kingdoms: “If you would eat, come to me, Jon thought. If you would not freeze or starve, submit” (*Dragons* 138). This plan is met with resentment and open hostility, as it undermines what many of the Night’s Watch view as their duty, keeping the people they see as barbarians and savages out of their civilised lands. The Nights Watchmen first argue they should kill the wildlings, and later abandon any remaining beyond The Wall to their fate. Jon is the only one able to see the failure of this plan in the light of the Others’ returning:

“Let me tell you what will happen,’ Jon said. ‘The dead will rise again, in their hundreds and their thousands. They will rise as wights, with black hands and pale eyes, and *they will come for us.*” (*Dragons* 522-523)

What becomes clear from this is that even the Night’s Watch, sworn to defend the realm from the Others and the wights that they create, is unable to identify the real threat, remaining endlessly paranoid about the wildlings who are merely a symptom of the threat of the changing climate. Jon’s attempts at reform begin to address this myopia, but the Watch, like the rest of Westeros’s political and military systems, is slow to evolve to face the impending peril. Furthermore, it becomes clear as The Nights Watch attempts to understand its foe that this loss of focus on the Others has been a longstanding issue. Only too late do they discover that the Others are vulnerable to fire, Valyrian Steel, and obsidian. As Jon’s predecessor as Lord Commander of the Night’s Watch laments as they make this rediscovery:

“*We never knew!* But we must have known once. The Night’s Watch has forgotten its true purpose, Tarly. You don’t build a wall seven hundred feet high to keep savages in skins from stealing women. The Wall was made *to guard the realms of men...* and not against other men, which is all the wildlings are when you come right down to it. Too many years, Tarly, too many hundreds and thousands of years. We lost sight of the true enemy. And now he’s here, but we don’t know how to fight him.”(*Swords* 450-451, italics original)

The Night’s Watch has ignored or lost the collective experience of dealing with the Others, which are intimately linked with extreme cold and thus the changes in climate Westeros is experiencing: “The Others come when it is cold, most of the old tales agree. Or else, it gets cold when they come. Sometimes they appear during snowstorms and melt away when the skies clear” (*Crows* 114). Ultimately, the question Martin raises with the misapprehended enemy beyond the Wall is one of a failure of vision on the part of the Night’s Watch that is rooted in conventional military concerns, rather than one that sees the climate and the supernatural dangers associated with it as a geopolitical threat. As Tormund Giantsbane, one of the wildling leaders, tells Jon: “[They are] Shadows with teeth... air so

cold it hurts to breathe, like a knife inside your chest [...] can your sword *cut cold*?" (*Dragons* 779, emphasis added). In a world of magic swords, Tormund's question can be answered. However the question is pertinent if rephrased broadly: can conventional military thinking in Westeros combat climate change and the threats it brings? This question applies not only to the slowly-reforming Night's Watch, but to the whole of the Seven Kingdoms, where warfare is leaving the realm underfed, vulnerable, and indefensible against the Others, and the effects of a long winter.

A Feast (for Crows)

From *Clash*, through to *Crows*, Martin has a variety of focal characters journey through the Riverlands, the area where the fighting between Stark and Lannister has been thickest. The focalisers range from the fleeing Arya Stark, to the noble warrior Brienne of Tarth, to the once-famed, now maimed swordsman Jaime Lannister. As a result, we see the devastation of the fighting through three very different viewpoints, especially across the Lannister-Stark conflict lines. Arya's flight through ruined towns reveals the damage that Tywin Lannister's army has done: "Farms, villages, castles, septs, barns, it made no matter. If it could burn, the Lannisters burned it; if it could die, they'd killed it. They had even set the woods ablaze where they could" (*Clash* 289). However, by the time Brienne and Jaime journey through the same regions in *Crows*, the destruction is equally the work of Stark warriors. Tywin's scorched earth policy, and the need and greed of two armies encamped in the same area have denuded the landscape. By the time Jaime has finished his tour of the area, the political machine has crushed the major actors in the war. Robb Stark and his bannermen have been killed or captured in a betrayal, and Tywin Lannister has been shot by his son Tyrion. The war between Stark and Lannister is all but won, and Jaime has been negotiating for peace with the last of the rebellious lords in the Riverlands. Amid the devastation, he reflects on the coming change of season:

Snow in the Riverlands. If it was snowing here, it could well be snowing on Lannisport as well, and on King's Landing. *Winter was marching south*, and half our granaries are empty. Any crops still in the fields were doomed. There would be no more plantings, no more hopes of one last harvest. He found himself wondering what his father would do to feed the realm, before he remembered that Tywin Lannister was dead. (*Crows* 957-950, emphasis added)

The descriptions of the war, and the destruction of the landscape that is part of Lord Tywin's battle strategy, are interspersed with many descriptions of feasts and eating. An enormous amount of detail goes into the descriptions of the feasts, notably King Joffrey and

Queen Margaery Tyrell's wedding feast, which is a lavish seventy-seven course meal. Tyrion reflects after the first course on the extravagance of "Seventy-seven dishes, while there were still starving children in this city, and men who would kill for a radish. They might not love the Tyrells half so well if they could see us now" (818). The story of the war in Westeros is really the story of food, and it is where the internal stresses that present vulnerability to a changing climate become most evident. Early in the war, Tyrion, acting Hand of the King, makes a tour of the capital to see the impacts of the first refugees from the Riverlands on the city. He notes that:

The markets were crowded with ragged men selling their household goods for any price they could get [...] and conspicuously empty of farmers selling food. What little produce he did see was three times as costly as it had been a year ago. [...] On the street of flour, Tyrion saw guards at every other shop door. When times grew lean, even bakers found sellswords cheaper than bread. (*Clash* 64)

This stress only worsens as Stannis Baratheon marches on the capital, while the destruction of farmlands in the conflict areas leaves the realm with little growing for a final harvest. In the north, all the able-bodied men have been taken to war, leaving crops to rot in the field when they do not return. The situation in the capital is only noticed by the royals when they leave the security of the lavish Red Keep and its rich feasts to see Princess Myrcella off on a voyage south. *En route* back to the Red Keep, the smallfolk harass King Joffrey with claims of his bastardy and declarations for his rivals. As cries for Robb Stark and Stannis Baratheon fly along with rotten food, someone shouts, "We want bread, bastard", and "In a heartbeat, a thousand voices took up the chant. King Joffrey and King Robb and King Stannis were forgotten, and King Bread ruled alone" (594).

What is made clear by this juxtaposition of feast and famine is that the problem in Westeros is not simply the destruction of food as a strategy in war, but the deep social stratification that prevents the majority from accessing food. This reveals Westeros to be in a position where social collapse is increasingly likely, and the impending climate change will worsen or perhaps fully trigger it, in line with Widgren's analysis. The coming winter, with the reappearance of the Others, looks to be one of unprecedented harshness. Furthermore, the juxtaposition highlights the injustice of Westerosi social stratification, particularly how the environmental impacts of war and food shortages are borne by those already in the most vulnerable positions in society, in this case refugees and peasants. The cynical exile knight, Jorah Mormont, says, "The common people pray for rain, healthy children, and a summer that never ends [...]. It is no matter to them if the high lords play their game of thrones, so

long as they are left in peace. [...] They never are” (*Thrones* 233). What the chapters travelling through the brothels, inns, taverns, and ruins of the Riverlands show is precisely the extent to which the burden of war is borne by the common people. The emphasis on food security as a lens through which the conflicts in Westeros can be viewed, especially against a backdrop of climate change, is similar to Felipe Fernandez-Arnesto’s emphasis on food in his study of history and civilizations:

[History] belongs in the soil, seeds and stomachs. It has to encompass episodes in the history of technology, because, at his most effective, man meets nature at the edge of his tools. It has to be about food because, at their most dependent and their most destructive, people encounter the environment and eat it. (7)

His argument that “nothing matters more” (7) than food to the average person is clearly evident in Westeros, as the failing fortunes of the Lannister family are directly linked to their inability to continue providing food to the people of King’s Landing. Indeed, the failure of the highborn rulers in the realm is made clearer as the narrative progresses, with only one king out of all the claimants to the throne, Stannis, responding to the threats from beyond the Wall that attend the coming climate change. Indeed, he is also the only ruler aware of the existence of the Others as a potential threat, although like the Night’s Watch he is drawn into conflict with more immediate threats instead.

In *Dragons* it is only when the great snowfalls that herald the coming of winter hit that the high lords and their soldiers are confronted with the reality of the coming winter and the effects that their war has had. Stannis’s army, encamped in the snow, turns to cannibalism to survive. In a telling image, we see the walls of the now-occupied Winterfell guarded not by the soldiers of the turncloak Boltons and Freys, but snowmen built by squires which in the heavy snowfall “had grown into monstrous giants” (*Dragons* 678). This symbolically echoes Jaime’s thought quoted above that winter was “marching south” like an invading army, the real threat from which the war has merely been a distraction. As winter approaches and the chance for a final harvest withers, it becomes clear that the political situation in Westeros has failed to identify the real threat to the realm, and the grip the Iron Throne has on power is waning in the face of food insecurity, rebellion, and potentially the coming of a supernatural foe that the crown knows nothing about. The conventional warfare that has dominated the early parts of the novels cannot deal with this threat.

Tywin Lannister, one of the most ruthless and efficient military leaders in Westeros, has already proven to be unable to factor in the effects of the coming winter in his scorched earth policy. Similarly, we see a failure in the political realm to prepare to face a foe unseen

in eight millennia. A Night's Watchman comes to petition the Iron Throne for aid, bringing the arm of a wight, a corpse raised by the Others, as proof. Tyrion, the acting Hand of the King, betrays his own feelings for political expedience, dismissing the proof as children's stories:

A dwarf enjoyed at best a tenuous hold on dignity. Once the court and kingdom started to laugh at him, he was doomed. And yet... and yet... Tyrion remembered a cold night under the stars when he'd stood beside the boy Jon Snow and a great white wolf atop the Wall at the end of the world, gazing out at the trackless dark beyond. He had felt – what? – something, to be sure, a dread that had cut like that frigid northern wind. A wolf howled off in the night, and the sound had sent a shiver through him. (404)

