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Galeković, Filip

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**THE EVOLUTION OF FREE WILL IN FRANK
HERBERT'S DUNE**

Filip Galeković

Rijeka, 2020

University of Rijeka

Faculty of Humanities and Social Sciences

Department of English Language and Literature

The Evolution of Free Will in Frank Herbert's Dune

Student: Filip Galeković (MBG: 0009070096)

Mentor: Prof. Lovorka Gruić-Grmuša, PhD

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Abstract

The topic of free will is a very complex one, no matter what context one might put it in. In contemporary terms, its existence is as of yet undecided, and it is unclear whether we will ever be able to offer a satisfying conclusion to the matter. What we can do, however, is to discuss free will in a more easily digestible frame of reference, like that of Dune. Being a science-fiction novelist, Frank Herbert had the opportunity to play around with a number of interesting topics, and it is my goal to discuss a very particular one: determinism.

By describing Dune as deterministic, I will create a framework for the central problem of this thesis: is it possible for a deterministic subject to develop free will? The notion that something like free will might arise in a purely deterministic universe is a curious one, not least because it is not something we often come across. However, at a certain point in the series, the human race undergoes a qualitative change in existence, with the implication being that it had transcended the deterministic universe in which it had no real agency up until then. This process will be explicated and expanded upon with a variety of sources from renowned philosophers and Herbert's writings. It is important to note that I will presuppose Herbert's idea of *prescience* as the clear signifier of a deterministic universe.

Before the issue is presented in-depth, I will first provide two main pillars for the argument to rest upon. The first is determinism itself: a historical and contemporary discussion of the matter. The second is a short summary of Dune's relevant narrative threads. These two features will combine into one comprehensive whole, which I will use to discuss how free will may have developed in the universe of Dune.

Keywords: Dune, determinism, free will problem, science-fiction, meta-narrative

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1 Free Will and Dune

1.1 Introduction

The goal of this first section is to present the given problem in very broad terms. I need to establish what we know about free will in general and in Dune, and relate how and why this information is crucial in concluding the nature of Frank Herbert's most popular body of work. Following a short overview of the framework of this thesis, I will offer a number of examples from Dune itself that will help prove its deterministic nature. After enough context has been provided, I will begin with a granular dissection of determinism and Dune, cross-referencing information as it becomes relevant.

1.2 Free Will in a Deterministic Universe

The philosophical idea of free will is diametrically opposed to the determinist view of the universe. According to the central tenet of determinism, all behavior has a cause and is, therefore, preconditioned in some way that may or may not be apparent to us. This means that free will cannot exist in one such universe without major modifications to its definition (Kane 2005, 69). Determinist philosophy says that all events - including moral choices - are predetermined by those events that came before them (Britannica, Determinism 2020). A solid - if extreme - example used in works discussing determinism was that of the Columbine massacre (Kane 2005, 68). Having taken place in 2000, Columbine was one of the most horrific acts of terror ever to have happened in the United States. Two young men, Eric Harris and Dylan Klebold, entered their school equipped with a variety of firearms and began

to hunt for and gun down other students and teachers. One of the theories surrounding this incident suggested that it was violent media that conditioned them to such an act: video games and movies, for the most part. The obvious retort to this is that virtually everyone is exposed to violent media nowadays, yet few people ever get the idea to go out and murder others in cold blood (Kane 2005, 68). Harris and Klebold were also fairly starstruck and wanted to become famous. Could this, perhaps, have led to some demented desire for brutality and violence? Determinism concludes that a generalization such as this has no place in any serious discussion: *“We all bring different backgrounds, histories, experiences, and temperaments to every situation; and it is naïve to think that people have free will simply because they act differently in similar circumstances.”* (Kane 2005, 69). Hard determinism exalts a human being from any real consequence for their actions, metaphysically speaking. This is the case because, when presented with a choice, there is only one thing a person can do, given all the factors that led to them being who and what they are. (Hodgson 2002, 86) The word of law held Harris and Klebold responsible for what they had done, but if we regard them from a determinist perspective, we need to bring the idea of responsibility into question. Whether day-to-day decision-making and behavior account for true human agency at a metaphysical level is an open question. In practical terms, however, if we were to discuss a deterministic universe for the purpose of this thesis, the popular conclusion is that it does not. (Pereboom 2001, 135)

Presupposing determinism, if there were to be a creature with perfect knowledge of the past, it necessarily follows that it would also have perfect knowledge of the future. This is not magic, but a simple case of following the causal chain of events and seeing what it leads to.

One such creature is known in philosophy as Laplace's Demon¹, and it ties in very neatly with the overarching discussion of Dune in this thesis.

Considering everything I have mentioned above, it is safe to make a conclusion that will be very relevant in the coming lines. In determinism, we are presented with a mirroring situation: knowledge and understanding of the past lead to knowledge and understanding of the future. Curiously, this is a major theme in Dune from the very start. For the sake of context, let us briefly touch on the topic of Dune's Bene Gesserit (Herbert, *Dune* 94%) - a powerful shadow organization exclusive to transhuman women. More details on Bene Gesserit will be provided later on, but what is relevant right now is their ability to access the so-called *Other Memory* (Herbert, *Children of Dune* 20%). The term describes one's access to the complete set of memories from all of their female predecessors. Ordinary Bene Gesserit operatives cannot gain access to the memories of their male ancestors for reasons left unclear, which is at odds with their otherwise transhuman abilities. For example, altering one's body at a genetic and chemical level is commonplace among the Bene Gesserit, to such an extent that they can even affect the biology of their unborn children. However, since they cannot complete their understanding of *Other Memory* with access to only their female ancestry, unlocking this inaccessible male portion of their genetic memories is a major driving force behind everything the Bene Gesserit order does. Coincidentally, it is possible to make a direct connection with determinism here.

¹ Laplace's Demon is the first proper articulation of causal and scientific determinism, as per Pierre-Simon Laplace's explanation. If said Demon knows the precise location and momentum of every irreducible part of the universe at any given point in past and present, it can "calculate" every possible outcome of their interactions in the future. (Laplace 1951, 4)

It has been established that the proverbial Demon posited by Laplace needs to have full access to *all* the information preceding the present in order to know the future. At the start of Herbert's tale of Dune, Bene Gesserit can only see the female side of history, making a precise description of the future impossible. To alleviate this problem, they need the *Kwisatz Haderach* (Herbert, *Dune* 96%), a messiah that could see the entirety of *Other Memory* and thus be used as an accurate predictor of future causation. Therefore, for the purpose of this thesis, we could equate *Kwisatz Haderach* with a version of Laplace's Demon. A more detailed analysis of these (and other) actors and their motivations will be forthcoming. First, however, I need to establish the idea that the universe of Dune is deterministic in the first place.

1.3 Why is Dune deterministic?

At no point in any of his Dune novels does Frank Herbert outright say that Dune is deterministic. This means we need to draw our own conclusions about this universe from the way characters and events develop, and from what world-building information we are privy to as readers. A brief overview of some of the key events of Dune is now in order.

