VILNIUS UNIVERSITY

FACULTY OF PHILOLOGY

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STUDY PROGRAMME

ENGLISH STUDIES

From Superposition to Sacrifice: Quantum Metaphors, Individuation, and Transformative Knowledge in Ted Chiang's *Story of Your Life* and Its Adaptation *Arrival*

Master Thesis

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Vilnius

2025

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Acknowledgements

I would like to express my gratitude to every professor I was fortunate to meet during my studies at Vilnius University.

I am especially thankful to my supervisor, Dr. Linara Bartkuvienė, for her steadfast faith in me. Throughout my life, I have met a few brilliant people who possess the rare gift of awakening something essential in their students. For a long time after school, I had not encountered anyone else with that gift – until recently. Above all, I believe it is the ability to truly understand, the willingness to talk about life and books, and a genuine care for who you are and where you're going – that is what we seek when we look for a teacher.

My sincere thanks also go to Dr. Rūta Šlapkauskaitė, whose teaching will stay with me as a model of intellectual rigor and humanistic spirit. I will never forget a belief she shared in one of our classes – that striving for new intellectual heights should be the deepest purpose of human existence. Her words, expressed with such conviction and integrity, astonished me – for this pursuit, so often obscured by false meanings imposed by modernity, is one of the noblest endeavors we can choose.

I am also thankful to Professor Jolanta Šinkūnienė for the incredible warmth and good humor she brought to every class. Her kind encouragement, especially those treasured compliments on my observational skills, was a true balm during stressful exam seasons.

And of course, I am endlessly grateful to my beloved husband, who inspired and supported me throughout this journey. I could not have done it without you.

Abstract

This MA paper proposes to consider the concept of quantum superposition as an employed narrative and experiential metaphor in Ted Chiang's *Story of Your Life* (2000) and Denis Villeneuve's *Arrival* (2016). It explores how this metaphor shapes a sense of time and self for Louise, suggesting insights into transformation and sacrifice in both the original story and the film.

The analysis draws on Carlo Rovelli's relational quantum mechanics and Paul Dirac's superposition principle to offer an interpretation of nonlinear narrative and outline the relational relationship between the observer and the system at play in the narrative. In addition, Carl Jung's concept of individuation and Friedrich Nietzsche's notion of tragic knowledge offer perspectives for theorizing the heroine's personal transformation as a process of psychological integration and a Dionysian affirmation of life in the face of suffering.

Bringing together scientific and philosophical perspectives, this paper offers new ways of interpretation of Chiang's and Villeneuve's works. It also suggests that quantum concepts offer an insightful way in examining nonlinear narratives where choice and inevitability overlap or coexist in tension.

Keywords: superposition; nonlinear temporality; quantum mechanics; narrative structure; individuation; transformative knowledge.

Introduction

The influence of modern science, especially quantum physics with its paradoxes and entanglements, is becoming increasingly visible in contemporary storytelling. Black holes, multiple worlds theory, and time warps entered the cultural imagination through literature and film before they were fully understood or scientifically proven. Within this growing dialogue between science and narrative form, Ted Chiang's *Story of Your Life* (2000) is a successful example of pairing scientific precision with philosophical depth that offers a structurally innovative and conceptually rich narrative. In 2016, Denis Villeneuve adapted it into a true visual symphony – *Arrival* retains the story's core while expanding its protagonist's existential stakes. Both the novella and the film push the boundaries of temporality, while raising profound themes about language, memory, and choice.

Studies of *Story of Your Life* and *Arrival* cluster around three key areas: linguistic determinism, nonlinear temporality, and posthumanism. Thus, Brophy and Malley (2023) and Fernández (2021) approach the film narrative from a linguistic determinist perspective, the Sapir-Whorf hypothesis, showing how Heptapod B restructures Louise's perception of reality.

Other scholars turn to theories of time to interpret the narrative structure. Noletto and Teixeira Lopes (2018) approach Heptapod B through an eternalist lens, while Carruthers (2018) and Brophy and Malley (2023) both highlight the use of prolepsis and Fermat's principle as strategies for disrupting linear chronology. They all accentuated the time function as a spatial architecture, consistent with broader philosophical notions of non-sequential temporality.

A third strand of interpretation draws on posthumanist and ethical frameworks. Carruthers (2018), Nicol (2019), and Zavota (2020) explore how the texts consider reproduction, maternal embodiment, and planetary ethics. Zavota, for example, uses Derrida's notion of "arche-writing" (2020: 188) to interpret the logograms as non-linear inscriptions that destabilize humanist subjectivity. She also sees heptapod language as a geopolitical gift that invites a reassessment of interspecies ethics and communication. Notably, Carruthers's reading of "pregnant embodiment" (2018: 321) shows how cyclical temporality complicates traditional models of motherhood by reimagining reproduction as an ethical and temporal rupture.

In this critical landscape, the scientific paradigm to which both narratives make significant appeal, and that could enrich the discussion, remains underexplored. Thus, one of the quantum principles, the concept of superposition, describes how multiple outcomes, even contradictory ones, can exist simultaneously. Despite its relative resonance with Louise's experience of time, the principle of superposition has not been adressed in critical discussions of both Chiang's work and Villeneuve's film adaptation. Robert Colson's (2015) precedent-setting application of this quantum concept in literary analysis has offered a promising avenue for further research not yet explored in discussions of *Story of Your Life* and *Arrival*. This MA thesis, therefore, aims to fill a gap in current scholarship by examining both narratives through the lens of quantum superposition as a conceptual reference, and structural and empirical metaphor. The terrain of my research is defined by the question of how exactly the metaphor of superposition could explain the temporal narrative structure, and what limitations or innovations does this concept bring to Louise's psychological transformation and her existential choices in both narratives?

Through a comparative analysis of the novella and the film, this study combines close textual analysis with schematic comparisons of temporal models. In particular, it contrasts *Arrival's* structure, rooted in quantum physics and narrative recursion, with the narrative architectures of other well-known films that employ nonlinear or cyclical temporality. By applying Paul Ricoeur's theory of threefold mimesis, the paper will examine how *Arrival* reconfigures emplotment, memory, and expectation to mirror Louise's evolving temporal consciousness, aligning narrative form with the quantum logic of superposition.

Drawing on Carlo Rovelli's relational quantum mechanics and Paul Dirac's superposition principle, the heptapods' language is interpreted as a medium that collapses the epistemic boundary between observer and observed – between Louise and the temporal structure she comes to inhabit – placing her in a state where present and future coexist. Ricoeur's theory of narrative time and Deleuze's time-image provide tools for analyzing how each narrative disrupts linear chronology, while Jung's theory of individuation and Nietzsche's concept of tragic knowledge illuminate Louise's internal transformation – another subject that has not been touched upon enough. Together, these frameworks allow for synthetic reading in which superposition becomes a metaphor not only for nonlinear temporality but for psychological individuation, foreknowledge, and ethical becoming.

Accordingly, this thesis will pursue three objectives: first, to show how superposition functions as a narrative and conceptual structure in both texts; second, to explore Louise's psychological transformation through the lens of individuation; and third, to analyze her final decision as a Dionysian act of sacrifice – an affirmation of life despite foreknowledge of loss. Through this inquiry, the work aims to contribute to interdisciplinary studies of science and literature by demonstrating how quantum metaphors do more than evoke scientific curiosity: they actively shape narrative form, temporal logic, and ethical stakes. Unlike prior studies that focus primarily on linguistic relativity or non-linear structure, this MA thesis integrates quantum theory with psychological and philosophical analysis to offer a new framework for understanding how science fiction imagines transformation under conditions of foreknowledge. In doing so, it challenges the tendency in Chiang studies to isolate scientific ideas from their emotional and existential dimensions and extends literary discussions of scientific metaphor by showing how concepts like superposition and observer-dependence reconfigure the very experience of subjectivity, agency, and time.

Chapter 1. Adapting Superposition: A Theoretical Framework

Quantum superposition, narrative time, Jungian individuation, and the Nietzschean Dionysian principle inform my analysis. While each theory addresses a distinct aspect, they all intersect through the figure of Louise, as will be demonstrated in later chapters.

The first section introduces the concept of quantum superposition, drawing on the works of Paul Dirac and Carlo Rovelli. The following section considers how superposition functions narratively, based on Robert Colson's application of the term in literary analysis. The third section turns to Paul Ricoeur's theory of narrative time, particularly his distinction between episodic (chronological) and configurational (nonlinear) time, which informs how the texts manipulate temporal perception and shape audience experience.

The fourth section illuminates the Jungian theory of individuation, which finds its reflection in Campbell's journey of the hero. The last section introduces Nietzsche's Apollonian-Dionysian dichotomy, in which the tragedy's protagonist's existential choices reflect the fusion of rational order and intuitive chaos.

1.1. Superposition Principle in Quantum Physics

Quantum mechanics is one of the most conceptually complex areas in modern physics. Among its foundational principles, the concept of superposition emerges as particularly paradoxical. In everyday language and thought, based on classical physics, we attribute definite states to objects: a light is either on or off; a door is either open or closed. This binary distinction is so deeply embedded in our perception that it appears self-evident. However, the quantum realm defies this intuitive logic at the subatomic level, superposition describes the phenomenon in which a particle exists in multiple states simultaneously until it is influenced by a measurement, at which

point it assumes a definite state. In other words, it exists in all possible variants at once, which "collapse" into one specific result only upon observation (Carroll 2010: 281-283).

The principle of superposition in quantum mechanics was first formulated by Paul Dirac. In *The Principles of Quantum Mechanics* (1957), Dirac described superposition as a fundamental aspect of quantum states, arguing that any quantum system can exist as a combination (superposition) of multiple possible states:

The original state must be regarded as the result of a kind of *superposition* of the two or more new states, in a way that cannot be conceived on classical ideas. Any state may be considered as the result of a superposition of two or more other states, and indeed in an infinite number of ways (Dirac 1957: par. 4).

Yet this raises a question: if this principle governs the structure of reality, why do we not observe such behavior in our everyday experiences? After all, we never see a door that is both open and closed at the same time. The answer to this lies at the heart of quantum mechanics and its wave function – the striking discrepancy between what is and what we see. As Sean Carroll explains in *From Eternity to Here* (2010) the principle of quantum superposition:

To put it bluntly, the world doesn't look anything like that. We see cats and planets and even electrons in particular positions when we look at them, not in superpositions of different possibilities described by wave functions. But that's the true magic of quantum mechanics: What we see is not what there is. The wave function really exists, but we don't see it when we look; we see things as if they were in particular ordinary classical configurations (Carroll 2010: 275).

Carroll argues that while the wave function, describing all possible states of a system, offers the most complete account of reality, our observations are restricted to classical outcomes. Put it differently, a system might exist in several states at once, but when we observe it or measure it, we only capture one outcome, a solid and familiar one that aligns with our understanding of classical physics. Thus, we are unable to see the overlapping possibilities underneath. This gap between what is really there and what we perceive is one of the central debates in the scientific community. To understand this distinction between classical and quantum uncertainty, consider a

coin toss. While the coin spins mid-air, there is an equal probability of landing on heads or tails, but it is ultimately in a definite state even if we do not know it yet. However, quantum systems follow a completely different logic: a quantum particle does not just hide a fixed outcome – it exists in all possible states at once. Only when we do measurements does this range of possibilities "collapse" into one specific result we observe. This idea, known as the collapse of the wavefunction, or the Copenhagen interpretation, was introduced by Bohr and Heisenberg in the late 1920s[1]. Their interpretation posits that a quantum system is in a superposition of states until it is observed, yet upon measurement, the wavefunction "collapses" into one of its possible definite states. This interpretation reframes reality itself as inherently probabilistic until interaction with an observer compels a single outcome:

The observation itself changes the probability function discontinuously; it selects of all possible events the actual one that has taken place... Therefore, the transition from the "possible" to the "actual" takes place during the act of observation (Heisenberg 1958: 54).

Using the coin analogy, the collapse of the wavefunction happens at the exact moment you catch the coin and look at it. This collapse is not just about learning the result – it is a real, physical change in the system's state. What was once a mix of potential outcomes (like heads and tails at once) becomes one definite reality – the one we observe. Until that moment of measurement, a quantum system exists in a superposition, holding all possible states at the same time.