Tyrion here is caught in a trap of knowing the legitimacy of the Watch's call for aid and the need for political expedience. As a result, he chooses to mock the Night's Watchman to delegitimise his call for aid³⁴. In fact, only one of the five kings that claim the rights to the realm actually takes up arms to defend it. Stannis arrives at the moment when the Watch faces a wildling army, and takes the threat of the Others seriously. Even here, it is only because of the lowborn knight Davos Seaworth that Stannis receives the Watch's call, as his previous highborn Hand and advisors hid the threat from him to encourage focus on the struggle for the Iron Throne. Stannis says:

Lord Seaworth [...] reminded me of my duty, when all I could think about were my rights. I had the cart before the horse, Davos said. I was trying to win the throne to save the kingdom, when I should have been trying to save the kingdom to win the throne. (*Swords* 1057)

It is clear that conventional politics and military strategy cannot face the threats of the Others, much as the conventional democracy and economics in *Science in the Capital* is insufficient to face the new challenge of rapid climate change.

The Return of Magic

What is clear from the above discussion is an utter failure of the Westerosi political system to identify both magical and environmental threats, and that the burden of the effects of this is borne by those least able to face them. Most strikingly, Martin unites both the threats, and potential answers to them, drawing the environment of Westeros and its magic together in significant ways. This is most clearly suggested by the coincidence of the return of magic at the time of a climate regime shift across Westeros. While the above section focused most

³⁴ For all of his political manoeuvring to avoid becoming a laughing stock, Tyrion soon falls from favour, finally murdering his father and escaping. This calls into question his unwillingness to engage with the Watch when he was in power. In the end, his failure to heed the call for aid does not help him maintain power.

notably on realpolitik and the human effects within the social system that leave it vulnerable to climate change, what sets Martin's world apart from environmentally-aware historical fiction about the Medieval period is the use of magic to engage with climate and the nature-culture continuum in more nuanced ways. The novels draw on notions of the Otherworld in order to redefine the relationship between culture, belief and geography, use magic to underscore the complexity of human-animal relations, and suggest a level of anthropogenic change within a system where magic, climate, and the environment are bound together. Through this, Martin engages with elements of modern climate change, and decentres humans and, to use Braidotti's term, the *anthropos* (65) in a way that underscores the arguments of posthumanism.

To begin an analysis, however, it is necessary to take stock of the nature of magic presented in the world of the novels. For much of the series, magic is opaque, poorly understood by the focal characters, and relegated by many of the more learned in Westeros to the realm of superstition or the exotic. Much like his inspiration, Tolkien, Martin has chosen, as he puts it, to have "very little onstage magic" (in Poniewozik para 17) in the world of the novels. Apart from the vision we have of the Others in the Prologue to *Thrones*, it is only later in the series that we see magic performed by the Red Priests of the god of fire and light, Rh'lor, the hatching of dragons, and warging, sharing the mind of a wolf by magical means, which many of the Stark children learn to do. The secret of magic is seen only by liminal characters, as it is most notable in the fringe areas of Westeros and the rest of the world, beyond The Wall, and in the South and East where Daenerys travels with her dragons. To the majority of Westeros, magic is beyond belief. The Maesters, who are learned scholars, proto-scientists, and believers in a knowable universe, actively dismiss the existence of magic. Maester Luwin, who discourages Bran from believing in the prophetic dreams he is experiencing, has forged the Valyrian Steel link in his Maester's chain, a sign he has attained a vast amount of knowledge about the arcane. When Bran questions him on prophecy, warging, and greenseeing, Luwin says:

Oh, to be sure, there is much we do not understand. The years pass in their hundreds and their thousands, and what does any man see of life but a few summers, a few winters? We look at mountains and call them eternal, and so they seem . . . but in the course of time, mountains rise and fall, rivers change their courses, stars fall from the sky, and great cities sink beneath the sea. Even gods die, we think. Everything changes.

Perhaps magic was once a mighty force in the world, but no longer. What little remains is no more than the wisp of smoke that lingers in the air after a great fire has burned out, and even that is fading. Valyria was the last ember, and Valyria is gone. The dragons are no more, the giants are dead, the

children of the forest forgotten with all their lore. (*Kings* 441-442).

Martin makes use of dramatic irony throughout the novels, and it is nowhere more clear in the constant dismissal of both tales from the Watch about the return of the Others, and tales from across the Narrow Sea about the return of dragons. The Westerosi remain stubbornly ignorant on both fronts, and those who are confronted with the Others struggle to remain focused on this supernatural and environmental threat. Jon Snow laments, when the Watch balks at an alliance with the wildlings they have fought for generations, “They know nothing [...]. And worse, they will not learn” (*Dragons* 900).