Starting with the first book in the series, Paul Atreides is the single son of Duke Leto Atreides and his Bene Gesserit concubine, Lady Jessica (Herbert, *Dune* 1%). The primary goal of Bene Gesserit of this era was to bring about the birth of the all-knowing *Kwisatz Haderach* to better control the human extrasolar empire. They had been attempting to do so via their carefully-orchestrated breeding program; one that had been progressing for thousands of years before the events of Dune. Lady Jessica was supposed to give birth to a girl, who would

in turn eventually become the progenitor of the said messiah. Instead of following the plans of her employers, however, Lady Jessica acted upon the wishes of her Duke, providing him with a son. This foil is made obvious very early on, as the first pages describe plainly that *Kwisatz Haderach* may have arrived one generation too soon (Herbert, *Dune* 3%). An entirely fresh reading of *Dune* may suggest that Herbert wishes to undermine determinism from the very start, given the almost heroic individuality displayed by both Paul and Lady Jessica. The protagonist is immediately put in the position of dismantling the expectations of an immensely powerful organization, with the implication being that this is not to be taken lightly. The author is, however, far more interested in striking a balance between the two ontological extremes I established at the start. For the most part, *Dune* teeters between historical determinism and personal free will (Ower 1974, 129), though I will explain later why the issue may be more complex than that. The basic narrative thread of Paul being a free-willed protagonist develops over the course of the next few chapters alongside Atreides' acquisition of the planet Arrakis, which is the sole source of Spice Melange in the known universe.

After the successful assassination of Duke Leto Atreides, and a botched attempt at the murder of Lady Jessica and Paul, the two begin to embed themselves among the Arrakian Fremen natives (Herbert, *Dune* 33%). They do so by exploiting ancient Fremen mythology that had been planted by Bene Gesserit themselves many generations ago, specifically for their operatives to use in case of dire need (Herbert, *Dune* 70%). Herbert slowly works on redefining Paul - who takes up the Fremen name of Muad'Dib - as a fixed religious figure, taking away what we might understand as free will from him. The mechanism through which this is accomplished was described very precisely by Jean-Luc Nancy in his disassembly of

the heroic trope: “*Here the mythic hero - and the heroic myth - interrupts his pose and his epic. He tells the truth: that he is not a hero, not even, or especially not, the hero of writing or literature, and that there is no hero, there is no figure who alone assumes and presents the heroism of the life and death of commonly singular beings.*” (Nancy 1991, 79) In relation to this, I must mention *prescience*: the ability to see into the past, present, and the future at the same time. In Paul’s case, prescience is brought about by prolonged and excessive exposure to Melange on Arrakis, as the Spice is a powerful psychotropic. Many different types of transhuman beings could gain a limited sense of prescience (Herbert, *Dune* 87%), like spacecraft Navigators, computer-like Mentats, and even Bene Gesserit operatives. However, it was always clouded by the lack of a complete set of information about the past. Going back to the idea of a determinist Demon from the previous chapter, none but *Kwisatz Haderach* could access all of this information, making *Dune*’s version of the messiah crucial for long-term predictions of the future. Paul is eventually afforded this precious insight, and he discovers that his choices and the choices of his ancestors had already set everything into motion (DiTommaso 1992, 319). This is a major argument for the idea that *Dune* is set in a determinist universe. Given everything Herbert tells us about prescience (Herbert, *Dune* 55%), we can all but confirm that *Kwisatz Haderach* is an almost literal personification of Laplace’s Demon. If this is the case, and if complete prescience is the ability to see causal relations between everything of relevance, weaving them into possible future outcomes, what does that suggest about the universe of *Dune*? Could true free will, as established in popular philosophy (Britannica, *free will* 2020), exist in a universe where a *Kwisatz Haderach* can accurately predict the far future via their access to the causal chain of events? If we were to speak about some other science-fiction or fantasy universe, we could arguably ascribe this to magic, or some sense thereof. However, Frank Herbert went to great lengths to provide

chemical, biological, social, and genetic explanations to those transhuman abilities and technology he deemed worthy of explanation. It is a very reasonable assumption that there is no magic in Dune (Herbert, *Dune* 2%), and that prescience is, instead, a purely mathematical ability: an unfathomably complete analysis of cause-and-effect (Herbert, *God Emperor of Dune* 3%). If this is possible, truly unfettered free will is not. At least, established real-world ontology claims this to be the case.

Herbert stops presenting Paul as a traditional hero when his prescience unlocks in full: following a number of actions we could describe as ‘heroic’, Paul attempts to reject his own fate. At no point in time does Herbert suggest that, by becoming fully prescient, Paul would somehow become *unhinged* from the causal chain of events. Quite the opposite, after seeing what his actions would bring about, Paul falls into despair for not being able to change them: “*His entire future was becoming like a river hurtling toward a chasm - the violent nexus beyond which all was fog and clouds.*” (Herbert, *Dune* 71%) The majority of Paul’s prescient experiences are rather traumatic for him, which further underlines his helplessness in this regard:

“And what he saw was a time nexus within this cave, a boiling of possibilities focused here, wherein the most minute action—the wink of an eye, a careless word, a misplaced grain of sand—moved a gigantic lever across the known universe. He saw violence with the outcome subject to so many variables that his slightest movement created vast shiftings in the pattern.” (Herbert, *Dune* 54%)

By the end of the first book of Dune, Paul had ascended to the throne of the human extrasolar empire, as well as starting a galactic jihad that would last twelve standard years and result in

the conservative in-universe estimate of 61 billion deaths, as well as the complete sterilization of 90 planets, among other unimaginable horrors. Paul was aware of this information as soon as he had gained complete prescience, yet he could not escape from his predetermined fate (Herbert, *Dune Messiah* 99%). Originally set up as a traditional adolescent hero (Bank 1969, 1019) and a literal messianic savior, Paul Atreides is eventually shown to be a very unwilling pawn of the causal relation he could not ever hope to avoid, even as a *Kwisatz Haderach*. By the time Paul had become prescient and aware of what he would be a part of, it was already far too late for him to change anything of importance. Herbert explained his premise well in one of his interviews with LA Weekly:

“Charismatic leaders — not necessarily Messiahs, but Messiahs included — tend to create explosive upheavals in human societies that are very dangerous to individuals and to the societies themselves, because they create power structures. So you get these centers of power and it doesn't matter a damned bit how pure and good the hero is. By just being he creates a power structure and so it's like a magnet: the iron filings, the corruptible, come in and things are done in the name of the leader — as they were done in Christianity, in Islam, in Buddhism, in all major religions and lesser religions.” (Stine 1985, 19)

The plan was always to depict the creation of Paul Atreides' Muad'Dib as something innately negative, but necessary for the continued survival of mankind for reasons we are not immediately provided with. Since Paul became prescient and saw everything that his ascension would bring about, disapproved of it, yet could not act to stop or diminish its effects, we can surmise that changing things was epistemically impossible at that point in time (Pereboom 2001, 138). In other words, Paul Atreides was always going to become the

Fremen messiah, and the Fremen were always going to rampage across the known universe in the name of Muad'Dib. From Paul's perspective, he did not wish to act the way he did, but had to, if humankind was to survive. This makes Paul's situation parallel with that which is posited by soft determinism: he was free in the sense that he could act only according to his preconditioned nature (Kane 2005, 148).