The significance of measurement and observation changes across different interpretations of quantum mechanics. In the Copenhagen interpretation it is the measurement that collapses the wavefunction, reducing the system from a superposition to a single definite outcome. Another theory, the many-worlds interpretation, rejects wavefunction collapse altogether, suggesting that every possible outcome occurs each in a separate, branching reality. The relational interpretation in its turn, emphasizes a role of the observer, stating that different observers describe the same

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[1] Bohr developed the concept of wavefunction collapse, first introduced in Heisenberg's 1927 paper on uncertainty. Their complementary perspectives became what is now known as the Copenhagen Interpretation. See: Henrik Zinkernagel (2016), "Niels Bohr on the wave function and the classical/quantum divide", *Studies in History and Philosophy of Modern Physics*, 53: 9–19. DOI: https://doi.org/10.1016/j.shpsb.2015.11.001.

quantum event differently. All these theories and the scientists behind them are occupied with the fundamental mystery – the disconnect between the mathematical description of superposition and our observed reality.

In Rovelli's theory (1996) of relational quantum mechanics (hereinafter the RQM) what traditional quantum theory interprets as wavefunction collapse is instead seen as a relational change between the observer and the system – the quantum description of a system is not "an "absolute" … description of reality, but rather … of properties of a system *relative* to a given observer" (Rovelli 1996: 1648). This perspective closely aligns with *Story of Your Life*'s depiction of time and perception, where meaning and transformation arise through relational experience rather than being passed on.

RQM allows different observers to arrive at different but equally valid reports of the same system based on their unique interactions. As Rovelli comments, "the physical quantity takes the value *v* with respect to the so and so observer," and "the descriptions of the *same* sequence of events given by the two observers can be different" (Ibid., p. 1648).

In this context, Louise and Gary's differing experiences of time reflect the relational character of quantum states. Relational quantum mechanics and the concept of superposition thus provide a quantum perspective for understanding how the film and novella treat time as contingent and observer-dependent rather than fixed. This connection between quantum theory and Louise's evolving perception will be explored in more detail in the analysis.

1.2. Superposition as a Narrative Metaphor

The quantum world may seem far removed from storytelling, yet its contradictory and complex logic has found a surprising echo in literature. Patricia Warrick, in *Quantum Reality in Recent Science Fiction* (1987), was one of the first scholars to note the emergence of quantum

theories in narrative structures, commenting that "the quantum model of reality demands a radical rethinking of our ideas of the cosmos, and science fiction offers the best imaginative tool for a nonmathematical exploration of the possibilities" (Warrick 1987: 308). Although Warrick identifies narrative techniques employed to explore alternate realities and timelines, she does not address the concept of superposition in her analysis. This omission, however, highlights how early her work was in recognizing this shift – before superposition and other quantum principles became central to literary theory.

In their introductory chapter, "Introduction: Connectivities Between Literature and Science", in *Representations of Science in Twenty-First-Century Fiction* (2019), Nina Engelhardt and Julia Hoydis discuss a shift from the divide between science and the humanities – the so-called "two cultures" – toward what they call "connectivities" (Engelhardt & Hoydis 2019: 3) in which disciplines can intersect, overlap, and inform one another. They highlight the emergence of the "science novel" (Ibid., p. 2) that engages with ethical and existential questions posed by scientific advancement. Kanta Dihal, in the same volume, notes that quantum physics has become a compelling narrative trope which offers new tools for structuring plots, shifting focus, and exploring identity (Dihal 2019: 58).

Importantly, Robert Colson in *Narrative Arrangements in Superposition and the Critique of Nationalism in "Cyclops"* (2015) is the first to introduce the term superposition into literary criticism, examining the temporal experiences generated by the narrative structure of *Cyclops* in James Joyce's *Ulysses*. His interest focused on the tension between the unnamed narrator's voice and the episode's interpolations, each with its own temporal rhythm and contributing to the narrative's fragmented structure. To reconcile these complexities, he introduces "the concept of superposition from quantum mechanics" (Colson 2015: 88) as a novel critical framework, contending that it provides "a new critical vocabulary for reading the interpolations and the narrator's tale together" (Ibid., pp. 75-76).

Drawing on Paul Ricoeur's notion of a "fictive experience of time" (Ricoeur 1985: 100), Colson argues that the coexistence of at least two (or more) narrative tenses creates a "disjunctive temporal reading experience" (Colson 2015: 76). The multiple temporal layers, in turn, allow readers to immerse themselves in simultaneous temporal scenarios, which echoes the principle of

quantum superposition. Colson defines literary superposition as a state in which multiple narrative elements – separate timelines, perspectives, and interpolations – coexist without a fixed hierarchical structure until they are interpreted by the reader. He thus concludes that Joyce's use of interpolations and alternating narrative voices keeps multiple temporalities and meanings in limbo, reflecting the quantum concept of superposition. Within this framework, reading amounts to an act of observation, one that shapes which temporal thread or interpretation comes to the fore, just as measurement collapses a multi-scenario quantum system into a single outcome. Colson's innovative interpretation of superposition as a literary concept offers interesting ways of reading nonlinear narratives, which this analysis will rely upon.

1.3. Time in the Narrative

In literature, as in film, experimentation with narrative form has long been practiced, with authors challenging readers' expectations. Kurt Vonnegut's *Slaughterhouse-Five* (1969), Christopher Nolan's *Memento* (2000) and *Interstellar* (2014), and many others, disrupt temporal continuity while simultaneously inviting broader reflections on the nature of time and the role of memory and the ways in which chronology shapes the meaning of narrative. Ted Chiang's *Story of Your Life* and Denis Villeneuve's *Arrival* find particularly unique narrative intonations by structuring events in a distinctive mode of time perception. Rather than a linear logic of cause and effect, they shape temporal experience through what Paul Ricoeur called a process of reconfiguration in his theory of *Time and Narrative* (1984).

According to Ricoeur, the narrative does not simply retell events in sequence; rather, it shapes them into a distinct temporal structure, giving them meaning through the act of employment that "combines in variable proportions two temporal dimensions, one chronological and the other not" (Ricoeur 1984: 66). Ricoeur distinguished episodic time as a linear, chronological

progression, and configurational time, which "transforms the succession of events into one meaningful whole… which makes the story followable" (Ibid., p. 67).

He develops a theory of narrative time through what he calls the "threefold mimesis", a process that unfolds in three stages (Ibid., pp. 52–87). The first stage, mimesis1, concerns the understanding of time before the plot begins – our ability to make sense of actions and events, to recognize motives and consequences (Ibid., pp. 64–68). The next stage, mimesis2, involves the formation of a story through "emplotment" (Ibid., p.65), when events are selected and organized into a meaningful configuration (Ibid., pp. 64-70). Finally, mimesis3 occurs when the reader or viewer rethinks his own experience through retelling and, in light of the already known denouement, is able to reconstruct the meaning of the text (Ibid., pp. 70–77).

Ricoeur explicitly argues that narrative time is not bound to chronological time. Through his concept of mimesis2 (configuration), he shows how events can be re-ordered, layered, or made meaningful retroactively: "This configurational act consists of "grasping together" the detailed actions… It draws from this manifold of events the unity of one temporal whole" (Ibid., p. 66).

He emphasizes the "followability" of a story (Ibid., p. 67) – the reader must be able to interpret the relationship between parts and the whole, even if the events are told out of sequence: "To follow a story is to move forward in the midst of contingencies and peripeteia under the guidance of an expectation that finds its fulfilment in the "conclusion" of the story" (Ibid., p. 66).

Ricoeur's theory in *Time and Narrative* (1984) shows that stories do not need to follow chronological order to be coherent – narratives told out of sequence or through fragmented perspectives are justified as long as they lead the reader toward a meaningful whole. What matters is not a strict timeline but the ability to grasp how the story fits together (Ibid., pp. 66–67). In this sense, nonlinear storytelling is not a violation of narrative coherence but a reflection of the configurational dimension – it invites the reader to interpret the structure retroactively. As he notes, it is often in the retelling – when the ending is already known – that the whole structure and meaning of the narrative becomes clear we "learn to read time itself backwards, as the recapitulation of the initial conditions of a course of action in its terminal consequences" (Ibid., p.

68). Retrospective logic thus justifies the use of non-chronological devices, since they enhance the reader's engagement with the main themes of the narrative.

Should superposition challenge how we understand physical reality, narrative temporality complicates how we experience stories across time. Ricoeur's narrative theory is a helpful conceptual bridge to connect physics with plot, offering a way to think about how meaning is formed across fragmented or nonlinear timelines. In the analysis that follows, his threefold model of mimesis will be used to trace how time is prefigured, configured, and refigured in *Story of Your Life* and *Arrival* – not only in terms of narrative structure, but also in the reader's or viewer's evolving understanding of time itself.

1.4. Jungian Individuation in Storytelling

Narrative art forms have long served as keepers and bearers of eternal meanings conveyed through universal myths. Building on analysis of myths, symbols, and dreams, Carl Gustav Jung developed a concept of individuation, a psychological process he viewed as essential to achieving psychic wholeness (Jung 1976: par. 757–762). His *Archetypes and the Collective Unconscious* (1957) revealed recurring archetypal patterns that shape narrative structure and reflect a shared psychological journey one takes in pursuit of wholeness. These archetypes function as internal guides to self-realization, appearing in literature and film as transformation markers. Jung placed archetypes within the collective unconscious – a deeper layer of the psyche formed by inherited patterns that influence how we perceive and engage with the world:

It is in my view a great mistake to suppose that the psyche of a newborn child is a *tabula rasa* in the sense that there is absolutely nothing in it (Jung 1980: par. 136).

The form of the world into which he is born is already inborn in him as a virtual image. Likewise parents, wife, children, birth, and death are inborn in him as virtual images, as psychic aptitudes. These *a priori* categories have by nature a collective character...not individual predestinations...They are in a sense the deposits of all our ancestral experiences (Jung 1966: par 300).

Individuation is thus a process, a journey, implying inner development through the reconciliation of internal oppositions, the conscious and the unconscious, or the interplay of different archetypes. Lacking such inner work, Jung argues, the individual remains entangled in inherited roles, cultural expectations, and unconscious projections for the "aim of individuation is nothing less than to divest the self of the false wrappings of the persona on the one hand, and of the suggestive power of primordial images on the other" (Jung 1966: par. 269).

For the purpose of this study, special attention in individuation theory will be given to the integration of the *anima* and *animus* – archetypal figures that represent the unconscious feminine in men (*anima*) and the unconscious masculine in women (*animus*). These principles will be employed in the analysis, not for the aim of any gendered criticism but as symbolic structures within the psyche that influence one's emotional life and reasoning for "in the unconscious of every man there is hidden a feminine personality, and in that of every woman a masculine personality…" (Jung 1980: par. 511).

Jung associates the anima with Eros or "personification of the unconscious in general" (Jung 1970: par. 62), while the animus - with Logos, or the "spirit" (Ibid., par. 59). He writes: "Eros is an interweaving; Logos is differentiating knowledge" (Ibid., par. 60). If these archetypes remain unconscious, according to Jung (1980: par. 223), they are often projected outward, distorting relationships and reinforcing one-sided thinking. In practical terms, the dominated animus in women may appear as "dogmatic, world-reforming, theoretic... argumentative, and domineering" (Ibid.), while the anima in men may manifest as "uncontrolled and emotional, sometimes gifted with daemonic intuitions" (Ibid.). Jung's descriptions of the *anima* and *animus* based on binary gender distinctions reflective of his time might be found problematic – nonetheless, Jung is very clear in defining both archetypes as essential psychological functions (present in both genders). Each operates as a mediator between consciousness and the unconscious, offering the ego a symbolic bridge to deeper psychic material. In the process of individuation, they represent interiorized aspects of self that, when integrated, contribute to psychic wholeness.