While magic to the reader, too, is initially as opaque as it is to the characters, there is a vocabulary of magic provided by the conventions of fantasy, stretching back to mythology and folklore. Martin draws interestingly on the notion of the Otherworld and conventions of fairy stories both in the construction of his fantasy and within his world. In *On Fairy-Stories*, Tolkien argues that the population of the world with elves and fairies stems significantly from “the desire of men [sic] to hold communion with other living things” (20). Furthermore, Tolkien says that fairy-stories have as their essential face “the Magical towards Nature” (28), in other words connecting the natural world to magic, rather than magic as a mirror for higher powers or human agents. This emerges from Tolkien’s engagement with the Faerie, or what Alfred Siewers terms the Otherworld. The secondary world of Westeros and Essos is itself an Otherworld paralleling a medieval Old World in many respects: the Wall reflects a fantastically embellished Hadrian’s Wall; Aegon the Conqueror echoes William the Conqueror; and the war between houses Lannister and Stark is reminiscent of the English Wars of the Roses between the houses of Lancaster and York. However, there is also a clear sense of an Otherworld of faerie beings and mythology cohabiting spaces in Westeros in the novel, particularly north of the Wall, and in places like the Isle of Faces with close links to the children of the forest, “different cosmic environments coming together in the same topography” (Siewers 303).

In fact, the clearest indicator of this is the carved weirwood trees at the heart of the castles’ godswoods and the religion of the old gods associated with them. Tyrion, a southron, reflects on how “That wood was Winterfell. It was the north” (*Kings* 713), while the wildling Osha warns Bran that “The old gods have no power in the south. The weirwoods there were all cut down, thousands of years ago. How can they watch your brother when they have no eyes?” (*Thrones* 577-578). Religion, folklore, and geography become inextricably linked. The weirwoods are the eyes through which fey beings could magically observe the world, cut down by the human invaders to the area in an attempt to civilise Westeros.

Here I draw specifically on the notion of civilization as Fernandez-Armesto defines it: “I call those cultures civilised only according to the degree to which they attempt to refashion their natural environment” (6). On the one hand, the history of Westeros shown in the novels and particularly in *World* is one of a shift from the animistic or druidic relationship with the nature of the First Men to the relationship of domination and control started by the invading Andals, who share features with the Anglo-Saxons. Initially, the First Men waged war on the children of the forest, burning areas of the forest. However, after entering the Pact with the children of the forest they show a change in relationship to the trees and the old gods the fey beings worshipped³⁵. On the other hand, the Andals wage war with iron and fire, cutting down the weirwoods and driving the magical creatures ever northward, rather than attempting to achieve a symbiotic relationship with them. Indeed, their relationship mirrors a trend Robert Pogue Harrison notes in the West’s relationship to forests: “the mythic forests of antiquity stand opposed to the city in some fundamental way” (2).

In addition, the Andals’ burning of the weirwood groves is what Fernandez-Armesto would characterise as a civilizing project, and it is a clear indicator of the effects on magic that the Andals have. The complex relationship between magic, geography, and human activity in Westeros is further shown by other indicators of the ways in which the civilising project can affect magic in Westeros. For example, Jon Snow and his direwolf Ghost share a psychic or spiritual connection, allowing them to sense one another and even share a consciousness, but The Wall and the “spells woven into it” (*Swords* 770) seem to block this connection like a dam against magic. Interestingly, Fernandez-Armesto argues that magic is, through its supernatural power, “the last defence against nature [...]. Because magic is a way of mastering nature, it could be said to be a substitute for civilization, or even a refinement of the civilizing impulse” (46). While the magic in the works of the First Men and the Andals in the forms of The Wall and castles like Storm’s End represent a magical mastery over the forces of climate and weather events respectively, magic is also an inherent part of the ecosystem or biosphere, as well as a bridge that highlights the nature-culture continuum.

Instead of using magic as “a way of mastering nature” (Fernandez-Armesto 46), many of the characters in the novels are able to use magic to connect spiritually or mentally with animals. This process, called warging, is prevalent among the worshippers of the old gods of the North, gods whose worship is tied most closely to the natural environment. Warging encourages a profoundly different approach to animals and animality than conventional

³⁵ *World* indicates that the children of the forest supplied the First Men with obsidian, suggesting that they allied with the humans against the Others. However, the novels themselves offer little clarity on the nature of this relationship.

Westerosi society does. The dominant religion in Westeros following the Andals is the worship of the Seven. These are deities whose worship mirrors Judeo-Christian belief; six are representations of human ideals, such as the chaste and beautiful Maid, the wise Crone, the hardworking Smith, or the brave Warrior. The only one who does not fit this pattern is the Stranger, described as “carved to look more animal than human” (*Clash* 145), and representing death, otherness, and isolation. By assigning these features to the only non-human member of the pantheon, the Westerosi affirm a similar bias to Western anthropocentrism. As Braidotti explains, this is rooted in a “dialectic of otherness” which includes animal bodies as well as “anthropomorphic others: non-white, non-masculine, non-normal, non-young, non-healthy, disabled, malformed or enhanced peoples” (68). In highlighting the Stranger’s animality, and linking this with characters like Tyrion and the other “cripples and bastards and broken things” (*Thrones* 244), Martin shows how animals are denigrated in the “dialectics of negative difference” which mirrors the “moral ideals of white, masculine, heterosexual European civilisation” (68).