The series' fourth book is when Dune's determinist undertones become clearest, following a jump of 3,500 years into the future. At this point, Leto II, son of Paul Atreides, had already entered a symbiotic relationship with the sandworms of Arrakis (Herbert 2003, 3%), and began to follow the so-called *Golden Path* to a far greater extent than his late father ever did. The *Golden Path* was a singular term for the causal path humanity had to take in order to survive a future threat that had not yet been revealed. Both Paul and Leto II could see the *Golden Path*, but it was only the hybrid consciousness of a prescient Leto II and the ancient sandworms that had the capacity to realize this in its totality. (Herbert 2003, 5%) Leto II was a tyrant far worse than any that had come before, micro-managing humanity from his throne on the terraformed Arrakis. With powerful psychotropics such as Spice now outright forbidden for general consumption, Leto II was attempting to push humanity towards transhumanism without relying on technology and easily controllable resources (Herbert 2003, 11%), and his own prescience - far more potent than that of Paul - was the baseline for this process.

Being an all-knowing *Kwisatz Haderach*, Leto II had the ability to follow every line of causal relation all at once. His primary objective - the *Golden Path* - was to breed humans who could exist outside of prescience. However, if prescience is absolute, and the accuracy of

Paul and Leto II's predictions of the future suggests so, how could there be anything outside of it? Through hundreds of years of technological trial-and-error and a modified version of the Bene Gesserit breeding program, Leto II eventually managed to force evolution in this regard. There are two notable results, first of which are *no-ships* and *no-technology* in general, which are masked from the causal chain of events and, therefore, prescience itself (Herbert, *Heretics of Dune* 7%). The second and more important result is that of a human lineage that is invisible to prescient entities, the progenitor of which was Siona, Leto II's pupil, and his eventual killer (Herbert 2003, 3%).

In broader terms, it fits that having a centralized seat of power for mankind is inherently dangerous, and that the mere notion of it is something that Leto II wishes to eradicate. A singular decision-making nexus eventually becomes almost mathematically predictable (Van Kampen 1991, 279), which is a problem for the *Golden Path*. The final consequence, if Leto II were to not follow this plan, was made obvious with the revelation Leto II gave to Siona in *God Emperor of Dune*:

“The seeking machines would be there, the smell of blood and entrails, the cowering humans in their burrows aware only that they could not escape . . . while all the time the mechanical movement approached, nearer and nearer and nearer ...louder...louder! Everywhere she searched, it would be the same. No escape anywhere.” (Herbert 2003, 82%)

The great threat that the Golden Path was preparing humanity for were Thinking Machines. Either those that had survived the Butlerian Jihad (Herbert, *Dune* 95%) thousands of years before the first Dune novel took place, or some new threat that humanity would inflict upon

itself. Computational entities with immediate access to all the information from the past, each of these machines would be fully prescient and capable of predicting where their targets would be at any point in time. The only way for humanity to survive this would be for it to become unhinged from the causal chain of events and completely unpredictable. In other words, humans of Dune needed to develop true free will, or something most similar to it.

As I noted at the start of this chapter, there is no singular feature of Dune that would plainly show whether we are dealing with a determinist universe. We can, however, surmise that this is the case from what evidence is provided above. If this is not determinism as we describe it, Dune is at the very least similar enough that we can speak about it in equivalent terms. The same goes for the strange affinity to avoid prescience which Leto II fostered in humanity: if it is not free will, it seems functionally similar and roughly equivalent regardless. This qualitative change in the nature of humanity makes for the crux of this thesis.

2 The Philosophical Discussion of Determinism

2.1 Historical context and fundamentals

The discussion of determinism has been ongoing for decades, slowly growing to become one of the most important philosophical questions ever conceived. In fact, the ‘problem of free will’ is no single question, but rather a collection of matters that are viewed through a prism of the given context (Kane 2001, 4). In effect, when we speak of free will, we relate to topics such as moral responsibility and agency, accountability, blameworthiness, and human freedom. However, deterministic philosophy is also connected to otherwise esoteric topics, such as the possibility of having foreknowledge of the future, and gaining access to absolute predestination. To some extent, all of these items are relevant to my analysis of Dune, and I will attempt to present them as such.

The theory of universal causal determinism originally came from the Stoics of Ancient Greece, who posited that determinism was essentially equivalent to fate. (Bobzien 2002, 2) According to Bobzien, “*Stoic physics stands out in antiquity not so much because it is a deterministic system, but because it contains a worked out theory of universal causal determinism.*” (Bobzien 2002, 33) Even that early on in the history of philosophy, the idea of there being a predetermined causal line that humans could (hypothetically) follow, was enticing. Reports written by Cicero claim that Chrysippus presented the idea that nothing can happen without something causing it to happen, and though this notion is all but commonplace in deterministic discussion nowadays, it was a very original thought thousands of years ago (Bobzien 2002, 39), It is no accident that this idea of causation and causal

relation, simple as it is, remains relevant today. In slightly more modern terms, it is worth pointing out that determinism is often highly dependent on Newtonian physics: Laplace's Demon is a prime example of this being the case (Laplace 1951, 4). As soon as the starting conditions of a given universe are set, an intelligent and knowledgeable enough being would necessarily be able to produce perfectly correct predictions of the future.

A very interesting and relevant view of determinism comes from game theory. Chess, in particular, which is an obviously deterministic game, as it has no chance element included, aside from the original color choice (which of the two players makes a move first). From that point on, both players have a perfect set of information about the board at any given moment, and the only possible error comes from one's interpretation of the given set of data. (Shannon 1950, 3) We can draw a parallel with life in this case. If life was a game of highly-advanced multi-dimensional chess, with players (individual human beings) being perfectly aware of all the information that they were presented with, they would be able to predict the future and lead the universe to a win state, from their perspective. *Dune's Kwisatz Haderach* is one such perfectly aware player of chess.

2.2 Honderich on Determinism

Ted Honderich is one of the most prominent philosophers of determinism and free will in the contemporary scene. His work espouses using neuroscience and psychology to formulate new conclusions about human free will, and is generally a very innovative way of looking at the given problem. For example, Honderich believes that he has managed to

overcome both the compatibilist and the incompatibilist stances on free will², simply by embracing two separate definitions of human freedom at the same time.

As per Honderich's claims, there are two attitudes related to freedom that are innate to every human being. The first is that one can have a positive disposition towards the totality of their future: they don't hope to be alone, imprisoned, or permanently bed-ridden, but the exact opposite. Humans are driven by the notion that things will turn out in accord to their hopes and dreams, and it matters very little whether it is determinism or free will that leads to this outcome. (Stangroom 1999, 43) The second attitude relates to one's ability to overcome their past mistakes and faults. This necessarily presupposes that our future is not fixed and written in stone, because this kind of hope would be futile if that were the case. (Stangroom 1999, 43) Honderich claims that the fact that humans can harbor these two hopes at the same time means there is more to determinism and free will than popular literature might initially suggest.