Their integration involves a symbolic process of death and rebirth, a transformation through which the self undergoes dissolution and psychic reconfiguration. He writes – "When the two shall be one, the outside as the inside" (Ibid., par. 295) – describing a symbolic state in which all dualities

are transcended. This is echoed in his vision of individuation as a movement toward "the perfect state where masculine and feminine are united" (Ibid., par. 636) when the "wholeness is attained" (Jung 1973: par. 637). One moves toward greater wholeness by interacting with the anima and animus rather than repressing them, reorienting one's relationship to self and meaning.

Jung's concept of individuation and archetypes has left an indelible mark on literary analysis. Maud Bodkin (1934) and Northrop Frye (1957), among the first to apply Jung's insights to literature, identified recurring motifs – such as heroic quests and cycles of death and rebirth – as reflections of shared psychological structures. Both saw transformation as central to storytelling, with characters undergoing inner and outer trials that mirror the psyche's movement toward greater integration.

Joseph Campbell later developed this pattern into a model in *The Hero with a Thousand Faces* (1949), framing the hero's journey as a three-part cycle of departure, initiation, and return in which "the hero … is the man or woman who has been able to battle past his personal and local historical limitations" (Campbell 2004: 18). His model has since shaped countless stories, especially in genre fiction and film, where transformation is plotted as a structured arc.

And yet, many contemporary narratives subvert or reconfigure this model, particularly those that challenge the assumption of linear time. This paper argues that *Arrival* gestures toward Campbell's arc in Louise's journey, but ultimately destabilizes it by aligning individuation with foreknowledge, sacrifice, and non-linear time.

1.5 The Apollonian and Dionysian dimensions

Another lens that will guide this analysis is Friedrich Nietzsche's dichotomy of Apollonian and Dionysian. Nietzsche characterizes the Apollonian dimension as representing structure, clarity, and control, while the Dionysian is defined as tied to instinct, emotion, and the dissolution

of the self. Though these forces oppose each other, Nietzsche also admits their interconnectedness. He believes that the greatness of Attic tragedy emerged from a productive tension and fusion of these two principles – both necessary to understanding creativity, conflict, and transformation. Although this distinction emerges in *The Birth of Tragedy* (1872) as an aesthetic principle of Greek drama, Nietzsche later extends its scope to existential concerns – specifically, the question of how humans confront suffering and self-overcoming.

It is worth noting that Carl Jung also interpreted the Apollonian and Dionysian frameworks. Jung emphasizes their psychological dimensions, associating the Apollonian with a force that imposes "measure, number, limitation" (Jung 1976: par. 226), securing individuation through form. The Apollonian mode functions "in accordance with the nature of intellectual thinking. In other words, it produces ideas" (Ibid., par. 239). In contrast, the Dionysian impulse is described by Jung as a radical dissolution of boundaries, where the "*principium individuationis*" is destroyed and the individual is absorbed into the instinctual totality (Ibid., par. 227). Jung emphasizes that while Apollo governs the formation of a stable ego, Dionysus represents a regression that simultaneously threatens consciousness but also promotes its renewal. Individuation, as Jung conceives it, does not mean an exclusive adherence to the Apollonian but rather a reconciliation of both forces – what he calls "the warring antagonism that is only seemingly bridged by the common term "Art"" (Ibid., par. 225). This echoes Nietzsche's claim that Greek tragedy achieves its power precisely through the synthesis of these two impulses, with the Apollonian giving shape to the overwhelming ecstasy of the Dionysian.

The Birth of Tragedy (1872) describes the Apollonian as the world of images and forms – the "beautiful semblance" (Nietzsche 1999: par. 2), while the Dionysian – as "music", "the immediate idea of this life", "the primal mother, eternally creative beneath the surface of incessantly changing appearances" (Ibid., par. 16) – expressing a more primal ecstatic unity that transcends individuality. Again, tragedy as a genre emerges from the interplay between the two, necessary to allow suffering to be transformed into art. Nietzsche takes this interplay further, admitting the Dionysian not only as an artistic force but as a fundamental aspect of his life philosophy. Thus, the Dionysian principle is expanded beyond art into a philosophy, where life is not merely biological existence but self-overcoming, a force that surpasses itself and affirms its own transience. This aligns with the notion of *amor fati*, where Nietzsche declares:

I want to learn more and more how to see what is necessary in things as what is beautiful in them – thus I will be one of those who make things beautiful. *Amor fati*: let that be my love from now on! (Nietzsche 2001: par. 276).

However, in *the Twilight of the Idols* (1889) he also associates the Dionysian state with an acceptance of life's inherent suffering – what he calls "that joy which also encompasses the *joy of destruction*" – describing it as "the eternal joy of becoming" in an eternal recurrence dedicated to Dionysus (Nietzsche 1998: par. 5). Connecting "the will to life" (Ibid., par. 4) with "rejoicing in the *sacrifice*" (Ibid., par. 5), the Dionysian thus represents not only instinctual release but also a willingness to embrace chaos and destruction as essential to creativity and renewal.

Julian Young (2010) comments that

a great deal of *Twilight* [of the Idols] conveys the sense of closing the circle, of returning to the beginning of Nietzsche's path of thinking, of re-embracing the central insights of *The Birth of Tragedy*, albeit cast in a new, naturalistic form (Young 2010: pp. 501-502).

Young describes this later expanded aspect of Dionysian as a state in which one overcomes the fear of death and change by embracing life as an ongoing process rather than a fixed reality.

Nietzsche, drawing on his study of Greek tragedy, mentions sacrifice not as loss for its own sake but as a vital part of transformation. In the Dionysian worldview, destruction and suffering are not merely endured - they are conditions for creation and life to continue. To affirm life in its totality, one must also affirm its pain, its impermanence, and the collapse of old structures – "saying yes to life, even in its strangest and hardest problems" (Nietzsche 1998: par. 5).

This form of sacrifice does not offer redemption or transcendence but instead reflects a deeper acceptance: that to truly live is to welcome both beauty and rupture, clarity and collapse: "*Not* freeing oneself from terror and pity" but rising "over and above terror and pity" (Ibid.). And again, for creation to be eternal, "the 'torment of the woman in labour' *must* also exist eternally" – a metaphor that equates pain with the possibility of new life – "everything that vouchsafes the future, *presupposes* pain" (Ibid., par. 4). "The word 'Dionysus' means all of this" (Ibid.).

Thus, Dionysian sacrifice becomes a philosophical act. It symbolizes a relinquishing of control, a refusal to seek comfort in permanence. It also symbolizes the acceptance of transience or of the inevitability of loss. In *Arrival,* Louise's decision to live out a future she cannot change echoes this gesture. Her knowledge does not save her from suffering – it requires her to enter it knowingly, as part of a life fully embraced.

For Nietzsche, suffering is not something to overcome but a condition to affirm. As he writes in *The Birth of Tragedy*, "tragic myth in particular must convince us that even the ugly and disharmonious is an artistic game which the Will, in the eternal fullness of its delight, plays with itself" (Nietzsche 1999: par. 24). Louise's tragic knowledge in both narratives does not attempt to explain suffering, nor does it attempt to suppress it through reason and dialectic. Instead, it confronts the chaotic nature of reality and finds meaning not in escaping it, but in fully embracing it. For Nietzsche, Greek tragedy serves as an artistic resolution to existential despair for "only as an aesthetic phenomenon do existence and the world appear justified" (Ibid.).

1.6. Concluding Remarks

The outlined theoretical perspectives will guide the analysis of *Story of Your Life* and *Arrival*, linking quantum mechanics, narrative theory, psychology, and philosophy.

The concept of superposition offers a valuable and underexplored lens through which the unique nonlinear temporality of Chiang's story and its adaptation can be articulated metaphorically and experientially. Ricoeur's theory of narrative time will be particularly helpful in analyzing how the novella and film challenge traditional notions of causality and temporal continuity, requiring active interpretive participation from the audience.

Meanwhile, Jung's notion of individuation allows us to examine how the film's narrative addresses the heroine's inner transformation and the non-trivial solutions it employs.

Nietzsche's framework of tragic knowledge and self-overcoming will, in turn, provide a philosophical underpinning for understanding how both narratives interact with the tension between determinism and agency, suffering and affirmation.

Chapter 2. Superposition and the Structure of Time: Nonlinear Temporality in *Story of Your Life* and *Arrival*

This chapter offers an alternative lens to the interpretation of Chiang's novella and Villeneuve's film, applying quantum mechanics as a structural and experiential metaphor for temporal perception. Through Paul Dirac's superposition principle and Carlo Rovelli's relational quantum mechanics, this chapter will examine how both narratives conceptualize time.

Additionally, Paul Ricoeurs' concept of configurational time is applied to consider how narratives compress past, present, and future into a single experiential whole, consistent with the logic of quantum superposition. By contrasting the model of a time loop to superposition, the analysis attempts to challenge interpretations that view the film's timeline as a closed loop.

The analysis applies quantum physics, narrative theory, and film analysis to broaden the interpretive discourse on the novella and the film, whose narratives meet at the intersection of literature and science.

2.1. Superposition and Nonlinear Time

While previous readings interpret the film as a time loop, this chapter argues that a superposition model better captures its temporal logic: not repetition or recursion, but simultaneity and relational unfolding.

Dirac's principle of superposition states that a system does not exist in a single state until it is measured; rather, it exists in several possible states simultaneously, and only the act of measurement assigns it a specific state (Dirac 1957: par. 2-3). This principle aligns with the way Chiang structures the story. As Louise begins to experience time nonlinearly, the narrative mirrors

this shift – especially through its unusual use of verb tenses, which places past, present, and future side by side.

For instance, in the line – "Eventually, many years from now, I'll be without your father, and without you. All I will have left from this moment is the heptapod language. So I pay close attention, and note every detail" (Chiang 2000: 39) – Chiang weaves together future, past, and present in a single passage. In the beginning, Louise speaks from a future point of retrospection, recalling events that have already unfolded. But instead of conventional reflecting, she uses that future knowledge to justify her actions in the present. The present-tense verbs "I pay" and "note" do not simply describe her experience in real time; they are paradoxically shaped by outcomes that have not yet occurred within a linear framework. This temporal inversion confuses conventional cause-and-effect logic, for it is not the past that defines the present or her future point, but it is the future that determines the present, as if her consciousness exists across multiple states and collapses them into a unified moment of decision. The unusual use of tense mirrors the idea of quantum superposition: Louise appears to exist across multiple timelines, and it is only when she observes or engages with a moment that it crystallizes into a single reality.

One of the key moments that demonstrates how future and present experiences coexist in a single state of being, and possible outcomes are collapsed into a single result, is the scene of choosing a salad bowl that Louise knows will later harm her child. The scene begins with Louise and Gary wandering through the market: "I accompanied Gary as he collected fresh basil, tomatoes, garlic, linguini..." (Ibid., p. 30). The sentence is written in the past tense, but the past is functioning as a narrative present. This creates a simultaneity, where past, present, and future all remain "alive" in the narrative, thus maintaining a circular temporality for the reader.

The moment shifts mid-scene into future tense when Louise foresees the accident involving the salad bowl:

When you are three, you'll pull a dishtowel off the kitchen counter and bring that salad bowl down on top of you. I'll make a grab for it, but I'll miss. The edge of the bowl will leave you with a cut, on the upper edge of your forehead, that will require a single stitch. Your father and I will hold you, sobbing and stained with Caesar salad dressing, as we wait in the emergency room for hours.

I reached out and took the bowl from the shelf. The motion didn't feel like something I was forced to do. Instead, it seemed just as urgent as my rushing to catch the bowl when it falls on you: an instinct that I felt right in following (Ibid.).

The scene encapsulates the moment of quantum measurement and wave function collapse – multiple outcomes are possible before she chooses the bowl (as in the coin toss example). However, her action acts as an observation in quantum terms, collapsing the probability wave into a definite event – an inevitability that mirrors the mechanics of measurement in quantum theory. The passage also reinforces the theme of free will within a deterministic framework – even though Louise learns the outcome of the event through memory, she does not attempt to resist or change it. Her acceptance highlights the idea that knowing the future does not necessarily equate to influencing it. Section 2.2 will look at Chiang's narrative techniques in more detail.