Instead of this, warging³⁶ suggests a dynamic relationship between human and animal that decentres the *anthropos* and instead engages with the relationship between the Stark children and their “companion species” (Haraway 6), the direwolf. The direwolves certainly cannot be approached as mere pets. Instead what we see from the Stark children who are wargs is a complex intertwining of their identities with their wolves. Rickon, the youngest Stark, shares a wildness with his wolf Shaggydog that is not simply due to the fracturing of his home life, and the strength Arya draws from her wolf dreams, without even realising she is sharing the consciousness of her long-lost direwolf Nymeria, is undeniably a complex kind of relationship. However, Robb treats Grey Wind more as a tool of war, and his wilful ignorance of his wolf’s warnings is part of what leaves him open to betrayal. Similarly, Sansa treats her direwolf, Lady, more as a pet, but this is before any of the Starks show their skill at warging³⁷. Indeed, we also see little evidence that Robb is able to warg into Grey Wind either, further suggesting the transformative power of this form of magic as his apparent inability to share a consciousness with Grey Wind limits the depth of their relationship and understanding of one another. The wolves do not simply mirror the personalities of their ‘owners’, but instead help to structure the identity of the owners that share their minds³⁸,

³⁶ In the text, warging carries a perjorative sense; however it is a more convenient term for what the Stark children are able to do than skinchanging.

³⁷ With Lady’s death coming so early in *Thrones*, we never see if Sansa could warg and whether this would have renegotiated their relationship to something more complex than the conventional pet-owner relationship they have.

³⁸ There is an interesting intertext here with the ability to change skins in Le Guin’s *Wizard of Earthsea*, where the binary of animal and human is still suggested by the ability for a wizard to lose himself in animality. While Bran is

showing a kind of “significant otherness” (Haraway, 3) through the “metaplasm” (20) of warging which allows the wolves and their humans to show themselves to be two species “who shape each other throughout the still ongoing story of co-evolution” (29)³⁹.

As Bran, the most gifted at warging of the Starks, travels beyond the Wall to learn more about warging and its rarer, related gift of greenseeing, it becomes clear that this power is not limited solely to animals either. Greenseers have “a thousand eyes, a hundred skins, wisdom deep as the roots of ancient trees” (*Dragons* 457) Bran is able to use the same ability to greensee through the carved weirwood trees, offering a nontemporal view of the world. This is further emphasised by a seer who may have blood of the children of the forest, the Ghost of High Heart, who says “[The] oak recalls the acorn, the acorn dreams the oak, the stump lives in them both” (*Swords* 594). We are also treated in the prologue to *Dragons* to a vision of another powerful warg, the wildling Varmyr Sixskins, leaving his body on death and journeying through a transcendental vision of the unity of the natural world to his second life within another wolf. This is another facet that makes the novels literature of vision, rather than revision; the novels are concerned with the relationship between people and animals and the distinction between them, but do not take an absolute stance on the nature of this relationship, and certainly do not emphasise a singular ideal form for it to take.

Bran’s journey beyond The Wall, along with Jon’s time with the wildlings, also highlights the continued existence of supernatural elements long considered gone from the world. What we are treated to as the narrative progresses is the return of magic both to the world and to the narrative, where the supernatural elements of the world hinted at in the prologue of *Thrones* become central to the story, including the return of the Others and dragons, and the reveal of living giants, mammoths, and the children of the forest. However, while some of these seem to be recovering in the regime shift we are witnessing, the giants and the children of the forest are still small in number. The nature of the system of magic that allows for the dragons and Others to return is opaque to the reader, but hints from Leaf, one of the children of the forest, indicate that the system of magic, much like any ecosystem, is one of dynamic flux, complete with feedback loops and system drivers that dictate the system’s resilience. When Bran asks why there are so few of the children left, Leaf replies:

“[We have] gone down into the Earth,’ she answered. “Into the stones, into the trees. Before the First Men came all this land that you call Westeros was home

warned not to neglect his crippled human body in favour of his direwolf, Summer, the treatment of the warning is merely to do with physical needs like eating.

³⁹ Indeed, much of the relationship between the Starks and their wolves is interesting when viewed through Haraway’s *Companion Species Manifesto*, but a fuller engagement would take more space than this chapter can allow.

to us, yet even in those days we were few. The gods gave us long lives but not great numbers. Lest we overrun the world as deer will overrun a wood where there are no wolves to hunt them. That was in the dawn of days, when our sun was rising. Now it sinks, and this is our long dwindling. The giants are almost gone as well, they who were our bane and our brothers. The great lions of the western hills have been slain, the unicorns are all but gone, the mammoths down to a few hundred. The direwolves will outlast us all, but their time will come as well. In the world that men have made, there is no room for them, or us.” (*Dragons* 453)

This extract suggests a number of interesting features of the system of magic in Westeros, with regard to the return of certain magic beings while others, like the giants and the children of the forest, seem doomed to dwindle away. The first feature is the extent to which the civilising project of the Andals has succeeded. The natural world in its primal state, infused with magical beings, has been irrevocably altered by the actions of Westeros’s human inhabitants. Unicorns, fey beings, and giants are, according to Leaf, doomed to fade from the world; the resurgence of magic has done little to inspire her hopes. The project that began with cutting down the sacred weirwoods has all but succeeded in Westeros itself, and the few remaining habitats for these beings seem unable to sustain them. In this there is an interesting echo of a further element of the Anthropocene period: the mass extinction or “defaunation” (Dirzo et al 401) caused by human activity. It is interesting to note that the magical creatures within the bioregion of Westeros appear to be most vulnerable to human impacts, such as cutting down and enclosing weirwood groves. The Andals made war on the children of the forest for religious and security reasons, fearing the children’s powerful elemental magic, and their project has been continued by the Maesters of the Citadel. By the end of *Crows* the readers are finally made privy to the Maesters’ great secret, told by the renegade Maester Marwyn:

Who do you think killed all the dragons the last time around? Gallant dragonslayers armed with swords? [...] The world the Citadel is building has no place in it for sorcery or prophecy or glass candles, much less for dragons. (*Crows* 975)

World details the slow decline of dragons until their seeming-extinction (in Westeros and most of known Essos at least) after the Dance of the Dragons, a civil war which caused many of the Targaryen’s dragons to die in battle and riots. What Marwyn makes clear is that the Maesters were involved in the decline of the dragon population, and have been attempting to irrevocably alter the system of magic in Westeros as the ultimate end of the Andal’s civilising project.

This impact on the magical beings of Westeros suggests the second important

implication in Leaf's answer to Bran. Leaf links the low breeding rates of the children of the forest to their long lives, saying that without some control they would "overrun the world as deer will overrun a wood" absent of predators. This is a form of ecosystem feedback loop, ensuring low populations to maintain small environmental impacts. Similarly, if there is some "magical art" (*World 11*) involved in the changing of Westerosi seasons then it is clear that magic and climatic ecosystem drivers are in tandem, allowing certain magical beings like the Others to rise during particularly magically-powerful seasons. Furthermore, with the repeated connection between dragons and the vulnerabilities of the Others, Martin seems to be suggesting that dragons, which have returned at the same time as the Others, are in some sense a natural predator for these beings of ice. This theory is further supported by the rapidly increasing visibility and tangibility of magic in Westeros, in what might be termed rapid magic change to mirror the rapid climate change the area is experiencing. For centuries, magic has been essentially impossible in Westeros. Maester Luwin describes the test to earn the Valyrian Steel link: a Maester seeking the Valyrian Steel link to his chain must attempt to light a candle of obsidian using Valyrian magic, a practice which has been impossible for generations. He argues that it is a meditation on the failure of magic in Westeros. By the fifth novel in the series, however, we know of a Maester that can see visions by lighting an obsidian candle, just as we have seen the power of a once-failed priest of R'hllor to raise the dead, the return of dragons and the Others, and the ability of almost an entire generation of Stark children to magically share their direwolves' minds. When read against the backdrop of climate and its effects, these events are all clear evidence of a regime shift in the magical system in Westeros, connected through the return of the Others to the coming winter.

Through these two features, an examination of human impacts on a bioregion and the feedback loops and system drivers that are reintroducing magic to Westeros, Martin places the climate situation in Westeros into an interesting space between the deeply anthropogenic climate change of the 21st Century and the nonanthropogenic climate fluctuations in the Medieval period. Anthropogenic magic change, through the Andals' cutting down of the weirwoods and the Maesters' conspiracy to rid the world of magical beings and to silence research into magic, is a clear factor in the massive regime shift in magic that attends the climate change Westeros is experiencing. Furthermore, Martin deploys magic ambiguously, showing how it can be both a tool to master the environment (such as The Wall) and a route to renegotiate the relationship between humans and their environment. As a result, he does not offer magic as an automatic escape from conventional modes of domination, but rather provides the reader a vision of potential, complex relationships between humans and animals,

plants, and the ecosystem as a whole.

Martin's vision

From the novels' focus on human impacts on the environment, the complicated nature-culture continuum, and the impacts of climate change on human society, it is clear that Martin is engaging with environmental themes. While these themes are not the sole focus of the novels, sharing a platform with politics and social issues such as the war in the South and the problems at King's Landing, it is the engagement with the dynamic relationship between the environment and society which underscores many of the novel's main concerns. Dickerson and Evans argue, in relation to Tolkien, that a work does not need to be directly environmental to address environmental themes:

To the question, was Tolkien an environmentalist? our answer is no. Nevertheless, we believe that all his writings [...] convey a profound perspective on the natural world that constitutes an answer to Elder's call for "ecological depth" in literature with environmental vision. (xvi)

This holds true for Martin's *ASoIaF* which, while less directly environmental than *Tuf Voyaging*, has a striking resemblance to historical environmental crises, and addresses a number of socio-environmental issues, such as food security and defaunation. Martin's feelings towards the environment and climate change in particular are captured in an interview with Al Jazeera:

We have things going on in our world right now, like climate change that's [...] ultimately a threat to the entire world. But people are using it as a political football [...]. This is something that can wipe out possibly the entire human race. So I wanted to do an analogue not specifically to the modern-day thing, but as a general thing. (in Shuster pars 9-10)

While Martin's works are not a simple allegorical engagement with climate change, they are, by his own admission, an "analogue" for the relationship between human societies and the environment in general. Martin calls attention to our *willingness* to remain ignorant of significant long-term trends and threats when more immediate threats are evident. By focusing on climate as a driver for social change and engaging with other environmental themes such as the civilising impulse in Westeros, non-anthropocentric visions of the natural world, and examinations of the relationship between humans and animals, Martin engages with multiple levels of ecological concern in *ASoIaF*. This achievement is made, whether consciously or unconsciously, without writing didactic or allegorical fantasy in the strictest sense.