“Both these ideas are within us. If that is true, then both compatibilism and incompatibilism are false. They are both false because they agree in one thing - that each of us has one single conception of a free action. The compatibilists say that it is voluntariness and the incompatibilists that it is voluntariness plus origination.” (Stangroom 1999, 44)

Since humans - according to Honderich - harbor two separate ideas of freedom simultaneously, one of them in opposition to compatibilism, and the other in opposition to

² Compatibilist and incompatibilist arguments about free will discuss whether free will and determinism are mutually compatible and logically consistent. Compatibilists claim that they are, while incompatibilists believe otherwise.

incompatibilism, this means neither interpretation can truly be correct. *“The real problem of determinism is living with and somehow emerging from the situation where we’ve got two conceptions of freedom and they enter into important attitudes that we have - our life-hopes and a good deal more,”* claims Honderich. (Stangroom 1999, 44)

Most interestingly, Honderich espouses something he calls “near-determinism”. He does not discount the idea of there being indeterminate processes taking place at a subatomic level, but claims that they may not partake in a human being’s mental cause-and-effect: *“If it really were accepted as true that a random³ event could get in between the question and the intention, with great effect, then it would have to be accepted that one could get in between the intention and the lie, with as much effect. Any attempt to exclude the possibility is bound to be fatally ad hoc,”* he claims. (Honderich 2005, 125) It is this notion of near-determinism that will play a major role in my explanation of Dune’s evolving free will.

2.3 Nagel on Determinism

If Honderich aims to find common ground between the natural sense of free will and an apparently deterministic reality, Thomas Nagel takes a stance that is, in some ways, opposite. *“The history of the subject is a continual discovery of problems that baffle existing concepts and existing methods of solution,”* he said. *“We are in a sense trying to climb outside of our own minds, an effort that some would regard as insane and that I regard as philosophically fundamental.”* (Nagel 1986, 11)

³ i.e. quantum

According to Nagel, arguing that the issue of free will and/or determinism is impossible to resolve is not enough. *“Most of us find it hopeless some of the time, but some react to its intractability by welcoming the suggestion that the enterprise is misconceived and the problems unreal. This makes them receptive not only to scientism but to deflationary metaphilosophical theories like positivism and pragmatism, which offer to raise us above the old battles.”* (Nagel 1986, 11) Nagel views the problem of free will through the lens of autonomy and responsibility, explaining that the issue comes not from the verbiage we use to explain the problem, but rather from how we feel about it. We struggle with determinism because, if it were true, we would have to do away with our preconceived notions of agency, and be at constant unease with what we “choose”. No action of ours would, ultimately, be our own. (Nagel 1986, 112)

Nagel is of mind that the internal or subjective view of any given human contains something irreducible and potentially agency-providing: *“I think the only solution is to regard action as a basic mental or more accurately psychophysical category — reducible neither to physical nor to other mental terms. Action has its own irreducibly internal aspect as do other psychological phenomena,”* he said. (Nagel 1986, 111) Therefore, Nagel claims that a human being’s personal and subjective perspective has something in it that is impossible for an objective viewer to analyse, for the lack of a better word.

2.4 Modern determinism

The classic, baseline definition of determinism - as has previously been established in my thesis - is that all behavior has a cause and is therefore preconditioned in some way. In

more contemporary terms, however, determinism has been related with quantum mechanics (Vaidman 2014, 5). Quantum events are inherently random and/or impossible to observe without affecting them. This makes them essentially unknowable through the lens of classical mechanics. If that is correct, and the popular interpretation claims so (Britannica, *Quantum Mechanics* 2020), this presents a major issue for determinism as it is traditionally described. In most cases, those who reference the quantum theory of physics argue for nature's innate randomness. For example, classical mechanics are entirely adequate for the description of ordinary physical events, such as the flipping of a coin. If we were to consider all the forces and torques that come into play when a coin is flipped, we would conceivably be capable of predicting which side the coin would land on. The event itself may seem colloquially random, but it could be analysed, if we had the tools to measure each and every aspect of the flip. On the other hand, describing the radioactive decay of some material is outright impossible using these same principles. Classic mechanics presupposes that perfect knowledge of the initial conditions can only ever lead to perfect knowledge of the final outcome. This is not the case with the decay of a nucleus, which seems irreducibly indeterministic, according to Heisenberg's uncertainty principle⁴.

It is Heisenberg's uncertainty principle in particular that led to the consideration of quantum theory as something that opposes causal determinism (Vaidman 2014, 8), making it the main premise for the contemporary argument for nature's apparent (quantum) randomness. "*The argument of Heisenberg for indeterminism was that determinism as a starting point has a complete description of a system at the initial time. Inability to prepare the system with*

⁴ According to Heisenberg's uncertainty principle, the precision with which we can predict the position of a particle is diametrically opposed to the precision with which we can predict its momentum. In other words, the more precisely we can describe a particle's position, the less precisely can we describe its momentum. (Heisenberg 1949, 15)

precise position and momentum does not allow precise prediction of the future.” (Vaidman 2014, 9) At the most basic level, quantum considerations indeed do not allow for a concrete description of the initial state of a given system, making the baseline interpretation of determinism completely useless at this level. However, I believe it is possible to combine this idea with certain deterministic features presented by Honderich and Nagel, so as to form a theory of evolving free will. At least, one that applies to Herbert’s description of the fictional universe of Dune.

2.5 Indeterminism

Indeterminism is the belief that no outcome is certain, and that any given event relies on probability, rather than on something that had been outright necessitated by previous events. It was Popper who put indeterminism in its simplest terms: *“Indeterminism - or, more precisely physical indeterminism - is merely the doctrine that not all events in the physical world are predetermined with absolute precision.”* (Popper 1972, 220) Indeterminism is also the necessary prerequisite for the existence of free will, though it is not clear what other conditions need to also be fulfilled. (Stanford Encyclopedia of Philosophy, *Incompatibilist Theories of Free Will* 2020) Entities operating under the principles of indeterminism are the ultimate originators of their actions (they *will* their decision into being), whereas those that operate under the principles of determinism are merely the latest link in an ongoing causal chain. This idea is very much at odds with Dune’s original presupposition of prescience, though I intend to prove that this changes in Frank Herbert’s *God Emperor of Dune*.

3 A Historical Overview of Dune

With multiple diverging and converging storylines, many of Dune's relevant causal chains come in and out of focus as the novels proceed. Often, the timespan between the inception of a given causal chain and its apparent conclusion is thousands of years apart. This makes keeping track of specific events and their eventual ramifications a difficult task, though one that is of utmost importance for my thesis. The goal of this section is to present certain items of interest that are crucial for the discussion of determinism in Dune. This will also allow me to prepare the argument of Dune's seemingly impossible evolution of human free will more easily, as the terminology Herbert opted for is notoriously complex and layered. Before going further, however, I must establish the limits of the subject matter that I am working with. After Frank Herbert died, his son, Brian, took over the franchise, releasing numerous additional novels in the years since. My thesis will disregard these developments and focus primarily on Frank Herbert's own body of work. More specifically, the novels of Dune, Dune Messiah, Children of Dune, God Emperor of Dune, Heretics of Dune, and Chapterhouse: Dune. The reasoning behind this is that the tone and narrative developments present in Dune change drastically following the takeover. Similarly, Brian Herbert's rewriting and retrofitting of his father's work (Wolf 2012, 275) is another major issue for an in-depth analysis such as this. Focusing only on Frank Herbert's own books allows for a clear and pointed analysis of the given matter, whereas considering the work of another author would disqualify one such attempt.