While the previous paragraph demonstrated narrative simultaneity at the level of language, the following example highlights its visual parallel in *Arrival*. In the final act Louise experiences a flash forward to a diplomatic gala dinner in the future, where she meets General Shang, who thanks her for calling his personal number during a global crisis and echoing his wife's dying words. He gives her his phone number along with a message – something she will use in her present timeline to resolve the international crisis. What is important is that she recognizes it from the future at the moment of the present, the "now" of the crisis. This scene is not a prophecy – it is a moment when the past, present, and future converge. Louise's consciousness accesses future information and uses it to make decisions in the present. The only reason she has the information to resolve the crisis in the present is because she receives that knowledge in the future. Thus, the future causes the past just as the past causes the future. This nonlinear structure reflects the heptapods' language, which is not bound by time – and once Louise has internalized their perception, her own sense of time begins to function in the same way.

This scene visually dramatizes superposition: Louise's consciousness exists in multiple states – she knows and doesn't know the phone number at the same time. Her consciousness "contains" both the present self (who is unaware of it) and the future self (who gets informed). The paradox is only resolved (or "collapsed" in quantum terms) when she acts: calls General Shang and uses the phrase he tells her in the future.

The example reflects Dirac's principle of superposition and the collapse of the wave function: Louise's consciousness exists in multiple timelines until she makes a call, "collapsing"

the system, and one result becomes real. Similar to quantum mechanics, the action of the observer crystallizes reality. Louise's decision here functions as the "measurement" that collapses the uncertainty and informs the film's central theme: the acceptance of foreknown pain, the choice to love and lose anyway. Although a scene is absent in *Story of Your Life* as there is no global conflict, it is rather personal, introspective, and focused on language, memory, and motherhood, however, the "salad bowl" moment serves a similar function illustrating how Louise acts with full knowledge of what will happen. A more detailed discussion of the film appears in Section 2.3.

Here is another quote from Chiang:

The semagrams seemed to be something more than language; they were almost like mandalas. I found myself in a meditative state, contemplating the way in which premises and conclusions were interchangeable. There was no direction inherent in the way propositions were connected, no "train of thought" moving along a particular route; all the components in an act of reasoning were equally powerful, all having identical precedence (Chiang 2000: 26).

Louise is reflecting here about the heptapods' language, in which all parts of an utterance are equally weighted and simultaneous, each component holds the same significance – she effectively describes the principle of superposition, where all potential states coexist with equal probability.

Dirac's superposition principle challenges the prevailing cyclical time model proposed by Noletto & Teixeira Lopes (2018) and Gokhale *et al.* (2023), who argue that *Arrival* constructs time as a loop (illustrated further as Timeline 2). The concept of superposition helps to understand that Louise's position in time is not confined to a closed loop. Although the concept of a circular model of time is relevant, it does not reproduce a series of repeating cycles. Instead, Louise lives in a panoramic perception, where past, present and future coexist. Her time model is not a closed loop, but a central vantage point within a circular model of time flow, from which she perceives all moments of time simultaneously.

To illustrate the difference between these two concepts – time loops and superposition – Table 1 compares *Arrival* with the structures of time loops in *Groundhog Day* (1993) and *Interstellar* (2014), demonstrating how the former diverges from the repetitive and deterministic cycles imposed in the latter.

Groundhog Day (1993) is a classic example of a true time loop with a mechanism that resets events. It lacks a "butterfly effect" – nothing from the previous loop carries over. Once the day restarts, the prior loop's actions and consequences are erased, giving the film its comedic effect.

In contrast, *Interstellar* (2014) tells its story through a causal loop. When Cooper enters the Tesseract, he finds himself able to send signals back to his daughter, Murph, when she was a child. Yet it turns out he had always been the "ghost" from her childhood. What seems like a discovery in the future is actually something that already shaped the past. In the end, Cooper realizes he did not change events; he fulfilled a role he had unknowingly played from the start.

Table 1. Comparative Models of Cinematic Temporality in *Groundhog Day*, *Interstellar*, and *Arrival*

Groundhog Day (1993)
Narrative Structure:
Phil Connors relives the same day – February 2nd. Each morning, everything resets as if nothing had happened the day before. No matter what choices he makes, the loop begins again.
Mechanism:
The loop resets every morning.
Theme of the timeline:
Phil must become a better person to break out.
***Arrival* timeline difference:**
Louise's memories do not allow the restart of the timeline.
Interstellar (2014)
Narrative Structure:
Cooper enters the Tesseract, from which he sends gravitational signals back in time to his daughter, Murph, when she was a child, encoding them in her watch. Because of this, Murph can solve the equation years later, as an adult, using the message her younger self received.
Mechanism:
Events should happen exactly as they did – Cooper's actions in the Tesseract lead to the results that must occur for him to be there.
Theme of the timeline:
Time is a closed loop – the future causes the past, and the past leads to the future.

| ***Arrival* timeline difference:** |
|---|
| 1)Louise does not send messages into the past to change her actions. |
| 2)Her awareness expands rather than looping back to affect previous events. |
| 3)*Interstellar* presents a self-contained causal loop, while *Arrival* – a superposition of moments –they exist all at once rather than being bound in a paradox. |
| *Arrival (2016): Superposition Model* |
| **Narrative Structure:** |
| Louise's timeline cannot be reset or restarted. She begins to perceive her life as a web of interconnected moments, all accessible at once. |
| **Mechanism:** |
| Time becomes a field in which every point exists simultaneously. Louise does not control what is to come or attempt to change the past. Her awareness works more like a quantum superposition – past, present, and future are held together in a single state of understanding. |
| **Theme of the timeline:** |
| Acceptance rather than control – Louise does not change her future; she embraces it. |

Although *Arrival* appears to engage with causal loops, in a scene where Louise calls General Shang using information from a future vision, it ultimately resists the logic of closed or predetermined timelines. Unlike *Groundhog Day*, where time is reset, or *Interstellar*, where the protagonist's future actions directly cause past events, Louise does not change the past – she acts in the present with knowledge of the future. Her timeline is not fixed by external causality and does not loop. Louise experiences time from a panoramic perspective – one in which past, present, and future coexist. This perspective allows her to respond to events in time without changing them, so that she is not trapped in a deterministic loop but in a field of relational moments where awareness, not chronology, drives her decisions. In other words, if there were loops, they exist internally, in her consciousness, rather than as a fixed sequence of events dictated by external causality.

Both *Story of Your Life* and *Arrival* align with quantum superposition – events do not repeat, nor do they dictate one another in a fixed sequence; they coexist. Louise is not moving through time in a repeating loop; she experiences time as layered and simultaneous – better captured by the idea of superposition than by a cyclical time loop.

To visualize the difference between a superposition model and a cyclical loop, we can think of three distinct timelines (see Figure 1). Let the first one (Timeline 1) follow a familiar linear structure, where events move in a straight line from past to future. The second (Timeline 2) forms a closed loop through repeated resets, as in *Groundhog Day*, or through tightly bound cause-and-effect cycles, as seen in *Interstellar*. The third model (Timeline 3), based on superposition, presents all events as existing at once. Instead of progressing through time, this structure offers a unified view, where moments are perceived simultaneously from a central point – *Arrival* being a prime example.

Timeline 1 aligns with classical physics and the sequential progression of events. Narratives operating within this structure unfold the past as fixed, the present as experienced, and the future as unknown.

Figure 1. Comparative Schemes of Linear, Looped, and Superpositional Temporalities

Timeline 1. Linear time

Timeline 2. Looped time

Timeline 3. Superposition
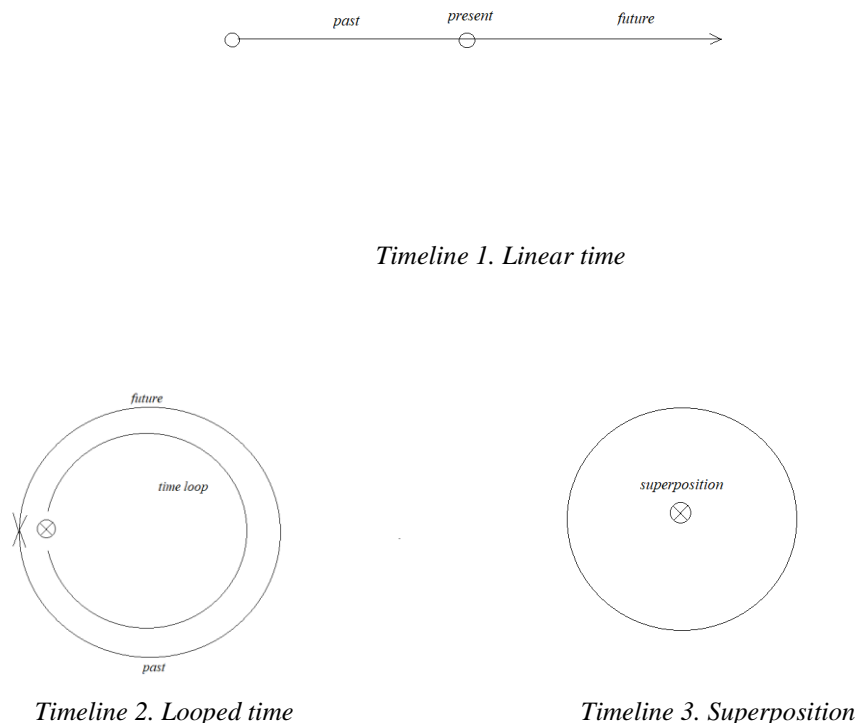
Timeline 2 represents both repeating loops and closed causal cycles. In *Groundhog Day,* time resets every morning, giving Phil a chance to change his behavior and outcomes. *Interstellar* follows a fixed causal loop where Cooper's actions in the Tesseract send messages back to the past, completing a cycle that was already set in motion. Although Ricoeur does not explicitly theorize time loops, his concept of emplotment emphasizes the structuring role of organizing temporal experience. As he states, "to understand a narrative is to master the rules that govern its syntagmatic order" (Ricoeur 1984: 56). The idea of loops comes from a philosophical concept of eternal return or eternal recurrence where events occur repeatedly, for eternity: "The eternal hourglass of existence is turned over again and again" (Nietzsche 2001: par. 341).

Meanwhile, Timeline 3 best captures the time model of *Arrival* – Louise is positioned in a relational field of interconnected events, much like a quantum system, where multiple states coexist until noticed. Her panoramic perspective denies the logic of cause and effect and offers a different meaning – not of change, but of acceptance.

2.2. Observer-Dependent Reality

While many scholars interpret Louise's altered perception through the Sapir-Whorf hypothesis, quantum theory encompasses an explanation of its own. Carlo Rovelli's relational quantum mechanics (RQM) reframes her transformation as a shift in the structure of reality itself, where time emerges through observation and relation. As Rovelli argues, "an event may be both before and after another one" (Rovelli 2018: 57). He illustrates this through a simple example: time runs faster in the mountains than at sea level (Ibid., pp. 11-13). Even such measurable differences show that time is not an absolute flow but depends on context and perspective. In *Relational Quantum Mechanics* (1996), the foundational paper that introduced the theory, Rovelli explores the relationship between the observer and the observed system:

A quantum description of the state of a system *S* exists only if some system *O* (considered as an *observer*) is actually "describing" *S*, or, more precisely, has interacted with *S* (Rovelli 1996: 1648).

The fact that the pointer variable in *O* has information about *S* (has measured *q*) is expressed by the existence of a correlation between the *q* variable of *S* and the pointer variable of *O* (Ibid., p. 1652).

In this view, Louise is not simply learning new grammar; she is entering a new relationship with time itself, where Louise is an observer *O*, and time is a system *S*. Louise's immersion in Heptapod B – let it be "the *q* variable of *S*" (Ibid.) – places her within a distinct temporal framework, underscoring that time, like reality, is not fixed but relational.

Applied to *Story of Your Life*, the heptapods' language functions as a quantum interface, facilitating Louise's entry into a new relational system. She is not just learning to speak differently; she is entering a new structure of awareness, where time becomes something lived in multiple directions simultaneously. As she explains: "But occasionally I have glimpses when Heptapod B truly reigns, and I experience past and future all at once; my consciousness becomes a half century-long ember burning outside time" (Chiang 2000: 36).