For this reason, Martin's novels fall into the ambit of the "Literature of Vision"

(Hume 82). Central to Hume's notion of the literature of vision is the text's presentation of a fictive world that, rather than encouraging escapism into an illusion, "[invites] conscious comparison of our own vision of reality with that which we confront in the stories" (82). This can be achieved through adding fantastical elements, subtracting or erasing non-essential elements, or constructing a simple binary through which this reflection is to be achieved. Martin's *ASolaF* seems to fit Hume's type of a created or "augmented world" (84), presenting a world rooted in the history of the Middle Ages but adding to it a necessarily fantastic layer, by drawing on the ecological themes present in much of his source material. These influences range from the Eddas to the Otherworld of the faerie. Through the exploration of magic among the features of what may have otherwise seemed mere historical fiction, Martin invites reflection on our perception of animals, climate, and human activity, highlighting system in the manner of Tolkien's "arresting strangeness" of fantasy (44) the complex nature of the nature-culture continuum. This is especially notable in the exploration of human impacts on a natural system of magic, which reflects human impacts on the climate. Hume, in a manner similar to Tolkien, suggests that the strength of this type of literature is that it not only offers pleasurable enjoyment, but also, importantly, "helps free us from our automatic filtering and makes us freshly aware of our vision of reality" (Hume 100).

In other words, what Martin is best able to achieve through this approach is that the novels do not present themselves as didactic attempts to educate the reader about contemporary climate change, but rather as engaging narratives that reveal new ways of considering the relationship between humans and the environment, both historically and contemporarily, emphasising the nexus of nature-culture that anthropocentrism renders invisible. While the climate change presented is not allegorical for contemporary anthropogenic climate change, the features it shares with our current situation invite a much-needed reflection on many ecological concerns beginning with the failure of the powerful to address environmental threats.

Finally, the novels highlight the way in which contemporary climate change will affect the most vulnerable as it did historically and does in the world of the novels. After all, the novels show the ways in which anthropocentrism obscures the profound interconnectedness of human and animal life within a continuum of nature-culture all of which is under threat from climate change. Taking the organisational structure of the novels to its logical conclusion, it is clear that, much like Tolkien, while Martin may not appear to be an environmentalist on the face of it, an ecocritical reading of the ways in which the novels engage with ecological issues is vital to understanding their full range of concerns.

Conclusion

It is clear that the fantastic provides a platform for a critical renegotiation of the position of humanity in the environment. The subversive nature of unreality in the texts explored, as varied as it is from one series to another, allows the texts to accommodate the posthuman condition that Braidotti terms “post-anthropocentrism” or “life beyond the species” (54). In the process, they challenge assumptions about the validity of interplanetary expansionism, and the possibility of ecotopias. The series examined in this thesis use the fantastic in differing ways in order to render “problems in ecology” visible for the general reader, that is, to make them “ecological problems” (Garrard 6). This thesis has positioned these selected texts across three of Hume’s four types of literatures, examining the texts as grouped primarily around two related themes: 1) altering the global ecosystem of other planets, and 2) rapid climate change. These are two different approaches to the representation of the nexus between society and the ecosystem that surrounds and supports it, and, as I have shown throughout the textual analyses, the different approaches the texts take can produce different engagements with this theme.

Both Herbert’s *Dune Chronicles* and Robinson’s *Mars Trilogy* deploy the fantastic to imagine a future where humanity has spread to another planet, and engage with the challenge of transforming a global ecosystem to one suitable for human life. The *Dune Chronicles* follow the fortunes of the Atreides family as they attempt to reshape the ecology of the desert planet that gives the series its name, while also attempting to reform the society that depends on the planet for the vital resource, melange. The difficulty of surmounting the legacy of history, the “violence of our ancestors” (*Dune* 173), is linked to the challenge of remaking an ecosystem that is damaged by the water required to allow humans to thrive. In the *Mars Trilogy*, Robinson also imagines the impact of terraforming on Mars, with a particular focus on the lingering violence that metanational capitalism visits on the Martian environment in the same way that it has totally depleted the Earth in Robinson’s vision of the future. Both series are concerned with the difficulty of transcending the pattern of destructive relationships between humans and their environment.

However, their orientations are diametrically opposed on both of Hume’s axes: Herbert’s works aim to discomfort the reader and encourage disengagement, while Robinson’s work encourages the reader to engage after reading by offering comforting suggestions for a better future. Herbert’s emphasis on cyclical history and the inevitability of failure in a random universe does not produce the same transformative emphasis that

Robinson's more didactic approach does. By focussing on the failure of Paul and the ambiguous Golden Path of his son Leto, Herbert deconstructs narratives of easy ecotopias, emphasising the importance of hardship in tempering the required care for negotiating harsh ecosystems that prove intractable to short-term cultivation. However, he offers no alternative. Robinson's approach is more didactic, instructing the reader on the ways in which metanational capitalism comes short of ethically and responsibly constructing Earth-like environments on other planets. Robinson offers the reader a glimpse of a society that, while not an easy ecotopia, is a more sustainable and ecologically ethical configuration that offers itself as a guide for engineering a better real-world relationship between the reader and the environment. A major element of this distinction is the difference in expectation that texts have when they focus on disengagement rather than engagement. Disengagement does not provide the reader with a framework for reinventing their relationship with the environment. While both texts draw on scientific knowledge about altering the environment and building resilient ecosystems in harsh ecologies, Robinson's clearly demands action from the reader in engaging with current ecological problems.