3.1 Butlerian Jihad

One of the most important events of Dune is the Butlerian Jihad, which had grown to define the universe in every sense (Herbert, *Dune 2%*). Dune is unique for its almost complete lack of advanced technology that would rely on artificial intelligence, which is a direct consequence of this Jihad. In Dune, Herbert often wrote about reality-warping tools, weaponry that could burn through rock, and space-travel that is faster-than-light, but all of that is built to make good use of human and transhuman agents, rather than any sort of artificial intelligence. This is well-established in the fictional history of Dune, rather than being some simple quirk the writer wished to implement. The Butlerian Jihad was a total purge of all artificial intelligence from human technology, upon which this rendition of far-future humanity had become overly reliant on. The specifics of it are not stated in Frank Herbert's own novels, though we do know that the event was rather traumatic for mankind, and that it was spurred by an AI's decision to abort the pregnancy of one Jehanne Butler (McNelly 1984, 141). Following this event, the death of Butler's unborn daughter enraged humanity at large, fostering a new era of zealous fervor for mankind. From Butlerian Jihad came the Orange Catholic Bible (McNelly 1984, 404), the primary directive of which is: "*Thou shalt not make a machine in the likeness of a human mind,*" and which is often quoted by various major characters in Dune. The topic of trusting an artificial intelligence absolutely (Rossi 2018, 127) is not foreign to modern philosophy, but it was driven to its extreme in Herbert's Dune. It was Butlerian Jihad that sowed an almost total distrust in technology for the people of Dune, leading them towards the creation of various transhuman factions I had mentioned at the start, such as Bene Gesserit and the Mentat order. Since the machines capable of computing space travel, strategy, and social science at a grand enough scale to

matter were now outlawed, humanity had no choice but to evolve to fill said niches organically.

The Butlerian Jihad took place about 12,000 years before Paul Atreides was born (Herbert, *Dune* 94%), during which period the artificial intelligence - thinking machines, as they are known in-universe - became little more than legend. The Ixian technocrats did, however, continue producing borderline heretical machinery, which was spoken about in hushed tones and fostered by Leto II in his sandworm hybrid stage. (Herbert 2003, 3%) Though the Butlerian Jihad did purge virtually all thinking machines, the implication that some yet remain had always been present. Especially in *God Emperor of Dune*, where Leto II directly references a future where humanity comes at odds with thinking machines yet once more. (Herbert 2003, 82%) The major difference is that humanity would no longer be in the position where enacting a Jihad against AI would even be possible. Instead, Leto II sees a complete subjugation and the eventual extermination of the human race. Given that one of the major themes of *God Emperor of Dune* is the importance of the Golden Path and the absolute necessity for the human race to become invisible to prescience, we can safely surmise that thinking machines are the great interstellar threat that humanity otherwise cannot survive. Given the obvious parallels between prescience and determinism (Moyal 1949, 310), we can also conclude that thinking machines must come equipped with highly-potent causality processors. If this enemy could fully understand and anticipate the moves of a determinism-bound humanity, there would be no hope of survival. Leto II and his Golden Path confirm this. The claims made in *God Emperor* can be interpreted through a game of chess. A playing field between humans and weaponized thinking machines would be equivalent to a situation where a human chessmaster plays against a perfectly-aware AI that

is incapable of making a mistake: no matter what the human does, the AI will outplay them eventually.

3.2 The notion of *Kwisatz Haderach*

A *Kwisatz Haderach* is the ultimate messiah in the war against the thinking machines of Dune, and a catalyst for the Golden Path. There is no single *Kwisatz Haderach*, as multiple examples of this phenomenon become apparent as Herbert's storyline progresses. For example, both Paul Atreides and his son, Leto II, grew to become such entities during their respective lifetimes, though to a different extent. From what I can conclude, the sole role of a *Haderach* is to bring humanity at large to long-term prosperity using the causal line of the Golden Path: the sole future in which thinking machines do not exterminate mankind. As I have previously established, it is this entity's innate propensity to fully comprehend and interpret the causal state of the universe that makes it as important as it is. A *Kwisatz Haderach* is the literal embodiment of the Laplacean Demon (Laplace 1951, 4), and a necessary foil to the thinking machines' equivalent of this concept.

The meaning of the term '*Kwisatz Haderach*' is derived from the language of Chakobsa: an ancient hunters' language (Herbert, *Dune* 51%) that has a real-world equivalent in Romani and various Caucasus languages - Persian, most prominently. (Blanch 2015, 5%) Bearing a literal translation in mind, it means '*Shortening of the Way*', (Herbert, *Dune* 24%) which fits well with the theme of Golden Path that Frank Herbert worked hard to establish. The second meaning of the term comes from a phrase of Hebrew origin: '*Kfitsat Ha'derech*', or 'קפיצת הדרך' which roughly translated in English to 'leap ahead'. The messianic qualities of a

Kwisatz Haderach are contained not only in the context of Dune, but also in the word's morphology. This entity shortens the way towards the survival of the human race, and it leaps ahead to ensure progress that would otherwise not be attainable.

What is important to note is that *Kwisatz Haderach* is not an unnatural or mutant creature on its own. Instead, the entity is brought about by a selective breeding of baseline humans (Herbert, *Dune* 82%), which Bene Gesserit themselves had been successful at. Leto II Atreides - the human and sandworm hybrid - was born a baseline, too, and had to consciously go through the process of melding with numerous sandworm larvae (Herbert, *Children of Dune* 93%). This, in turn, ensured his longevity over the next 35 centuries, which was crucial for the establishing of the Golden Path.

3.3 The notion of Golden Path

The Golden Path is the causal chain of events foreseen by *Kwisatz Haderach* entities that needs to be followed for humanity to stand a chance against the thinking machines' eventual return. *"It is the survival of humankind, nothing more nor less. We who have prescience, we who know the pitfalls in our human futures, this has always been our responsibility. Survival."* (Herbert, *God Emperor of Dune* 3%)

Though it has a valiant goal in mind, the execution of the Golden Path is nothing short of horrific: *"I promised them a lesson their bones would remember. I know a profound pattern which humans deny with their words even while their actions affirm it. They say they seek security and quiet, the condition they call peace. Even as they speak, they create the seeds of*

turmoil and violence. If they find their quiet security. they squirm in it.” (Herbert, God Emperor of Dune 44%)

Owing to his prescience, Leto II was aware of the fact that the humanity of Dune would go extinct when thinking machines came back, and his goal was to breed a human who would be invisible to prescience (i.e. existing outside the principles of determinism). “*A genetic predisposition for liberty,*” as Nicholas put it in his *Dune and Philosophy* analysis of the novels. (Nicholas 2011, 92%) “*Humanity could be tracked by prescience if it remained confined within the known universe of the Imperium. Leto II showed that mere abundance in population was not enough to protect the human race from complete annihilation—in his own regime, he demonstrated that humanity, by existing in an empire, could be controlled by a single interest.*” (Nicholas 2011, 10%) To combat this, Leto II put it upon himself to instill in humanity a powerful hatred for centralized rule. Over the course of several thousands of years, Leto II became known as the worst tyrant there ever was, and it was his eventual death at the hands of a prescience-immune assassin that cemented the Golden Path for good. “*Ultimately he sought to create in humans a new mimetic defense - just as other animals create camouflage to elude their predators, he selected the adaptation that allowed human beings to hide in time from prescient minds.*” (Nicholas 2011, 11%)

My thesis presupposes prescience as the clear signifier of a deterministic universe. Or, rather, as clear of a signifier as one could hope to get, especially as far as fiction goes. Therefore, for something to be invisible to prescience means it had somehow sidestepped the central tenets of determinism. Yet, this is intuitively impossible. Determinism either *is*, or it *is not*: it should not exist on a sliding scale. In a deterministic universe, the Golden Path would be a

self-defeating idea. An AI-operated Laplacean Demon capable and willing of exterminating humanity could conceivably do so, since it could anticipate our every move well in-advance. Yet, Leto II's causally invisible assassin proves that there exists *something* in Dune that can blindside perfectly-aware beings. If we look at this issue from the opposite point of view, in a universe where there exists free will, there can be no Laplacean Demon. The argument is self-explanatory: free will makes it impossible to predict what a person's definitive course of action will be. If that is the case, the potential Demon cannot determine the outcome with any certainty, making predictions of the future impossible. The problem of combining these two ontological concepts is obvious. However, it was Dennet who had an interesting idea that might apply to the universe of Dune, in particular.