This passage captures the heart of RQM, where Louise's temporal awareness does not operate independently of the system, it is co-constituted by it. Her transformation differs from Gary's because the same "system" (time) appears differently to each observer, depending on the nature of their interaction (Rovelli 1996: 1666).

Arrival illustrates this relationality visually – the moment Louise touches the glass in the alien chamber marks a turning point in her perception, the barrier becomes less about separation and more about transition between temporal frameworks. Later, when she sees visions of her daughter, the narrative shifts entirely into superpositional temporality, where present and future are experienced as coexisting states – equally real, equally inhabited, like outcomes of a coin that have not yet collapsed into a single result. Thus, RQM's central claim echoes the principle of superposition: observation collapses potentiality into experience.

In this way, RQM, another theory from the domain of quantum physics, adds a dimension that neither linguistic determinism nor psychological metaphor alone can explain. Time behaves

not merely as grammar, but as a quantum system shaped by interaction and never entirely separable from the person experiencing it. *Story of Your Life* becomes not only a meditation on time, but on how the act of seeing transforms what is seen.

2.3. Nonlinear Temporality in *Story of Your Life*

Ted Chiang's *Story of Your Life* creates a distinctive reading experience by encapsulating a multi-layered, non-linear temporality that mirrors the linguistic and perceptual structure of Heptapod B. Drawing on Paul Ricoeur's theory of mimesis, this section will examine how Chiang manipulates the narrative to shape the reader's sense of time in a heptapods-like manner: rather than unfolding events chronologically, he weaves together moments from different points in time so that the narrative feels simultaneous to each of these points. Unlike *Arrival*, which gradually leads the viewer to the realization that the timeline is not unfolding but already complete – as will be discussed further in Section 2.3 – Chiang aims to heighten the reader's cognitive and emotional engagement with Louise's temporal entanglement by immersing the reader in a simultaneous experience from the very beginning.

From the perspective of Paul Ricoeur's threefold mimesis, *Story of Your Life* primarily operates within mimesis 2 (configuration), in which the narrative is already structured in a way that collapses temporal distinctions. As Ricoeur explains, "configurational act consists of "grasping together" the detailed actions" (Ricoeur 1984: 66), transforming episodic events into an integrated whole. However, the novella also engages mimesis 3 (refiguration) by compelling the reader to interpret past and future events as a unified structure rather than as sequential occurrences (Ibid., p. 70).

Unlike conventional narratives, which move progressively from mimesis 1 (prefiguration)— where the reader initially engages with the text – toward mimesis 3 (refiguration) – where meaning

is retrospectively constructed – Chiang's novella begins with a fully reconfigured temporal structure. From the outset, Louise's consciousness is already transformed, her narration does not unfold toward revelation but emerges from an already-configured understanding of time. Ricoeur describes this phenomenon as follows:

…the repetition of a story, governed as a whole by its way of ending, constitutes an alternative to the representation of time as flowing from the past toward the future, following the well-known metaphor of the "arrow of time" (Ibid., p. 67).

He suggests that in certain narratives, time is not simply represented but actively reshaped by the act of storytelling, where events derive meaning from their predetermined conclusion. This applies directly to *Story of Your Life*, where Louise states early in the novella: "I know how this story ends; I think about it a lot. I also think a lot about how it began, just a few years ago, when ships appeared in orbit and artifacts appeared in meadows" (Chiang 2000: 2).

From the first page, her awareness spans the timeline. The story does not build toward a conclusion – it unfolds from one. This narrative device echoes the logic of Heptapod B, in which time is not divided into separate phases but experienced as a whole. An experiential shift is particularly evident in Louise's recollections of her daughter, which move between first-person, second-person, and future-tense. This pulls the reader into a strange simultaneity and disorients him in this unfamiliar space of temporal coexistence.

Table 2 illustrates how Chiang's manipulation of tense blurs temporal boundaries. In Example #1, Louise's first-person narration directly addresses her daughter, mimicking second-person while remaining rooted in the "I" perspective. Such narrative technique diminishes the boundary between narrator and addressee, mirroring Louise's nonlinear experience of time. The phrase "I remember… when you are five years old" (Ibid., p. 7) symbolizes the time disruption characteristic for Louise: the present tense contradicts the past-tense frame of remembering, forcing past and present into simultaneity. This effect deepens with "You'll be coloring with your crayons while I grade papers" (Ibid.) where Louise shifts into future continuous tense, rendering a memory as something still ongoing and alive in the future.

Table 2. Examples of Narrative Shifts

Past Memory as an Active Future Experience
Example #1. *"I remember one afternoon when you are five years old, after you have come home from kindergarten. You'll be coloring with your crayons while I grade papers* (Chiang 2000: 7).
Example #2. *"I remember when you are fifteen, coming home after a weekend at your dad's, incredulous over the interrogation he'll have put you through regarding the boy you're currently dating. You'll sprawl on the sofa, recounting your dad's latest breach of common sense: "You know what he said? He said, 'I know what teenage boys are like'". Roll of the eyes. "Like I don't?""* (Ibid., pp. 21-22).
Future Memory as Recollection and Prediction
Example #3. *"I remember a conversation we'll have when you're in your junior year of high school. It'll be Sunday morning, and I'll be scrambling some eggs while you set the table for brunch. You'll laugh as you tell me about the party you went to last night.*   *"Oh man," you'll say, "they're not kidding when they say that body weight makes a difference. I didn't drink any more than the guys did, but I got so much drunker."*   *I'll try to maintain a neutral, pleasant expression. I'll really try. Then you'll say, "Oh, come on, Mom."*   *"What?"*   *"You know you did the exact same things when you were my age."*   *I did nothing of the sort, but I know that if I were to admit that, you'd lose respect for me completely"* (Ibid., pp. 12-13).

Chiang further employs grammatical disruptions in Example #2, beginning with "I remember" (Ibid., p. 21) which immediately shifts to the present ("you are fifteen") and then to the future perfect, creating a layering effect. The line "the guy you're dating now" (Ibid., pp. 21-22) again embeds current-tense language into the remembered future event, further unsettling the narrative timeline. The closing sentence – "You'll sprawl on the sofa, recounting your dad's latest breach of common sense" (Ibid., p. 22) – treats an anticipated moment as something already known, reinforcing the sense of simultaneity.

What makes this moment especially vivid – the eye-roll, the rhetorical question, the casual sarcasm – the emotional details draw the reader into the scene. Unlike traditional first-person narration of dialogue retelling a past event, Chiang's use of the future tense gives the impression that the moment is happening as we read, even though it technically has not occurred yet. His layered future memory effect reinforces the idea that time is not remembered in the conventional sense but unfolds all at once. He thus forces the reader to live in the same cognitive structure as Louise, in which foreseeing events does not change them but transforms one's relationship with

time, resonating with RQM, where reality is defined by the observer's relation with time rather than by an objective temporal sequence.

In Example #3, Chiang inserts a second-person voice into a first-person narrative – "Then you'll say, "Oh, come on, Mom"" (Ibid., p. 13) – to place the reader within the space of an imagined conversation. The passage ends with an abrupt change in tense, a sudden shift from future to reflection in present – "I did nothing of the sort" (Ibid.) – which functions as Louise's internal monologue. The return to the present tense unsettles the reader, breaking the usual flow and catching them off guard, marking disorientation as a side effect of perceiving time as nonlinear.

This layering of voice and temporality not only disorients the reader but also raises questions about focalization and identity within nonlinear structures – a phenomenon explored by Kanta Dihal in her analysis of quantum narratives. As she notes, "quantum physics in fiction presents new possibilities for focalization…The very meaning of the personal pronoun "I" is questioned when quantum physics is made to influence the narrative" (Dihal 2019: 71). Louise becomes both narrator and character, both subject and observer, "spread out over eigenstates," to borrow Dihal's phrasing (Ibid.).

The discussed techniques ultimately shape the reader's cognitive and emotional engagement with Chiang's nonlinearity. Although events unfold as inevitable, the narrative does not claim that all of reality follows strict determinism. Louise's experience is deterministic, but the focus is not on proving determinism itself – it is on her acceptance of foreknowledge. The novella challenges the assumption that knowing the future must lead to a desire to change it and instead presents time as relational, arguing that it is perception, rather than causality, that transforms one's experience.

The reader becomes complicit in the determinism governing Louise's life. As previously noted, the effect is both immersive and disorienting – immersive because the reader adopts her cognitive framework, disorienting because conventional narrative expectations (e.g., progression toward discovery) are subverted. While this section was focused on Chiang's novella, it is helpful to note that the cinematic adaptation, *Arrival*, engages temporality differently, which will be discussed in the next section. Unlike the film, which employs visual markers like color grading

shifts to signal nonlinear time, Chiang's text destabilizes the reader solely through linguistic and structural disruptions.

2.4. Cinematic Temporality in *Arrival*

Denis Villeneuve's *Arrival* preserves the essence of quantum superposition not so much by reproducing Chiang's temporality as by delineating for the viewer the evolving perception of Louise through non-linear editing. His cinematic language repeats the circular structure of Chiang's short story, which begins and ends with the same locking question: "Do you want to make a baby?" (Chiang 2000: 1, 39; Heisserer 2015: 1, 118)[2]. The film incorporates the same locking question, mirroring the beginning at the end, it opens and closes with the same long take – the camera slowly moves down, and a landscape appears in the blue of the evening twilight; this is the window from Louise's house that looks directly onto the shore of the lake: "This is the same scene as the first. Shot by shot" (Heisserer 2015: 117)[3]. The long take and the fatal question lock the circle for the viewer to doubt endings and beginnings.

While the original story immerses the reader in Louise's changing perceptions from the start through complex grammatical constructions, *Arrival* follows a traditional episodic structure and then gradually moves towards non-linearity. Such approach situates the audience in what Paul Ricoeur calls mimesis 1 (prefiguration), where both Louise and the viewer experience time as linear (Ricoeur 1984: 54-64).

Before moving forward, it is worth asking: where does the story of *Arrival* actually begin? At first glance, the opening scenes seem to follow a familiar linear structure. Louise reflects on

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[2] While the sentence refers to Villeneuve's cinematic style, the phrase "Do you want to make a baby?" recurs in Chiang's short story (Chiang 2000: 1, 39), Heisserer's screenplay (Heisserer 2015: 1, 118), and the film *Arrival* (2016), which is the focus of this discussion.

[3] Pages and scene numbers (some scenes and pages marked with additional letters due to a distinct editing cut, shot transition, or added pages) correspond to those in Eric Heisserer's original screenplay draft, 2015 version, the only script version available.

memory in voiceover, and we see her daughter Hannah's birth, moments from her childhood, and eventually her death. On first viewing, these moments are perceived as flashbacks, reinforcing the assumption of a standard linear narrative with shown memories of what happened with Louise, Ian and Hannah. However, the film's climax forces us to rethink these scenes - not as memories of the past, but as glimpses of events that have not yet happened. This shift to mimesis 3 (refiguration) forces viewers to reconstruct their understanding of the narrated time after Louise's final understanding of how her visions work. Structuring the narrative that way – as a process of discovery rather than presenting nonlinearity from the outset – *Arrival* actively engages the viewer in the cognitive transformation that defines Louise's journey.

Structurally, the film begins with what could be understood as the resolution to Louise's story or its "end": "I used to think this was the beginning of your story" (Heisserer 2015: 1), she states after Ian asks about having a child, subtly suggesting this is not the true beginning despite being the film's opening. This is followed by the scene of Hannah's death, where Louise's voiceover reflects: "But now I'm not so sure I believe in beginnings and endings" (Ibid., p. 3), which underscores the film's nonlinear structure, as its beginning is neither the actual start of events nor a retelling of something that happened before. The first scenes function rather as an emotional prologue, revealing what will take place in Louise and Ian's future – namely, how their shared decision to have a child ultimately unfolds. Villeneuve establishes the film's temporal complexity by following such a structure choice.