The interaction between Hume's two axes is perhaps more clearly shown by contrasting novels that are closer together on the schema, and doing so also highlights a challenge facing writers of ecologically-oriented fiction. Robinson's *Science in the Capital* trilogy and Martin's *A Song of Ice and Fire* both explore climate change, one set in a future near enough to feel almost mimetic, the other drawing on historical climate change to create a fantastic world through which to explore climate-related issues. The series, then, are both positioned on the "engagement" end of the engagement-disengagement continuum, but because they fall into the literature of revision and vision respectively, they fall on opposing ends of the comfort-disturb spectrum. The result of this is clear in the different focal areas of the novels. On the one hand, Martin's works refract elements of contemporary climate change. This includes anthropogenic elements and climate change doubt as political expedience, organised through a fantastic lens. Rather than being simply allegory for modern climate change, the novels in *A Song of Ice and Fire* engage with the ways in which climate and society interact, highlighting the nature-culture continuum. In the end, they use fantasy to disturb the reader's assumptions about the environment of Westeros. On the other hand, Robinson's novels are explicitly engaging with contemporary, anthropogenic climate change, representing scientific knowledge in an accessible way in order to educate the reader about ways in which to mitigate against climate change. As a result, Robinson's novels insist upon a revision of the current status quo, demanding that readers position themselves alongside

Robinson's views, whereas Martin's novels present an alternate vision of potential relationships between humans and the environment.

What this shows is a tension between didacticism and what Hume calls "delectation" (100); these are features not dissimilar from Scholes's sublimation and cognition. Martin's work, and the literature of vision in general, provides entertainment through the use of fantasy to make reality appear "new and different" (Hume 100) after reading, a technique that allows it to "free us from our automatic filtering and makes us freshly aware of our vision of reality" (100). Ecological themes in Martin's work call attention to the ways we think about the environment, as a geopolitical factor, a driver of culture, a stressor in social systems, and potentially a source of transformative relationships with nonhuman beings. The novelty of the images, like the spectral Others or the transcendent greenseeing sections, breach the reader's emotions to disturb assumptions about climate and the environment.

However, these novels do not attempt to educate the reader, to approach with logic the challenge of climate change. Robinson's novels, like others of the literature of revision, want "a stronger commitment" (Hume 57) to addressing climate change. The fantastic images of Martin's series are absent here, as the novels blend strong mimetic qualities with a quite pertinent speculation: what if a rapid climate change trigger event occurred soon? They educate the reader on the science of climate change, albedo and the feedback loop of warming, and of methods to mitigate against the damage we have done. As a result, Robinson challenges the reader to alter actual behaviour. However, the novels make light use of the fantastic, and in a way they may struggle to keep sceptical readers engaged, since this form of literature may lack the defence-piercing newness of fantastic visions. The form of engagement asked for by the two literatures is therefore different for ecological themes.

This study has been far from exhaustive, leaving unexamined many other texts which exhibit the range of Hume's positions. If this study were to be taken further, the literature of illusion might also be analysed; although it offers neither the challenging discomfort nor the requirement for engagement with the world that the other three positions do, the potential (if any) for ecological themes emerging from escapism may be worth further examination. Indeed, it would be valuable to move beyond the limits of the studied authors in this thesis. All three authors are white, American men. The use of fantasy from widely different subject positions for ecological ends would be an important further step in this field; it is worth noting already the many studies of Ursula La Guin and Margaret Atwood, whose fantastic novels like *The Dispossessed* (1974) and *Oryx and Crake* (2003) both engage with environmental themes. South African author Karen Jaye's *For the Mercy of Water* is another

text that grapples with water scarcity. These are a few examples of texts from other locations and subject positions worthy of critical study as part of the rising interest in the many forms of fantastic literature worldwide, alongside growing emphasis on environmental awareness.

Ultimately, the study of the fantastic as a device for ecological writers grapples with the tension between potentially unsuccessful attempts at didactic reasoning and emotive visions that do not demand the same level of ecological commitment from the reader. What emerges from this is that novels which encourage readers to engage with real-world environmental and climatological issues offer stronger potential for transformation. While the critical, anti-utopian stance of Herbert's novels is challenging, demanding that the reader break down the myths of ecotopian futures achieved through scientific mastery and knowledge, the *Dune Chronicles* finally offer no support for the reader to re-engage with real world climate issues. The literatures of vision and revision, in other words, drive engagement with the pressing issues of climate change and other ecological problems, but do so through different means. In the end, what is required is a negotiation of these drives, to engage the reader through fantasy in images and visions, or to use fantasy to make palatable and engaging a kind of ecological didacticism. This shows the profound usefulness of fantasy, as a source of new viewpoints on ecological issues as well as a snare for "the story and its values" to hold readers even if they "disbelieve the author's premises" (122). Through these drives, ecological fiction can engage even the sceptical reader through differing uses of the fantastic.

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