"We live in a world that is subjectively open. And we are designed by evolution to be "informavores," epistemically hungry seekers of information, in an endless quest to improve our purchase on the world, the better to make decisions about our subjectively open future. The moon is made of the same sort of stuff that we are, obeying the same laws of physics, but its nature, unlike ours, is fixed."

(Dennet 2003, 93)

Leto II sought to foster evolution at a grand enough level to subvert stagnation and extinction, but it seems like this evolution may have been epistemic, rather than organic.

3.4 Thinking Machines

For the vast majority of Frank Herbert's books of Dune, the looming threat of thinking machines - the artificial intelligence - is seemingly irrelevant. It is only when Leto II Atreides shares his vision of a future where humanity fails to follow the Golden Path that Herbert shows what the true nature of the threat is. (Herbert, *God Emperor of Dune* 82%) There are two ways in which one could interpret the relevant passage, however. One is that a certain subset of thinking machines survived the Butlerian Jihad and escaped, only to return sometime in the undisclosed future. Alternatively, some faction of humans may yet develop true thinking machines that would eventually subvert and exterminate mankind. In fact, Leto II implies as much himself: "*The Ixians contemplated making a weapon - a type of hunter-seeker, self-propelled death with a machine mind. It was to be designed as a self improving thing which would seek out life and reduce that life to its inorganic matter.*" (Herbert, *God Emperor of Dune* 55%) Ixians are a technocratic sub-species of humans that rely heavily on technology that is borderline forbidden, and Herbert was careful to suggest that they might bring about a second Butlerian Jihad if they proceeded with the development of artificial intelligence. (Herbert, *Dune* 96%)

This suspicion that thinking machines (or something roughly equivalent to them) would eventually make a return to the universe of Dune is given even more weight in *Chapterhouse: Dune*, where a highly-militarized sect of humanity - Honored Matres - makes a reappearance in the Imperium. (Herbert, *Chapterhouse: Dune* 1%) Following the death of Leto II Atreides, humanity was free to scatter across the galaxy, evolving into various new factions and species of transhuman beings over the following centuries. (Herbert, *Heretics of Dune* 2%) Honored

Matres originated from Leto II's personal military force, making them more numerous and technologically advanced than any of the factions that remained in the Imperium. However, even a faction as potent as the Honored Matres had to run away from the threat that *Kwisatz Haderach* had envisioned thousands of years before. As of Chapterhouse: Dune, there was no concrete information on what, exactly, were the Honored Matres running from, and since Frank Herbert passed away a year after its release, the conclusion was left pending.

Whichever variant of thinking machines the Golden Path may be trying to avoid, its final goal remains the same: a certain percentage of humans needs to be capable of subverting prescience and determinism for them to stand a chance against the threat. The final words of Leto II were to explain that this goal was fully accomplished: "*I give you a new kind of time without parallels,*" he said. "*It will always diverge. There will be no concurrent points on its curves. I give you the Golden Path. That is my gift. Never again will you have the kinds of concurrence that once you had.*" (Herbert, *God Emperor of Dune* 99%)

4 Combining Dune, Determinism, and Free Will

This part of my thesis is going to put together all the disparate subjects and concepts I have previously written about. I will use determinist teachings of Nagel, Honderich, and several other prominent philosophers to present an argument for a determinist universe that also supports human free will. Since Dune is a fictional setting, this will be a layered thought experiment that may or may not apply to the reality that we ourselves exist in. Regardless, I believe the argument may lead to interesting discussions on the nature of free will, as well as to questioning the ontological qualities of an idea as perplexing as free will.

4.1 Prescience and determinism

Comparing Dune's concept of prescience with determinism is not a difficult task. From the variety of quotes and references provided in the novels, it is easy to surmise that prescience has determinism as its necessary prerequisite (Pereboom 2001, xiii). At its core, prescience is the ability that Laplace demonstrated with his Demon: a logical possibility for an entity to see into the future using its access to the complete set of information about the past. The 'Demon' entity needs to be aware of as much data as possible, in as great detail as possible, in order to become prescient. In the case of Dune's *Kwisatz Haderach*, this set of information includes essentially everything that ever happened: the totality of memories from each and every one of the *Haderach*'s predecessors. (Herbert, *Children of Dune* 30%) The only way for a Golden Path or its equivalent vision of the future to emerge from previous information is for determinism to be true in the given universe. Otherwise, an entity like the *Kwisatz Haderach* would be ontologically impossible.

One of the ways in which prescience can be achieved in *Dune* is through the use of awareness-spectrum narcotics, such as Spice Melange. (Herbert, *Dune* 87%) Most baseline and transhuman (and, indeed, post-human, too) beings in *Dune* can become prescient to varying degrees. Ingesting large amounts of Spice will unlock complete prescience in a *Kwisatz Haderach*, for example. A spaceship Navigator, on the other hand, will need to be completely immersed in Spice to be able to extrapolate safe routes for hyperspace travel. Similarly, a Bene Gesserit might become extremely aware of her surroundings, allowing her to “sense” emotions that others might feel in the near future. I have already gone in great detail on the specific prescience of a *Kwisatz Haderach*, but to bolster the relation between prescience and determinism, I will also offer the aforementioned examples of Spacing Guild’s Navigators and Bene Gesserit operatives.

The job of a Navigator is to captain their moon-sized spaceships through almost incomprehensible spatial distances of open space. Before the Butlerian Jihad, this job was relegated to thinking machines, but once these were rendered functionally extinct, humanity needed to start relying on transhuman beings in AI’s stead. Herbert did explain that a Navigator’s prescience is functionally equivalent to that of a *Kwisatz Haderach* (Herbert, *Dune* 93%), but far more limited in scope. A Navigator can fully plot the travel of their vessel over incredible distances, which means their prescience takes into account real-world information and uses it to come up with a future in which the vessel does not crash into a planet, or find itself barraged by free-floating micro-clutter of outer space. By now, I have already established that the prescience of a *Kwisatz Haderach* needs to be deterministic for

Herbert's story to make sense, and the fact that Dune's Navigators use this same ability (DiTommaso 1992, 316) with great success only underscores the argument.