After its prologue, the film shifts into a linear progression: we see Louise at an earlier point in time – before Hannah's birth. She looks different: "Her hair is longer here, and there's no wedding band on her finger. She carries herself like someone who's learned how to be alone" (Ibid., p. 4). At this stage the audience is unaware of the change, confronted with Ricoeur's question of "where?" in relation to the timeline they are (Ricoeur 1984: 10). Louise enters a lecture hall to teach, and it is during this moment that news of the heptapods' arrival breaks – marking the true chronological beginning of events.

Villeneuve's decision to suggest *Arrival*'s nonlinear structure by opening with what appears to be a beginning but ultimately functions as a resolution echoes what David Bordwell describes as a "puzzle film" (Bordwell 2006) – stories designed to prompt rewatching and reinterpretation.

Bordwell notes that films utilizing fragmented timelines often guide audiences through "gap making and gap filling" (Ibid., p. 82) to ensure comprehension. He discusses how modern narratives embrace techniques of "scrambled time schemes" (Ibid.) and parallel flashbacks, moving away from traditional memory-based flashbacks to structures that juxtapose different moments in time. This is particularly relevant in *Arrival*, where scenes that appear to be flashbacks are not memories at all - they chart Louise's metamorphosis of perception.

Villeneuve's treatment of temporality also aligns with Deleuze's concept of the time-image, where time unfolds as overlapping layers outside of linear progression. Unlike conventional storytelling with the function of movement-image, where time is conveyed through movement and cause-effect sequences, the time-image makes time itself visible, disrupting linear causality (Deleuze 1989: 26-41). Instead of being structured around clear resolutions, time in the time-image unfolds in a fractured, non-hierarchical manner, allowing different temporal moments to coexist within the frame. *Arrival* exemplifies Deleuze's concept of the time-image, particularly in how Louise's visions of her daughter disrupt conventional chronology. These are not framed as flashbacks or dreams, but as lived experiences of a future already known. As Deleuze argues, "each present coexists with a past and a future" (Ibid., p. 37) – a temporal entanglement the film makes visible by rendering the future perceptible as memory.

Through elliptical editing, soft dissolves, and temporal ambiguity, the film invites the audience to Louise's experiential world where present and future bleed into one another, not intellectually, but sensorily. Using the cinematic language of color and framing, Villeneuve gradually reveals the true nature of time. Close-ups and shallow focus create an intimacy of Louise's point of view, particularly in her interactions with the heptapods. If in the beginning, aliens are framed within rigid symmetry, reflecting a linear mindset, later, when Louise learns Heptapod B, the camera movements become more fluid, symbolizing the dissolution of sequential time.

Villeneuve marks Louise's transformation with four pivotal moments: the moment of cognitive shift (scene 63 in Heisserer 2015: 53)[4], the moment of revealing that time is nonlinear

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[4] I indicate the page number and the scene designation on that page to ensure accurate reference.

(Ibid., pp. 103-109), the moment of realization of acquired knowledge (Ibid., pp. 109-113B)[5], and the moment of discovery of further events in her life with Ian and Hannah (Ibid., pp. 117-118). In Scene 63 while listening to the heptapods through her headphones, Louise experiences her first true vision of Hannah, signaling the moment her mind begins operating in a nonlinear framework. The subtle change in sound design (a shift in ambient noise) and match cuts between Heptapod B symbols and images of Hannah visually encode her transformation.

The earlier scene of the first entry into the heptapod chamber is a key visual gesture, introducing the film's grammar of symmetry and temporal disorientation. As the team ascends into the alien spacecraft, gravity inverts and the scientists are seen climbing upward, ultimately suspended upside down – an early metaphor for the inversion of linear time. This moment foreshadows Louise's gradual reorientation in time. Once inside, the mise-en-scène shifts to a minimalist environment dominated by fog and soft symmetry. Later in the scene 108, titled "THE SHELL," Louise steps into "a dimensionless sea of bright mist" (Ibid., p. 100), "no walls or ceiling" (Ibid., p. 101). She is no longer grounded in familiar space or physics. The script emphasizes this estrangement: "She is in a truly alien place now" (Ibid.). As Louise gazes upward into the void and sees a heptapod drifting through a white, borderless field, the film visually externalizes the disintegration of classical spatial and temporal boundaries. The scene, thus, dramatizes her entry into a relational perception of time – mirroring the principle of superposition that defines the narrative's structure. Her line – "There is no linear time" (Ibid., p. 103) – signals realization of her condition.

Further in scene 114 (Ibid., p. 109), Louise has a vision of a future diplomatic event where she speaks to General Shang, who reveals that she once called him and quoted his wife's dying words, convincing him to halt the war. This moment confirms that her visions are not hypothetical but actual events, and her cognition fully embraces non-sequential time as Louise acts on what Shang discovered to her (Ibid., pp. 113A-113B)

Finally, in scene 125, Ian asks Louise, "Do you want to make a baby?" (Ibid., p.118), and "She smiles broadly at him and replies: "Yes"" (Ibid.) – the moment she consciously embraces her

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[5] Pages from 113 to 114 in Heisserer's screenplay include additional pages numbered 113A, 113B and 113C, so the marking corresponds to Heisserer labelling of pages.

future. Unlike the novella, the film constructs this as a moment of revelation where she actively chooses to live with full awareness of the consequences. This is the locking question of the movie as was mentioned in 2.1. as it serves the beginning and the end of the film, embodying the circular panoramic structure of time for heptapods and for Louise. Much like a quantum system returning to its original state, this moment does not "end" the story but crystallizes its temporal paradox: the beginning is the end, and the end is a choice made in full awareness of all that is to come.

This moment (discussed in section 2.1 in relation to Dirac's principle of superposition and the collapse of the wave function) marks the point at which Louise's fragmented perception resolves into a single, ethically charged action.

Sound design plays a powerful role in how *Arrival* builds emotion. Jóhann Jóhannsson's original score, particularly his piece *Heptapod B* (2016), perfectly incorporates tape loops and layered vocal patterns to mirror the film's circular motifs, from the logograms to the palindromic nature of time as Louise comes to perceive it. The music itself feels suspended in time. Throughout the film, subtle sound transitions allow shifts in chronology to feel seamless.

Finally, I would like to address the core difference that Villeneuve brings into his picture by introducing a crucial shift in how Louise's decision is framed – assigning it a weight that goes beyond what we find in Chiang's original. *Arrival* not only poses the question of whether having Hannah is an act of love or sacrifice; it pushes further, asking whether Louise truly chooses this path, or simply accepts it as inevitable. This tension comes to the surface in a key added scene, where Hannah asks why her father left. Louise answers quietly, "That was my fault" (Heisserer 2015: 105) – a moment that reveals the emotional cost of withholding the truth. Ian's departure, we learn, stems from discovering that Louise had foreseen their daughter's death and chose not to tell him. In this reframing, the ethical burden falls squarely on Louise. The film presents her not only as a mother, but also as the sole bearer of an impossible solution – one that brings into focus the complex, gendered dimensions of reproductive choice. The danger of world catastrophe resolved only through her temporal insight functions in *Arrival* as a magnifier, a metaphor for the scale and gravity of maternal decisions. The film turns the act of bringing a child into the world from a private experience to one whose emotional, ethical, and existential weight reverberates outward: Louise saves the world by choosing a life despite all obstacles. In this way, *Arrival*

universalizes Louise's sacrifice, transforming the story of one woman into a reflection on the quiet magnitude of all mothers' choices.

The movie offers additional ways to read Louise's decision. One perspective sees it as a moral sacrifice – Louise helps prevent a global conflict at the cost of inevitable personal loss; another would be framing it as an existential choice, where foreknowledge is not a means to alter fate but an invitation to fully embrace life despite what is coming. A third perspective – to see it as a deeply personal decision of a mother choosing to bring a child into the world, even when she knows how that story will end.

Unlike Chiang's story, which approaches Louise's personal tragedy with a philosophical distance, *Arrival* pulls the viewer directly into Louise's emotional world. It invites us to ask ourselves what it means to say yes to something fleeting and painful – something beautiful that we know will end. By making her foreknowledge both emotionally resonant and ethically complicated, dramatizing the setting by means of cinematic language of camera, editing, mise-en-scène, and sound, Villeneuve encourages a level of reflection that the original story only hints at. In this way, it can be argued that *Arrival* brings the existential entanglement behind quantum ideas to the screen not just as an abstract theory but as something the audience can feel.

2.5. Concluding Remarks

This chapter showed that Louise's temporal experience defies classical models of time, including the loop or cyclic structures commonly proposed, by applying Paul Dirac's superposition principle and Carlo Rovelli's relational quantum mechanics.

Instead of a deterministic sequence or closed cycle, her experience is shaped by simultaneous awareness, observation, and interaction, reflecting a relational superposition of events. The salad

bowl scene in Chiang's novel was identified as a wave collapse, while in Villeneuve's film a similar moment is the conversation with General Shang.

We also outlined the means used by the novella and the film to immerse in the experience of nonlinearity, in particular through Ricoeur's mimesis. In addition, themes specific to Villeneuve's film were raised, such as Louise's existential choice to embrace the future without attempting to escape it.

Chapter 3. Journeys of Transformation: Individuation, Knowledge, and Sacrifice

This chapter explores the themes of individuation and sacrifice (in the context of suffering), aspects that have received less attention in existing scholarship on both works.

Drawing on Carl Jung's concept of individuation, Friedrich Nietzsche's theory of tragic affirmation, and Emil Cioran's existential scepticism, the chapter explores how both texts confront the question: What does it mean to choose a life of inevitable loss? While Jung and Nietzsche offer frameworks for integration and affirmation, Cioran's writing serves as a counterpoint, highlighting the emotional weight of foreknowledge and the futility that can accompany lucidity.

By interpreting Louise's story as an existential transformation, this chapter attempts to follow her arc not as a metaphor for determinism but as a reflection on how we continue to live in full awareness of life's fragility.

3.1. Individuation and the Hero's Journey

Joseph Campbell's monomyth (1949) follows a structured trajectory: departure from the familiar, initiation through trials, and return with transformative knowledge. This closely parallels Carl Jung's concept of individuation, where the individual must confront unconscious elements often represented in myths and dreams by archetypal figures in the so-called "hero myth" (Jung 1980: par. 289) – and integrate them into a consciousness of unified self (Ibid., par. 83). Jung describes this individuation process as often involving symbolic death and renewal, which allows for inner growth (Ibid., par. 215–234).

While Campbell's monomyth offers a compelling lens for many traditional narratives, it is not a universal formula. Yet certain elements in *Arrival* do echo this structure, especially in the framing of transformation through the unknown. The monomyth typically involves a departure, an initiation (often aided by mentors and trials), and a return, where the hero brings back an "elixir" (Campbell 2004: 182, 201, 228) – a "boon of the knowledge" (Ibid., p. 32), a wisdom for the benefit of others. *Arrival* loosely mirrors this path but reorients its logic. While the form remains mythic, the trajectory resonates more directly with Jung's inward process of individuation than with Campbell's externally focused quest. This chapter focuses especially on the return stage and how Louise's "boon" functions not as magical empowerment, but as an ethically fraught and isolating burden. It also argues that *Arrival* subverts the monomyth and presents a fundamentally different model of individuation, one that is shaped by the protagonist's non-sequential perception of time. While Campbell's hero returns with knowledge that empowers and heals, Louise's transformation results in a paradox: she gains knowledge of the future but is bound by it. Moreover, her individuation is not a relational process through a male counterpart (Ian), but rather an internal synthesis within herself. Overall, the picture breaks away from a linear, goal-oriented transformation to a recursive and open-ended one, reinforcing the originality of Chiang's narrative.

At first glance, *Arrival* appears to set the archetypal structure of the hero's journey. A woman, helped by a man, encounters otherworldly beings who bestow transformative knowledge. This leads to intimacy and the birth of a child – a classic mythic motif. But the film swiftly departs from this trajectory: rather than achieving wholeness, the protagonist's arc bends toward ambiguity and internal fragmentation. The familiar progression from loss to renewal is complicated here by the film's refusal to reward transformation with resolution.