In the case of Bene Gesserit, their operatives rely on observing otherwise invisible minutiae to successfully manipulate their surroundings and other people. (Herbert, *Dune* 1%) They are exposed to awareness-altering drugs such as Melange from early on in their lives, which affords them varying levels of prescience, depending on their status and rank among the Bene Gesserit. Whereas a Navigator can direct their comprehension of causality into the plotting of a safe route through open space, a Bene Gesserit instead uses the information from the world around her to gain deep insight into the social context she has found herself in. (Herbert, *Dune* 73%) This makes them incredibly potent manipulators and schemers, and the fact that Bene Gesserit essentially form Dune's interstellar shadow-government proves how successful they are.

With all of the above in mind, I can only surmise that the fictional ability of prescience must be related to the understanding of determinism that humans of Dune possess. However, as the case of Leto II Atreides shows, Dune also plays host to metaphysical predators that could eradicate humanity if they so desired, and they could accomplish this task by abusing prescience and determinism. (Herbert, *God Emperor of Dune* 82%)

4.2 Determinism as a tool and a weapon

Most of the truly relevant entities in Dune operate on a scale far grander than most baseline humans could even imagine. Causal threads that Herbert introduces in the first book

of Dune go thousands of years back, with one of the clearest examples being the Fremen religion. The idea of *Kwisatz Haderach* and his messianic appearance among the Fremen of Arrakis is not something their culture developed organically, however. Instead, it was the Bene Gesserit who planted these notions into the Fremen' collective subconscious, centuries before Paul Atreides was born. (DiTommaso 1992, 316) The way this process works is that Bene Gesserit infiltrators ingratiate themselves among the general public of a potentially valuable locale, and begin to preach about messianic figures that will come to save them at some point in the far future. This is done so that, in the case of emergency, Bene Gesserit operatives can incorporate the public's religious beliefs in their behaviour, and manipulate them to whichever end they desire. On Arrakis specifically, Bene Gesserit teachings were amplified by the Imperial ecologist, Pardot Kynes, who gave the Fremen hope that Dune would eventually become a garden world.

“As the Missionaria Protectiva (i.e. Bene Gesserit teachings) reinforces Fremen religious conventions, so too do Pardot Kynes' ecological views have a profound effect on the Fremen perception of their future: the former transformed an autochthonous Kwisatz Haderach-like idea into the concept of Lisan al-Gaib, the Voice from the Outer Worlds; the latter uses the latent Zensunni concept of the sihaya⁵ and fuses it with the open-ended predictions of dry-land ecology to generate a Fremen hope for paradise in three to five centuries' time.”
(DiTommaso 1992, 316)

⁵ *Sihaya* is the paradise to come; the promise of a better (if indeterminate) future. (Herbert, *Dune* 97%)

Had Bene Gesserit not planted these beliefs beforehand, Jessica and Paul Atreides would never have survived their first encounter with the Fremen, who were immediately prepared to draw their water⁶. (Herbert, *Dune* 51%)

This is a clear example of how potent a tool even mediocre knowledge of total causality can be. Granted, Bene Gesserit could not have known the exact results of the intermingling of their breeding program and Missionaria Protectiva on Arrakis, but they were aware of the usefulness of planting memetic ideas that may or may not become useful in the future. Though I present a deterministic view of *Dune*, the major factions' tendency to prepare the terrain for something they only vaguely understand is highly reminiscent of chaos theory. (Ekeland 1998,147) In fact, it is chaos theory that might offer an avenue for the combination of free will and determinism. Palumbo had already suggested as much: "*As early chaos theorist Doyne Farmer points out, the concept of such a chaotic system, which is both recapitulant and unpredictable, can reconcile free will with determinism. The system is deterministic, but you can't say what it's going to do next.*" (Palumbo 1997, 62) Considering the context, it stands that *most* entities cannot say what the system will do next, while those that have some level of prescience might subvert this predilection for chaos.

4.3 The breakdown of determinism in *Dune*

Up until *God Emperor of Dune*, the universe of *Dune* is presented as perfectly deterministic. I have provided a variety of references and events from Herbert's *Dune* novels that build the argument for this being the case. However, it is a fact that Leto II Atreides

⁶ To 'draw water' from someone in Fremen culture means to kill them, and exsanguinate their bodies for the fluids' distillment into drinking water. (Herbert, *Dune* 51%)

managed to breed a human that somehow avoids prescience. To reiterate in simple terms, Dune features both perfectly-aware Laplacean Demons and entities that subvert them. This statement is paradoxical, so the only conclusion that remains is that the ontology of Dune undergoes a qualitative, all-encompassing change at some point, switching from a deterministic universe into one that seemingly supports free will.

"I give you a new kind of time without parallels," he said. "It will always diverge. There will be no concurrent points on its curves. I give you the Golden Path. That is my gift. Never again will you have the kinds of concurrence that once you had." (Herbert, *God Emperor of Dune* 99%)

I believe that the key to this change must lie in quantum mechanics. Specifically, I subscribe to ideas first presented by Dennet and Honderich, with which they claim that the type of indeterminism that is necessarily present at a quantum level does not matter at a macroscopic level. *"QM (quantum mechanics) indeterminism would not involve macroscopic indeterminism of human action,"* interprets Kane from Dennet's writing, *"unless there happened to be something of the nature of natural Geiger counters in our brains, so as to amplify QM indeterminism to the requisite macroscopic scale."* (Kane 2005, 101) In other words, Dennet (via Kane) claims that quantum indeterminism could theoretically apply to human decision-making, if humans were to have the ability to detect and amplify its effects. I claim that this is the mysterious mimesis that Leto II bred humans for: the final step towards ensuring the Golden Path. In the same text as quoted above, Kane also explains that, with an ontological state such as the one described, we would never know whether a person was responsible for any given act or not due to the innate randomness stemming from quantum indeterminacy. (Kane 2005, 101) It does seem, however, that this apparent randomness would

serve as the perfect foil to a metaphysical predator that uses prescience in much the same way a wolf uses its sense of smell to hunt.

On a further note, there are a number of free will artifacts present in *Dune post-Emperor* to support my argument.

4.3.1 The Scattering

Following the death of Leto II Atreides, the human Imperium effectively fell apart, leading to a long period of reorganization and a system-wide compartmentalization of government. During this reorganization, a great number of human factions set out to leave the territories of the Imperium, and this grand exodus is what ended up being commonly referred to as ‘the Scattering’. (Herbert, *Heretics of Dune* 2%) The Scattering came as a direct response to Leto II’s generations-spanning rule of tyranny, where the vast majority of mankind remained forcefully planet-bound and policed: “*It is galling to be held in place against your will. This is why I teach about tyranny in the best possible way: by example.*” (Herbert, *God Emperor of Dune* 66%)

The ultimate goal of Leto II Atreides was always for humanity to attain a penchant for epistemological fluidity and individual decision-making that does not exist at the start of *Dune*. Herbert often injects his view that history exists as an infinitely-repeating wave-pattern (Stine 1985, 22) into his protagonists, most notably Leto II. (Herbert, *God Emperor of Dune* 39%) This historic pattern is endemic to the universe’s determinism, and the Scattering was the solution that Leto II had envisioned for it. Fjellman described this using the example of

double-binding⁷, where Leto II forced other characters (and humanity at large) to unknowingly resolve the default contradiction between free will and determinism. (Fjellman 1986, 51) This metaphysical process of forced evolution runs parallel - though at a different scale - to the series' "vitality struggle", which is, as DiTommaso put it: "*the conflict between the philosophy of the Imperium and that of Arrakis.*" (DiTommaso 1992, 313) If we were to go along with this explanation, the Imperium of man would represent the kind of entrenched determinism that Dune begins with, and Arrakis would be the new conception of free will that the Atreides' bloodline manages to usher into existence. With this in mind, the sheer act of "scattering" proves that Leto II was right. As the Imperium dissolves, entities both human and transhuman leave the system to create a new life for themselves, away from the tyranny that had beset them for thousands of years before Leto II died.