When we first meet Louise, she appears isolated: without her child or partner. This initial solitude suggests psychological incompletion, which myth and Jungian theory often link to an unintegrated psyche. Rather than signaling an eventual return to wholeness through reunion, however, her journey unfolds through fragmentation. Her transformation involves not the recovery of what was lost, but the acceptance of inevitable loss as an enduring condition.

The heptapods, as extraterrestrial beings, embody the mysterious and the unknowable, which closely echoes Jung's idea of the unconscious. He describes water as "the commonest symbol for the unconscious" (Jung 1980: par. 40), and Villeneuve's choice to depict the heptapods with deep-

sea, fluid-like qualities visually echoes this association. Even their circular language recalls Jung's mandala – the term Chiang also uses in description of semagrams: "...they were almost like mandalas" (Chiang 2000: 26) – a symbol of wholeness and integration (Jung 1980: par. 634). The mandala appears so prominently in Jung's *The Archetypes and the Collective Unconscious* (1957) that the material was later published in a separate volume titled *Mandala Symbolism* (1959). Thus, the visual language in Chiang's narrative signals an individuation, bringing together the conscious and unconscious.

Here *Arrival* echoes specific moments from Campbell's structure as the heptapods might function as mentor figures in the initiation phase, offering Louise access to transformative knowledge. Their alien language becomes a tool of revelation, akin to the boon or insight granted by mythic guides, thus, Louise's foreknowledge of the future mirrors the "elixir" in the final stage of the monomyth. While not magical in the traditional sense, this knowledge enables a pivotal intervention: Louise contacts General Shang and prevents a global conflict, applying her insight to alter the present. In this sense, *Arrival* momentarily reclaims the redemptive logic of the return with the elixir, only to complicate it by presenting that same knowledge as ethically burdensome and isolating. This is where Campbell's model begins to fall short, as the focus shifts from outward-facing quest to internal confrontation – a transition better understood through Jung's framework of individuation, which centers on integrating unconscious knowledge rather than external triumph.

In Chiang's story, Louise and Gary interact with the heptapods through the "looking glasses", described as "a semicircular mirror over ten feet high and twenty feet across" (Chiang 2000: 4-5). The "looking glass", the mirror, speaks of self-reflection and self-exploration; therefore, Louise's frequent glances into it can be read as introspection, an essential aspect of individuation. As Louise learns to understand the heptapods, the screen slowly clears, and we can assume that Louise is thus coming to terms with the unconscious, a part of herself that was previously hidden.

The film offers its own version of this image. Inside the alien craft, Louise and Ian stand on a platform facing a hazy barrier that divides them from the heptapods. Like the glass in the story, it becomes a threshold between worlds, but also between conscious understanding and something deeper she's just beginning to grasp. The knowledge that the alien beings impart to the man and

woman, according to the film, will allow for cooperation between one and the other side, and according to psychology, one of the goals of individuation – the exchange of energies between consciousness and the unconscious.

Jungian psychology emphasizes the need for the integration of the masculine and feminine principles for psychological wholeness (Jung 1980: par. 636). At first glance, Louise and Ian represent these dual forces: the masculine principle of logic and analysis (Ian as a physicist) and the feminine principle of synthesis and interpretation (Louise as a linguist). Their union produces a child, symbolizing the synthesis and the completion of the individuation process. However, this interpretation is controversial. Although the idea of Louise and Ian representing the Jungian masculine and feminine principles is sound, it risks oversimplifying their roles, especially given that both characters come from fields based on logic and analysis – linguistics and physics. In addition, Jung sees the personal world of the individual as more complex and conflictual, with both anima and animus coexisting in one person (Ibid., par. 511–512). Since the animus represents the masculine part of the female psyche, and the anima – a feminine part of the male psyche, considering individuation as a paired performance without Ian's narration risks being unfounded.

A more convincing approach is to consider the development of the integration of both principles in Louise herself, rather than emphasizing the binary opposition between Ian and Louise. *Arrival* thus presents individuation as an internal rather than a relational process. Louise, as a scientist, is herself part of the expression of the structured analytical "masculine" principle of systems and order (the dominant animus, to use Jung's terminology). Ian recognizes it by saying: "You know, you approach language like a mathematician" (Heisserer 2015: 59), implying that they are alike for Ian is the one responsible for the mathematician domain, to which Louise responds – "I'll take that as a compliment" (Ibid.).

As was discussed above, Louise encounters the unconscious (the heptapods) in order to learn their language, that is, to understand another principle, to discover other archetypes in herself. Here the symbolism of Heptapod B as alien and irrational, which cancels the order of time and things that are familiar to Louise, is of no small importance. In other words, the plot revolving around the study of the heptapods' language can be interpreted as Louise's internal metamorphosis – her process of acquaintance with and acceptance of a new principle of understanding the world. Jung describes wholeness as a "perfect state where masculine and feminine are united" (Jung 1980: par.

636). In this case, the missing principle is the "feminine" principle or anima. Louise's encounter with heptapods entails the rejection of the previous structured picture of the world of systems and order in favor of irrational, nonlinear, seemingly chaotic intuitive perception.

Villeneuve makes this metamorphosis visible through editing: as Louise's understanding of language deepens, her sense of time begins to blur, the dislocation increasing, visually emphasizing the dissolution of structured time in favor of an intuitive, holistic awareness. It is evident in the pivotal moment where Louise writes in Heptapod B for the first time. As she writes out the circular logogram, the camera tilts slightly, creating a destabilizing effect. This tilt communicates to the viewer the severity of her cognitive transformation. The slow motion and deep focus of the sequence emphasize that at this moment her perception of time has begun to change irreversibly. The altered camera perspective suggests that Louise is no longer bound by conventional frameworks of understanding; instead, she is stepping into an entirely new mode of perception.

This transformation is foreshadowed earlier when Abbott demonstrates the structure of Heptapod B:

> Abbott writes a heptapod sentence in real-time. With two hands simultaneously. It is poetry in motion. A dance of ink. He begins at opposite ends, and then writes phrases and symbols in a perfect pair of arcs so that they connect as a circle at the end (Heisserer 2015: 64).

The description of writing as poetry and dance stands in direct contrast to the rigid linearity of prose. Traditional writing follows a sequential structure with a beginning and an end, poetry – especially free verse – operates under its own principles, privileging simultaneity, rhythm, and ambiguity over fixed meaning. Heptapod B, in its circularity, embodies these poetic qualities, rejecting any known system of linear sequence in favor of holistic, all-encompassing expression. By embracing this mode of communication, Louise moves away from structured, analytical reasoning (prose) and towards an intuitive, fluid understanding of existence (poetry).

Abbott's next demonstration can be read as a call for individuation. He "draws two lines that meet in the middle to form one long, contiguous line" (Ibid., p. 66) – a visual metaphor for integration, the aim of individuation. Just as individuation requires reconciling the conscious and

unconscious mind, Abbott's symbol merges two seemingly separate paths into a unified whole. When Louise finally picks up the tablet and begins drawing in Heptapod B herself – "she's quite good at it" (Ibid., p. 64) – she is not merely translating but actively participating in a transformative process. By writing in Abbott's poetic, circular orthography, Louise rejects conventional ways of thought, embracing a holistic mode of being, where the division between reason and intuition dissolves into continuity, and symbolically enters a space of individuation.

Jung saw individuation as the process of integrating unconscious elements into a unified self, achieved through confrontation with the shadow and symbolic death and rebirth (Jung 1980: par. 199-205; Jung 1966: par. 269, 296-305). Such path, according to Jung, leads to self-realization, providing the individual with a more evolved state of psychological wholeness. Campbell's monomyth applies Jungian ideas, framing the hero's journey as a path toward empowerment, resolved in a triumphant return to the ordinary world with newfound wisdom. *Arrival* takes the idea of transformation in a different direction. Louise gains knowledge of the heptapod language, which allows her to see time differently, yet her knowledge cannot be interpreted as empowering – it anchors Louise to an already known future, requiring her to accept a path where her daughter's death is inevitable. Unlike the traditional hero, who returns to share wisdom with the world, Louise's knowledge isolates her.

In mythic structures, sacrifice is often a necessary step towards a higher unity. It can lead to rebirth and personal growth, or it can mean loss. In other words, by sacrificing some part of oneself, one can either be reborn, develop, mature, or not reborn, not develop, in which case the loss leaves behind a sacrifice. In *Arrival*, Louise's sacrifice seems to bring no tangible benefit – there is no clear higher purpose, no resolution beyond the acceptance of suffering. This makes her path to individuation harder to define. If we understand individuation as the act of holding opposites together, then she does reach it by balancing logic and intuition, system and chaos, linearity and simultaneity. But if we interpret individuation as an agency to apply one's knowledge to achieve desirable results, her journey remains incomplete. The future she sees can't be changed, and that knowledge keeps her bound rather than free.

Arrival challenges the traditional hero's arc on both structural and emotional levels. In its nonlinear design, individuation is not a traditional path toward wholeness – but an ongoing negotiation between knowing and accepting, between integration and loss. Rather than returning

with the "elixir" of knowledge, Louise steps forward with quiet resolve, bearing the weight of foresight by herself. Hers is not a story of triumphant self-realization, but of surrender to time itself – a paradoxical transformation where wisdom is indistinguishable from sacrifice.

3.2. Dionysian Tragedy, and the Meaning of Sacrifice

Story of Louise, as of tragic inevitability, causes tension: is her journey a conscious acceptance or a defeat? Nietzsche (1872; 1889) provides a framework for interpreting this paradox, in which the Dionysian, as opposed to the Apollonian. believes that suffering is not to be avoided but to be confronted:

Saying yes to life, even in its strangest and hardest problems; the will to life rejoicing in the *sacrifice* of its highest types to its own inexhaustibility – *this* is what I called Dionysian, *this* is what I sensed as the bridge to the psychology of the *tragic* poet (Nietzsche 1998: par. 5).

Nietzsche argues that the unique power of tragic art lies in its capacity to both enchant and disturb, compelling the viewer to look while simultaneously awakening the desire to see beyond – "for it says to us: 'Take a look! Take a close look! This is your life! This is the hour-hand on the clock of your existence!'" (Nietzsche 1999: par. 24) – experiencing both the beauty of the image and the sense that it conceals a deeper truth (Ibid.). For Nietzsche, this tension is not a flaw but the defining aesthetic effect of tragedy – it invites us to confront suffering not merely as a narrative event but as a metaphysical experience. Tragic myth, he claims, "participates fully in the aim of all art, which is to effect a metaphysical transfiguration" (Ibid.). Tragedy, therefore, does not simply reflect reality, for

tragic things really do happen in life would in no way explain the origins of a form of art, unless art did not simply imitate the reality of nature but rather supplied a metaphysical supplement to the reality of nature, and was set alongside the latter as a way of overcoming it (Ibid.).

Tragic myth, Nietzsche affirms, justifies existence by transfiguring suffering into aesthetic form (Ibid.). His concept of Dionysian tragedy suggests that knowledge does not liberate the tragic hero but instead deepens the awareness of suffering, transforming it into an experience to be endured rather than resisted.

The application of Nietzsche's Dionysian perspective leads to an unexpected reevaluation of Louise's tragic foresight, which, while not offering her control over the future, also does not demand a choice from her; it only tells her to accept life in its fullness. The moral power of tragedy, for Nietzsche, lies not in the resolution of conflict, but in the affirmation of existence in spite of it. Rather than seek for a moral retribution, Dyonisian perspective calls for *amor fati* – the love of one's fate, embracing all that life entails without reservation (Nietzsche 2001: par. 276).

If we start considering Louise's transformation through this dichotomy, we can read her initial approach to Heptapod B as rooted in Apollonian dimension – where she treated it at first as a structured linguistic system to be studied and decoded. But as she adopts the heptapods' perception, she finds that this approach no longer applies. Nietzsche distinguishes Apollo as characterized by clarity and rationality, while Dionysus as embodying emotion, chaos, and the dissolution of boundaries. Jung uses these same archetypal forces to describe internal psychic tensions. Thus, the heptapods' language represents a Dyonisian realm. And as Louise acquires an understanding of this language, her perception shifts toward a Dionysian mode. Regarding the fate of yet-to-be-born daughter, Louise is not confronted with a choice of whether to have the child or not – she experiences love and loss, joy and suffering in inseparable continuum. Applying Nietzsche's view of tragedy allows us to interpret Louise's foreknowledge not as a burden or an escape, not as a failed trial or a curse but as a part of her existence.

We can trace a subtle affirmation of this interpretation in *Story of Your Life* through Louise's evolving relationship with her daughter, where her memories, past, and future are saturated with love and suffering. She recalls:

It'll be like growing an errant limb, an extension of myself whose sensory nerves report pain just fine, but whose motor nerves don't convey my commands at all… I'm going to give birth to an animated voodoo doll of myself (Chiang 2000: 20–21).

This description encapsulates the Dionysian paradox: a life intimately felt, despite its inescapable pain. Even as she feels helpless to alter Hannah's fate, Louise cherishes moments of joy: "…there will be the times when I see you laughing... It will be the most wonderful sound I could ever imagine, a sound that makes me feel like a fountain, or a wellspring" (Ibid., p. 21). Her experience is a conscious embrace of fleeting beauty: "I'll feel elated at this evidence of a unique motherchild bond … Yes, that's her. She's mine" (Ibid., p. 38). There is no resistance, no rejection, only a willing acceptance that weaves joy and loss into the same gesture – in Nietzschean terms, the tragic transfiguration of reality, "hour-hand on the clock of your existence" (Nietzsche 1999: par. 24).

Yet, *Arrival* complicates this affirmation. From the beginning, Chiang situates Hannah's death within Louise's nonlinear perspective, allowing grief and love to coexist throughout the story. Meanwhile, Villeneuve confronts the viewer with its harrowing reality: a dying child, her final breath, and a mother who cannot let go – "Louise's grip on her daughter tightens. Trembling… now it's mother trying to return to her baby girl" (Heisserer 2015: 3). These added scenes of suffering intensify the emotional weight of the story and raise ethical ambiguity. *Arrival* introduces doubt where Chiang presents certainty. When Hannah asks, "Are you gonna leave me like Daddy did?" (Ibid., p. 105) and Louise replies, "That was my fault. I told him something he wasn't ready to hear… he got real mad. Said I made the wrong choice" (Ibid., pp. 105-106), the tragic affirmation shifts toward moral speculation. The film suggests that Ian, unlike Louise, could not embrace this suffering as meaningful.

By adding these lines, *Arrival* cements the anguish of Louise's position, shedding light on her ongoing guilt towards Hannah and Ian. In *On the Heights of Despair* (1934) Emil Cioran warns: "All suffering is an abyss", it "unhinges the reason, dulls the senses, and finally destroys" (Cioran 1992: 70). For him, there is no beauty in sacrifice, only disintegration. Where Nietzsche offers metaphysical transfiguration, Cioran sees "a satanic principle" (Ibid., p. 123) driving the individual into isolation:

> Suffering separates and dissociates... it pulls you away from the center of life, the hub of the universe where all things tend toward unity. The divine principle distinguishes itself by an effort toward cosmic synthesis and participation in the essence of everything. The satanic principle, on the other hand, is a principle of dislocation... Through joy, spiritual or sensual, you ... partake of life ... each particle of your body vibrating with the … pulsations of the Whole (Ibid., p. 124).

From this view, Louise's choice might not be heroic but tragic in a different sense – the unbearable burden of knowing, as Louise says to Hannah: "I know something that's going to happen… and it can't be stopped" (Heisserer 2015: 106). The ambiguity deepens when Louise tells General Shang, "War doesn't make winners, only widows" (Ibid., p. 113B), which hints at loss and fatalism. Perhaps she identifies herself with that widowhood – living with loss as her only possible choice. And yet, she chooses to live fully. Here, *Arrival* suggests a tension between affirmation and guilt: was Louise's choice inevitable, or was it wrong? The film dramatizes this tension more explicitly than Chiang, introducing a conflict not only between joy and suffering, but between perspectives on responsibility.

This dilemma reaches its most intimate form in the rift between Louise and Ian. He blames her for choosing to bring Hannah into a life that ends in terminal illness – suffering not just for the child, but for the parents. And yet, Louise had already loved her daughter before the question of "choice" could even be articulated. As Jung would argue, individuation demands integration. Louise's joy and grief, her bond and her foreknowledge, cannot be separated without losing the wholeness of herself. She did not sacrifice Hannah for herself – she could not unlove her. As Louise puts it together in the novella: "Even if I had never laid eyes on you before, I'd be able to pick you out from a sea of babies … that's her. She's mine" (Chiang 2000: 38).

We thus arrive at the central philosophical question: Is bringing a child into the world a form of tragic affirmation? Chiang answers this question from a Dionysian position: life *must be* lived fully, regardless of knowing its outcome. However, the film rather leaves the question open, asking the viewer to decide whether Louise's act was an act of selfless love or an egocentric decision. Villeneuve integrates the ambiguity and sometimes shifts the register of Chiang's original story from a Dionysian affirmation to an ethical confrontation.

In *Story of Your Life*, knowledge is weighty but welcome. In *Arrival,* it demands a reckoning. Both stories ask: Can love survive certainty? In the novella, the answer is yes – Louise's choice affirms time, love, and grief in a single breath; her sacrifice is not a rejection of suffering but a transfiguration of it. But the film, in contrast, resists closure. The novella offers catharsis; the film

provides conflict. If Chiang shows the weight of foreknowledge and its strange rewards, Villeneuve reminds us that some truths offer no comfort, only presence. Both invite us to reflect on the cost of knowledge, but only Chiang leaves us with the quiet certainty that the cost is worth it.

3.3. Concluding Remarks

This chapter examined the themes of individuation, tragic knowledge, and sacrifice, suggesting a new synthesis of metaphor and tragic philosophy that opens new interpretive possibilities. It focused on questions many readings leave to the side: How can we read Louise's choice to have Hannah born?

Jung's theory of individuation allows a more complete picture of the psychological situation in which we find Louise, interpreting her arc as a path to integrating the missing archetypal elements necessary for wholeness. Nietzsche's Dionysian perspective, in turn, answers the central question by recognizing her choice not as resignation but as a conscious acceptance of life in the face of suffering. Cioran's skepticism, on the other hand, invite us to doubt whether suffering can ever be truly transfigured.

The chapter also addresses the philosophical implications that differ between the novella and its film adaptation: *Story of Your Life* internalizes Louise's transformation as a metaphysical acceptance, and *Arrival* renders it an ethical burden. The cinematic adaptation changes not only the form of the original story but also the weight of its resolution.

Conclusions

This study attempted to examine *Story of Your Life* and *Arrival* through a multidisciplinary approach, drawing on physics, narrative theory, Jungian psychology, and existential philosophy. The central argument connected Louise Banks's nonlinear perception of time to the principle of quantum superposition, wherein multiple temporal states coexist and gain meaning only through observation — a metaphor that, as this work argues, operates not only at the structural level but also as an existential and psychological condition.

Beyond the structural analysis, the present work has examined Louise's arc as a psychological process of individuation consistent with Jungian theory, reading her encounter with the heptapods not only as an epistemological change but a symbolic integration of opposites: logic and intuition, agency and acceptance, love and loss. Delving into existential philosophy, the study was interested in following Louise's decision to have a child despite foreseeing her daughter's death. In dialogue with Nietzsche's *The Birth of Tragedy* and the idea of *amor fati*, this choice is reinterpreted not as fatalism, but as a deliberate acceptance of suffering as part of a meaningful existence, an act of tragic affirmation. Where other narratives treat foreknowledge as something to overcome, *Story of Your Life* and *Arrival* face it as a philosophical experience.

The present MA paper also addresses the crucial differences between the two as narrative media. Chiang's novella is shown as relying on grammatical disorientation and internal narration to render nonlinear time as a lived experience. In contrast, the film externalizes this perception through visual techniques — elliptical editing, recurring imagery, color grading —while expanding Louise's ethical dilemma into a geopolitical and intimate emotional context. Villeneuve nuances Louise's actions within the urgency of the international crisis and the rupture between her and Ian. Their divergence marks a deeper ethical conflict Villeneuve layers on Chiang's original narrative: between approaching reproduction as a matter of outcomes and consequences, or as an act of unconditional love that affirms life even when choice feels illusory.

By proposing quantum superposition as a central metaphor for narrative structure and psychological transformation, this paper offers an original perspective on existing scholarship about Chiang and Villeneuve, bridging scientific metaphor with archetypal theory, temporal philosophy, and existential inquiry as an interpretive lens beyond linguistic determinism. Superposition here is not just a conceptual tool for describing nonlinear time; it is an existential condition. Louise's expanded awareness, modelled on quantum simultaneity, enables her to perceive her life as a totality – a logogram of past, present, and future. Yet this state also has consequences: what collapses in moments like the "salad bowl" in the novella or the ballroom scene in the film is not just a quantum wavefunction, but the illusion of open-ended choice. This collapse clarifies her ethical burden: to affirm what she already knows will lead to loss. In this sense, the metaphor of superposition does not negate other readings, such as Fermat's Principle or the Sapir-Whorf hypothesis, but complements them, demonstrating that meaning itself is relational. As in quantum physics, there is a place for every interpretation of what we call reality, and it only depends on the observer.

Future research could expand the interdisciplinary approach to other works of science fiction that explore nonlinear time and those engaging with contemporary physics. Both *Story of Your Life* and *Arrival* convey a compelling vision of time and language while also profoundly meditating on human choice, transformation, and the beauty of living with full awareness of loss. In their embrace of ambiguity and multiplicity, these works suggest a shift from instrumental views of knowledge toward something more philosophical, where knowledge is not always power, but it may still be meaningful.

Summary in Lithuanian

Nuo superpozicijos iki (pasi)aukojimo: kvantinės metaforos, individuacija ir transformuojantis žinojimas Tedo Chiango novelėje *Story of Your Life* ir jos ekranizacijoje *Atvykimas*

Šiame magistro darbe Ted Chiango *Story of Your Life* ir Deniso Villeneuve'o ekranizacija *Arrival* analizuojami taikant tarpdisciplininę prieigą, apimančią kvantinę fiziką, naratyvo teoriją, jungiškąją psichologiją ir egzistencinę filosofiją. Darbo tikslas – ištirti kvantinės superpozicijos metaforą, kai keli rezultatai egzistuoja vienu metu tol, kol jie yra pastebimi, kaip naratyvinę struktūrą ir kaip pagrindinės veikėjos psichologinės transformacijos eigą. Metodologiškai darbe derinama nuodugni tekstinė analizė su vizualiniais ir struktūriniais palyginimais, įskaitant nelinijinio laiko schematinius atvaizdavimus. Analizėje remiamasi Paulo Ricoeuro trigubos mimetikos teorija, Gilles'o Deleuze'o laiko vaizdo samprata, C. G. Jungo individuacijos sąvoka ir Frydricho Nietzsche's tragiškojo patvirtinimo idėja, siekiant sukurti sintetinį interpretacinį pagrindą.

Tyrimo rezultatai rodo, kad abu kūriniai naudoja laiko rekursiją ne kaip priemonę sprendimui pasiekti, o kaip būdą tyrinėti išankstinį žinojimą kaip etinę ir egzistencinę naštą. Louise kelias interpretuojamas kaip individuacijos procesas, pasibaigiantis sąmoningu netekties priėmimu, o ne kaip tradicinė herojaus kelionė link išganymo. Novelėje nelinijinis laikas perteikiamas per gramatinę dezorientaciją ir vidinį pasakotojo balsą, o filme šios idėjos išreiškiamos vizualiniais motyvais, išplečiant Louise etinę dilemą tiek asmeniniame, tiek geopolitiniame lygmenyje.

Šis darbas prisideda prie tarpdisciplininių literatūros studijų, parodydamas, kaip mokslinė metafora spekuliatyvioje literatūroje gali būti integruota su psichologiniu gilumu ir filosofiniu sudėtingumu. Teigiama, kad *Story of Your Life* ir *Arrival* meta iššūkį instrumentiniam žinojimo požiūriui, siūlydami alternatyvią viziją, kurioje supratimas, net jei negali pakeisti pasekmių, vis tiek išlieka prasmingas.

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