As I mentioned before, people do return from the Scattering in *Heretics of Dune*, centuries following their initial departure, and this brings about massive, systemic changes in the reestablished Imperium. (Herbert, *Heretics of Dune* 3%) This makes for yet another layer of the ongoing vitality struggle, but Leto II ensured that Siona's own prototypical causality mimesis had already spread among humans by that point, improving from one generation to the next. We never do get to see what type of prescient predator chased Honored Matres back into the Imperium, but we do know that humans would at least have a fighting chance if it followed them. (Herbert, *God Emperor of Dune* 99%)

⁷ The term 'double-bind' describes an emotionally-distressing situation in which person(s) are fed two or more conflicting messages, with one negating the other. The person(s) affected cannot resolve the situation, nor can they avoid it.

4.3.2 No-Ships and No-Chambers

Leto II may have been the first to foster an organic causality mimesis in humans, but the Ixian technocrats managed to do something similar beforehand, using the no-space technology. (Herbert, *God Emperor of Dune* 89%) The tyrannical Worm-Emperor was aware of its existence, in that he saw a “shadow” in his prescient vision. Though he could not deduce what went on in the Ixian no-chamber, its mimesis was not nearly as potent as that which Leto II himself would later force onto humanity. I will use this paragraph to note that there seems to be a qualitative difference between the technological and organic causality mimesis, at least insofar as it is presented in Herbert’s later novels. Namely, humans who have the genes designed by Leto II remain wholly invisible to prescient beings. On the other hand, objects and vessels using no-space technology become visible to certain individuals by the events of *Chapterhouse: Dune*. (Herbert, *Chapterhouse: Dune* 71%)

No-ships are yet another example supporting the idea that thinking machines might soon resurface in the Imperium of man. Whereas interstellar travel previously required a prescient Navigator to plot a safe course through the vacuum of space, no-ships could operate with no human input whatsoever. While it is not outright stated that no-ships house artificial intelligence, it is made clear that this new type of vessel does not require a Navigator for safe space-travel. (Herbert, *Heretics of Dune* 16%) The implication is obvious, considering the context. It may be that Frank Herbert planned for no-ships to be the first step towards a re-established threat of thinking machines.

4.4 Birth of true free will and acausality

According to Herbert himself, the very nature of the universe of Dune is open to change at every conceivable level. He presents this view through a line found in Leto II Atreides' journals: *"In all of my universe I have seen no law of nature, unchanging and inexorable. This universe presents only changing relationships which are sometimes seen as laws by short-lived awareness. These fleshly sensoria which we call self are ephemera withering in the blaze of infinity, fleetingly aware of temporary conditions which confine our activities and change as our activities change."* (Herbert, *God Emperor of Dune* 96%) If we take this to be true for the universe of Dune, then we are certainly left with enough room for the presupposition of ontological changes in the nature of humanity, which is what the switch from determinism to indeterminism (i. e. free will) implies.

I believe that Honderich's idea of near-determinism (Honderich 2005, 125) must apply. There is no denying the existence of quantum processes that are - to the best of our knowledge - irreducibly indeterministic (Kane 2005, 126). Yet, we cannot with any degree of certainty say whether the aspect of our world that is most relevant to us - that which is governed by classical physics - is deterministic or indeterministic. The fact that this discussion is still ongoing, and has been since time immemorial, is proof enough of that. In other words, the Newtonian sense of matter in motion describes what we can see and feel precisely enough for it to be considered true. Simultaneously, electrons make quantum leaps⁸ that do not conform to this theory at all. (Garrison 1988, 123) This may suggest a duality of some sort, where indeterminacy rules the quantum level of existence, while the principles of determinism

⁸ Abrupt switch from one discrete energy level to another, with nothing that could resemble a smooth "jump" between the two states.

remain valid at the surface level. This is the specific type of ontology I would ascribe to the universe of Dune, as well as ours. The difference stems from the fact that, in Dune, Leto II Atreides succeeds in breeding a kind of human that bridges the gap between quantum and classical physics. To use Herbert's own words, a prescient predator (Herbert, *God Emperor of Dune* 82%) would be completely oblivious to humans affected by quantum indeterminacy, and qualify the effects of their actions as acausal (i.e. outside the causal chain of events) from its perspective. A prescient artificial intelligence would surely find it difficult to fight a war against humans whose actions it cannot rightly comprehend. If Frank Herbert truly wanted to reintroduce thinking machines as the major threat to humanity in Dune before he passed away, the Golden Path would have proven to be an invaluable foil.

Potentially problematic for my explanation of the problem is the idea that, if we were to ascribe indeterminism to humans with Leto II's causality mimesis, it would be impossible to say whether their actions are a result of free will, or some indecipherable quantum randomization. I use Nagel's conception of the issue for this critique. (Nagel 1986, 112) My response to it would be that the problem is entirely irrelevant in practical terms. Herbert's Dune novels following the establishment of free will do not picture a randomized, senseless stream of events, and relevant characters remain true to their previous behavior. From what Herbert shows us, we can conclude that a critique such as that of Nagel will find no footing in this case.

5 Conclusion

Frank Herbert's novels of Dune stand as a testament to science-fiction literature. Deep, layered, and infinitely readable, the six original Dune books explore topics that are still uniquely relevant to us even today, and from a wide variety of angles that Herbert himself might not have originally anticipated. My goal for this thesis was to explore the unique relationship between the universe of Dune's deterministic faculties and its apparent evolution of free will: something that should, by all accounts, be ontologically impossible. Since Dune is a fictional universe, it provides the specific kind of context that is necessary for a thought experiment as strange and robust as this was. In my analysis, I have shown that something equivalent to free will might conceivably arise from conditions fostered by Herbert's fiction.

A series of comparisons and equivalences has been made which, as I have shown, can be construed as viable proof for something that seems entirely counter-intuitive at first. I admit that there is merit in the traditional juxtaposition between free will and determinism, such as what is presented in classical philosophy. However, I do believe that the latest revelations in areas other than philosophy must be taken into account. Quantum physics continues to unravel the natural world in ways which we could never have anticipated before, and I believe that this means the precise relationship between free will and determinism may be far more complex than we thought. My assessment of Herbert's Dune backs this notion, even if only in the context of a thought experiment.

Whether this is applicable to the real world, however, remains to be seen. There may yet be some interaction between quantum and classical physics that science has not presupposed,

and which could support extremely important and wide-sweeping changes to our current ontological theories. There is no telling what discoveries the future of quantum mechanics might hold, and I am of the opinion that topics such as these will grow even more popular over time. In more specific terms, the coexistence of quantum free will and natural physical determinism may be worth revisiting in the future. Provided, of course, that we keep in mind the caveat that my take on this theory does, in fact, originate from a fictional universe.

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